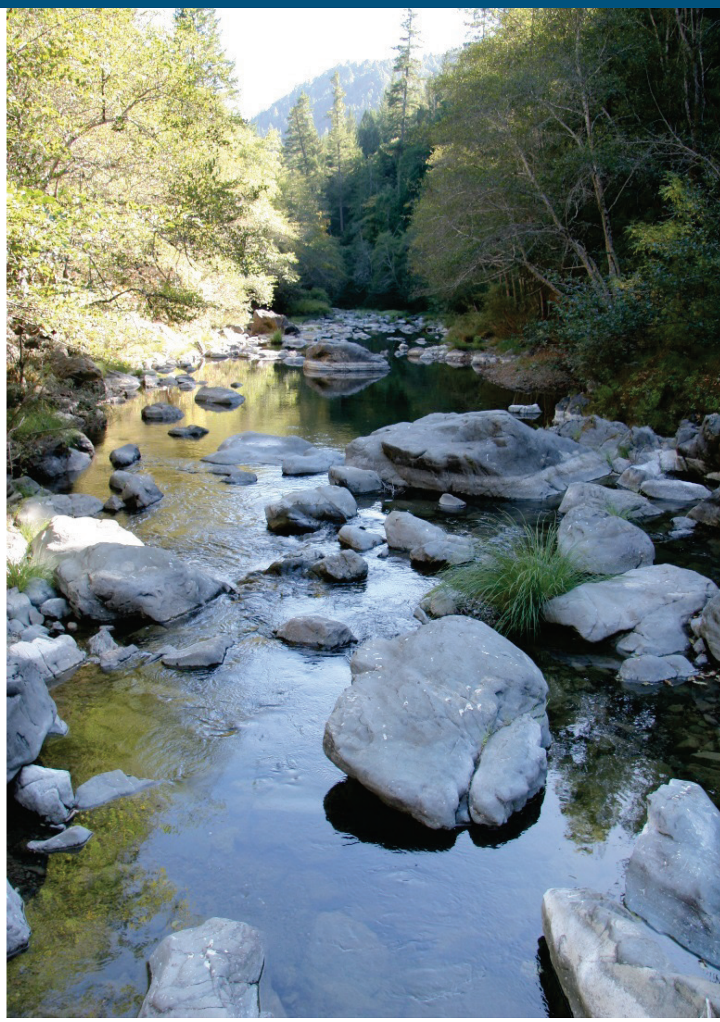
Garcia River Forest
Integrated Resource Management Plan



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THE CONSERVATION FUND

in partnership with The Nature Conservancy, State Coastal Conservancy, California Wildlife Conservation Board and California Department of Fish and Wildlife

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List of Acronyms and Abbreviations

Basin Plan	Water Quality Control Plan for the North Coast Region
BMP	Best Management Practice
BRSC	Big River and Salmon Creek
CAL FIRE	California Department of Forestry and Fire Protection

Cal-IPC	California Invasive Plant Council
CalVeg	California Vegetation
CAR	Climate Action Reserve
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CE	Conservation Easement
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFI	Continuous Forest Inventory
CHRIS	California Historic Resources Information System
CMZ	Channel Migration Zone
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRT	Climate Reserve Tonne
CWA	Clean Water Act
DBH	Diameter at Breast Height
DO	Dissolved Oxygen
EHR	Erosion Hazard Rating
ELZ	Equipment Limitation Zone
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FIP	Functionally Independent Population
FMU	Forest Management Unit
Forest	Garcia River Forest (or GRF)
FORSEE	Forest and Stand Evaluation Environment
FPR	Forest Practices Rules
FPS	Forest Planning and Project System
FSC	Forest Stewardship Council
GIS	Geographic Information System
GLO	General Land Office
GPS	Global Positioning System
GRF	Garcia River Forest
GRI	Gualala Redwoods, Inc.
GRSP	Gualala River Steelhead Project
GRWC	Gualala River Watershed Council
GuRF	Gualala River Forest
GWDR	General Waste Discharge Requirement
IFM	Improved Forest Management
IP	Intrinsic Potential
IPCC	Intergovernmental Panel on Climate Change
IRMP	Integrated Resource Management Plan
LiDAR	Light Detection and Ranging
LWD	Large Woody Debris
MBF	Million Board-Feet
MRC	Mendocino Redwood Company
Murrelet	Marbled Murrelet
MWAT	Maximum Weekly Average Temperature

MWMT	Maximum Weekly Maximum Temperature
NAD	North American Datum
NCRM	North Coast Resource Management
NCRWQCB	North Coast Regional Water Quality Control Board
NCWAP	North Coast Watershed Assessment Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	Nonpoint Source Program
NRCS	Natural Resource Conservation Service
NSO	Northern Spotted Owl
NWIC	Northwest Information Center
PIA	Permitted Improvement Area
PRI	Program-Related Investment
Forest	Garcia River Forest (GRF or Forest)
PWS	Planning Watershed
QMD	Quadratic Mean Diameter
RPF	Registered Professional Forester
RMZ	Riparian Management Zone
SCC	State Coastal Conservancy
SCS	Scientific Certification Systems
SFI	Sustainable Forestry Initiative
SOD	Sudden Oak Death
SPWS	Super Planning Watershed
SRF	State Revolving Fund
SSMP	Site Specific Management Plan
Strategy	Strategy for Implementing State Revolving Fund for Expanding Use Projects
SWB	State Water Board
SWRCB	State Water Resources Control Board
the Fund	The Conservation Fund
THP	Timber Harvest Plan
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCB	California Wildlife Conservation Board
WLPZ	Watercourse and Lake Protection Zone
WTL	Watercourse Transition Line

1. Executive Summary

1.1 Project Description

The 23,780-acre Garcia River Forest (GRF) was acquired in February 2004 by The Conservation Fund (The Fund) in partnership with The Nature Conservancy, the State Coastal Conservancy and the Wildlife Conservation Board. The project is part of The Conservation Fund's North Coast Forest Conservation Initiative, which seeks to demonstrate that a large, under stocked tract of coastal forest can be returned to ecological and economic viability through patient, adaptive management by a non-profit organization in partnership with private and public entities and community stakeholders. The partners hope that a successful demonstration will stimulate similar projects in the redwood region and provide an example of how to balance the ecological needs of coastal forests, with the economic imperatives of ownership, management, and restoration.

As part of the sustainable management of the working forest, and as a condition of partner funding, The Fund conveyed a conservation easement (CE), on the Forest, to The Nature Conservancy (TNC) to maintain the conservation values inherent to the Forest in perpetuity. In accordance with the CE, an Ecological Reserve Network (ERN) was created on the GRF. The ERN is a well-distributed and representative network of habitat types present on the Forest including high-quality grassland, oak woodlands, anadromous fish-bearing streams, redwood/Douglas-fir forest, and eventually late-seral and old growth forest habitat; it totals approximately 35 percent of the Forest (8,265 acres).

The conservation easement describes the Forest as having “significant natural, ecological and aesthetic values” to the Fund, Mendocino County and its residents, and the State of California that are worthy of conservation. The conservation values include “significant natural resource, ecological, and scientific values, including wildlife and plant resources, as well as scenic and open space values.” One of the requirements under the CE is to prepare a Forest Management Plan to document the sustainable management of the Forest and provide for compatible public access. The Plan follows requirements established in the Sustainable Forestry Initiative ® (2015-2019 Standard) and the Forest Stewardship Council ® (FSC®) U.S. Forest Management Standard (version 1.0). The Conservation Fund’s FSC Certification# SCS-COC-00102N.

The original Integrated Resource Management Plan was approved in 2006 with the intent to revise it every ten years. The preparation of this revised Plan has been aided significantly by work done by the Fund and its partners to prepare subsequent Plans on Big River and Salmon Creek (BRSC), Gualala River (GuRF) and Buckeye (Buckeye) Forests (2009, 2013, 2016 respectively). While there are significant differences between the current conditions of these Forests, including stocking levels and the financial obligations incurred in acquiring the various forests, there are also many commonalities with the ultimate management objectives. Consequently, many of the principles and strategies contained in the other North Coast Forest plans have therefore been adapted for this revised Plan.

1.2 Overview of Forest Characteristics and Conditions

The 23,780-acre Garcia River Forest is located in the coastal mountain range of southwestern Mendocino County, California, and encompasses approximately one-third of the entire 72,000-acre Garcia River watershed. Large family and industrial timber interests (including the Fund) own 75 percent of the watershed; 15 percent is under agricultural use, and ten percent is held in small private ownerships. A 150-year history of forest management has resulted in the current forest conditions, which can be characterized as a young redwood/Douglas-fir forest, with a high component of tanoak and relatively simple stand structure.

GRF conservation values include managing habitats that are essential to maintaining various sensitive, rare, and/or endangered plant and animal species, as well as other natural communities. This includes species such as Coho Salmon, steelhead trout, and the northern spotted owl. A search of the 2017 California Natural Diversity Database (CNDDB) revealed a total of 19 animal species and 35 special status plant species are predicted to occur on the Forest. The highly diverse vascular flora of the GRF is represented by at least 504 species in 277 genera and 78 families. The Forest is dominated by the redwood habitat type, which accounts for approximately 64 percent of the land-base. In most areas, redwood will dominate if vegetation succession is allowed to proceed naturally.

1.3 Streams and Roads

Large scale tractor logging in the 1950s and early 1960s created a network of unstable truck and tractor roads. Logging practices at the time also removed overstory shade canopy from primary anadromous spawning grounds. The removal of the overstory, in the riparian corridors, has resulted in a lack of large trees necessary for woody debris recruitment and thus, a lack of deep pools with shelter needed for salmon and steelhead summer rearing habitat.

Past extensive logging and road building practices, in this fragile and geologically sensitive landscape, have contributed to erosion and subsequent stream sedimentation. This has subsequently produced a legacy of increased sediment loads, which also severely impact the aquatic habitat in the Garcia River and its tributaries. Data collected in stream channels throughout the watershed show channel aggrading and simplification due to amplified sediment inputs.

1.4 Forest Management

The specific management goals identified and described in this Plan are to:

- Improve ecological conditions by protecting and enhancing water quality, by maintaining high standards for road construction and maintenance.
- Improve ecological conditions by protecting and enhancing terrestrial and aquatic habitat, vegetative diversity, late-seral conditions, and riparian forests on the Forest, while significantly increasing the inventory of commercial timber volumes.
- Generate sufficient revenue to cover Forest taxes, on-site maintenance, management, and restoration projects.
- Develop and implement improved forest management greenhouse gas reduction projects under the California Air Resources Board Compliance Offset Protocol, U.S. Forest Projects.
- Practice continual improvement through adaptive management, based on monitoring of water quality and forest health against specific objectives described in the Plan.
- Support the local business community by utilizing local contractors and suppliers.
- Involve the local community by seeking input on management of the Forest, including review of this Plan as well as timber harvest plans implemented under the Plan, while providing compatible public access, educational, and recreational opportunities where possible.
- Maintain at least 35 percent of the Forest as a permanent Ecological Reserve Network, which shall include oak woodlands, grasslands, riparian areas and other areas with high value conservation features.

1.5 Community Use and Involvement: Public Access

The Fund will provide a range of opportunities for community use and involvement, while also protecting natural resources, engaging with long-term restoration and enhancement projects, and implementing active forest management practices. These opportunities for the public range from research, education and demonstration – to participation in restoration projects – as well as unsupervised pedestrian access.

To foster community relationships, The Fund provides guided tours of road improvement and restoration projects, native plants, and areas that are intended for timber harvest. Tours, tailored for youth education, are also organized by The Fund. In turn, these programs familiarize the public with sustainable management methods and objectives, while building transparent community partnerships. As mentioned above, The Fund has developed an access program, to allow unsupervised pedestrian access on designated roads. Through these cumulative community initiatives, The Fund emphasizes that not just the company, but also the public, has an active role as being a steward of the Forest.

2. Project Introduction

2.1 Project Rationale

2.1.1 Background

The Redwood Region of California's North Coast is one of the richest and rarest ecosystems in the world; it is home to keystone species such as the northern spotted owl, marbled murrelet, mountain lion, Coho Salmon and steelhead trout. For decades, timber harvesting has been the predominant land use in the region. Today, many of the coastal watersheds in Mendocino and Humboldt counties continue to be held in large blocks of industrial timberland. However, due to intensive harvesting practices in the past, the timber environment and market has greatly shifted in recent years. With forest landowners facing timber inventory depletion and rigorous regulations in California, many look to "higher and better uses," or to sell their land, in order to yield a greater financial return. As a result, rural, residential, and recreational use subdivisions and vineyard conversions are increasingly common on the North Coast.

The conversion and subdivision of coastal forests in Mendocino County presents a serious threat to the ecological integrity of these coastal watersheds, as well as the aquatic and terrestrial habitat they provide for a rich suite of natural communities and sensitive species. The fragmentation of these large forest tracts also threatens the future viability of a sustainable timber economy in the region. More than 40 percent of California's annual timber revenue comes from Mendocino and Humboldt counties. Based on crop reports for 2011, the value of harvests in these two counties totaled nearly $125 million. The forest products industry is "extremely important" to many local economies in the Northern California "timber counties," generating about 13 percent of the personal income and 16 percent of the jobs (Laaksonen-Craig et al., 2003).

Several State resource agencies have recognized the importance of preventing fragmentation of large forest tracts in the region. The California Department of Fish and Wildlife (CDFW) Recovery Strategy for Coho Salmon specifically recommends "encouraging continued economically sustainable management of forest and agricultural lands in the range of Coho Salmon to reduce the potential for conversion to residential or commercial development." (CDFG, 2004). California Department of Forestry and Fire Protection (CAL FIRE) has underscored the need to "recognize the continued importance of large scale, unfragmented ownerships in the working landscape … and examine if state policies can be improved to assure both private and public benefits of large unfragmented holdings" (CAL FIRE, 2003). Finally, the State Water Resources Control Board's (SWRCB) Nonpoint Source Program Strategy and Implementation Plan, 1998 – 2013 (SWRCB, 2000) identifies several management measures related to silvicultural and agricultural activities that can enhance water quality.

While the benefits of protecting large tracts of forestland are clear, the means of achieving their protection is less obvious. The traditional approach of public acquisition and preservation of forestlands cannot alone get the job done. There is not nearly enough public money to purchase or manage such large tracts of forestland. Further, local communities are increasingly resistant to the effects of such large public purchases on the local economy and tax base; intrusion of large government and wasteful spending are common themes in the current political and economic climate.

In response to this dilemma, The Conservation Fund (the Fund) launched its North Coast Forest Conservation Initiative in 2004 with the acquisition of the 23,780-acre Garcia River Forest (GRF) in Mendocino County. In November 2006, the Fund used innovative funding, through a loan from the State Revolving Fund (SRF), to help purchase the Big River and Salmon Creek (BRSC) tracts, totaling roughly 16,097 acres. Our partners included the State Water Board (SWB), the State Coastal Conservancy (SCC), California Wildlife Conservation Board (WCB), and the David and Lucile Packard Foundation. In 2011, the Fund purchased the Gualala River Forest (GuRF) to protect and restore an additional 13,913-acre contiguous commercial forest tract in the North Fork Gualala River Forest. This acquisition was made possible by partnering with the WCB, The Nature Conservancy (TNC), Keith Campbell Foundation, and the Mellon Foundation. The Buckeye Forest was acquired in May 2013 by The Fund, in partnership with the California Coastal Conservancy, Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), the Gordon and Betty Moore Foundation, Packard Foundation, and the Sonoma Land Trust.

2.2 Garcia River Forest Acquisition and Financing

With the 2004 acquisition of the Garcia River Forest, the Fund, along with our conservation partners, sought to test a unique hypothesis: large tracts of depleted coastal forest can be protected from fragmentation and conversion, returned to sustainable timber production and ecological vitality through use of innovative financing and patient management by a nonprofit organization, in partnership with private and public agencies and community stakeholders.

Sustainable forest management allows the Fund to rebuild commercial timber inventories that support the local economy and, at the same time, help repay loans taken to acquire in the Forest, upgrade roads and restore stream conditions for rare and threatened species. The emergence of a robust market for registered and verified greenhouse gas emission reductions associated with improved forest management has significantly improved the means and rate of attainment of our principal management objectives. The Fund continues to be a leader in sales of forest carbon offset credits from its North Coast properties.

Funding for the purchase of the Forest was provided by grants of public funds from the State Coastal Conservancy and the Wildlife Conservation Board. In addition, the Fund sold a conservation easement to TNC. Final sources and amounts are as follows:

California Coastal Conservancy	$6,000,000	
Wildlife Conservation Board	$4,000,000	
The Conservation Fund	$4,500,000	
The Nature Conservancy Easement	$3,500,000	
Total		**$18,000,000**

The Conservation Fund covers the cost of the ongoing management of the forest, including restoration projects, road maintenance, staff time, consultants, and property taxes, through revenue from timber harvests and carbon offset sales. The project expenses have averaged $1-2 million annually. To the extent there are net revenues from the project or from the sale of the property they will be distributed to the project partners for other conservation activities, per the terms of the easement.

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2.3 Principal Management Goals

The Garcia River Forest project seeks to balance the ecological needs of coastal forests, with the economic imperatives of ownership, management, and restoration. This document is a presentation of our vision for what this balance looks like, and how it will be attained over the coming decades.

This Plan identifies and describes the following specific management goals:

- Improve ecological conditions by protecting and enhancing water quality, by maintaining high standards for road construction and maintenance.
- Improve ecological conditions by protecting and enhancing terrestrial and aquatic habitat vegetative diversity, late-seral conditions, and riparian forests on the Forest, while significantly increasing the inventory of commercial timber volumes.
- Generate sufficient revenue to cover Forest taxes, on-site maintenance, management, and restoration projects.
- Continue to implement improved forest management greenhouse gas reduction projects first registered under the Climate Action Reserve (CAR) Forest Project Protocol version 2.1 and now

transitioned to the California Air Resources Board Compliance Offset Protocol, U.S. Forest Projects.

- Practice continual improvement through adaptive management based on monitoring of water quality and forest health against specific objectives described in the Plan.
- Support the local business community by utilizing local contractors and suppliers.
- Involve the local community by seeking input on management of the Forest, including review of this Plan and timber harvest plans implemented under the Plan, and providing compatible public access, educational, and recreational opportunities.
- Maintain at least 35 percent of the Forest as a permanent Ecological Reserve Network, which shall include oak woodlands, grasslands, riparian areas and other areas with high value conservation features.

Particular emphasis will be placed on achieving water quality enhancement and anti-degradation objectives by: a) permanently protecting the GRF from subdivision, residential and commercial development, forestland conversion, and agricultural intensification; and b) implementing remediation, protection, and restoration measures to address sediment pollution problems and associated impacts resulting from historic and current forest management in the North Coast Region, including measures identified in the:

- Nonpoint Source Program Strategy and Implementation Plan, 1998 – 2013 (NPS Implementation Plan) (SWRCB, 2000)
- Garcia River Total Maximum Daily (TMDL) Load for Sediment developed by the U.S. Environmental Protection Agency (EPA) (USEPA, 1998)
- Site Specific Management Plan (SSMP) as adopted by the North Coast Water Board in May 19, 2006 and as revised on July 21, 2006 (TCF, 2006a)
- Total Maximum Daily Load Implementation Policy Statement for Sediment-Impaired Receiving Waters in the North Coast Region (TMDL Implementation Policy) (NCRWQCB, 2004).

Successful implementation of these measures will also achieve important state objectives related to recovery of Coho Salmon and steelhead trout (CDFG, 2004).

2.4 Conservation Easement Requirements

As part of the sustainable management of the working forest, the Fund conveyed a Conservation Easement (CE) to TNC to maintain the conservation values inherent in the GRF in perpetuity. The CE will thus, restrict in perpetuity certain uses that are incompatible with the Easement Purposes cited below. These uses include, but are not limited to, subdivision, development, mining, and agricultural conversion.

The conservation easement specifies the following “Easement Purposes:”

- Restore and protect a productive and natural coastal California forest ecosystem;
- Protect fish and wildlife habitat associated with ecosystems in the GRF, in particular the oak woodlands, serpentine grasslands, and redwood/Douglas-fir forest, and spawning habitat for Coho Salmon and steelhead trout;

- Protect significant water resources, springs and the water quality thereof;
- Maintain the capacity of the Forest for productive forest management, including the long-term sustainable harvest of high quality forest products, contributing to the economic vitality of the state and region in a manner that does not impair the Conservation Values or the other Easement Purposes;
- Maintain the use of the Forest for outdoor recreation;
- Maintain at least 35 percent of the Forest as a permanent ecological reserve network (the "Ecological Reserve Network"), which shall include oak woodlands, grasslands, riparian areas and other areas with unusually high Conservation Value; and described later in this section; and
- Prohibit any use of the Forest that will impair, degrade or damage the Conservation Values of the Forest (collectively, the "Easement Purposes").

In addition, the CE specifies the following "performance goals" for the Forest:

- Significantly increase the inventory of commercial conifer volume over fifty years, while permitting the removal of timber at a rate considerably less than growth during that period;
- Respectfully maintain the vegetative diversity of the Forest by maintaining oak woodlands and serpentine grasslands as designated in a map in the Easement Documentation Report and by not seeking to completely exclude native hardwoods from sites managed for conifer growth and harvest;
- Conserve and improve the habitat conditions for northern spotted owl, marbled murrelet, Coho Salmon, and steelhead trout by increasing the forest inventory and late seral conditions. This includes the retaining of large trees, structural diversity, high canopy closure, and the maturity of the riparian forests;
- Maintain the highest commercial standards for road layout, construction, and maintenance, in order to minimize the impacts on water quality, riparian habitat, and the Ecological Reserve Network; and
- Designate and maintain at least 35 percent of the Forest as an Ecological Reserve Network.

The conservation easement provides for two, five-acre improvement areas on the Forest. One is for an environmental education and/or research center, and one is for a single-family residence to provide on-site management of the Forest. These are both subject to a variety of siting and construction restrictions to minimize potential adverse impacts on conservation values of the Forest. Whether and where these facilities will be constructed has not been determined at this time.

2.4.1 The Ecological Reserve Network

In accordance with the CE, the Ecological Reserve Network (ERN) is a well-distributed and representative network of habitat types present on the Forest including high-quality grassland, oak woodlands, anadromous fish-bearing streams, redwood/Douglas-fir forest, and eventually late-seral and old growth forest habitat. It totals approximately 35 percent of the Forest (8,265 acres). The ERN was designed and will be managed in accordance with the latest understanding of conservation biology to protect and enhance the conservation targets and support large-scale ecological processes. Design of the ERN is further described in the 2006 GRF Integrated Resource Management Plan (TCF, 2006b). Ecological purposes served by the ERN include:

- To establish ecological conditions over time that enhance the conservation targets.
- To maintain ecological functions and processes that might be absent or diminished in harvested areas—an example includes acting as a source network for slow-dispersing species such as lichens and fungi.
- To serve an important research and monitoring function by providing for control (unharvested) conditions.

Management guidelines for the ERN include the following:

- Ecological objectives will drive management of the ERN.
- Timber harvest and other intensive management activities (e.g. herbicide treatment, prescribed fire) will be applied within the ERN only to further ecological objectives, such as thinning to accelerate development of late-seral conditions. Activities including improving or relocating existing roads, to serve the larger goal of an operating forest and to reduce sediments and enhance water quality will occur.
- Adaptive management of the ERN will be guided by long-term monitoring results.

3. Purpose of Plan

3.1 Plan Requirements

The Plan follows requirements established in the Sustainable Forestry Initiative (2015-2019 Standard) and the Forest Stewardship Council U.S. Forest Management Standard (version 1.0). The Plan also includes elements required under the terms of the CE. The GRF Management Plan will generally follow the same format as the Plans prepared for BRSC, GuRF and Buckeye for continuity.

From FSC® Principle 7: Management Plan: "This Principle is intended to ensure that management of the [Forest Management Unit] FMU is described in a comprehensive management plan. The plan should be developed with expertise and public input appropriate to the scale of the operation. The management plan, and the process of its development, should embody and consider all of the Principles and Criteria in this Standard…The management plan may consist of a variety of documents or an umbrella document that describes how a collection of management documents relate to an integrated strategy for managing the forest. This may include a combination of ownership level plans, unit plans, site level plans (e.g., harvest plans), [Geographic Information Systems] GIS, published guidelines (e.g., regional silviculture or [Best Management Practice] BMP guides), landowner policies, and other information…Guidance on scale and intensity of operations: All management plans regardless of the scale and intensity of operations must address the Indicators of Criterion 7.1 unless otherwise noted in the guidance below."

The intent of Criterion 7.1 is to "ensure that a written management plan, as described in the Principle-level intent and guidance above, exists for the Forest within the scope of the certificate. The actions and objectives detailed in the plan are specific, achievable, measurable and adaptive. They are also sufficient to meet the requirements of this Standard…Whenever the term "management plan" is used, it refers to any combination of documents and systems that meet the intent of the Indicator." Per Criterion 7.1, the following Indicators must be included in the Plan:

- Management objectives.

- Description of the forest resources to be managed, environmental limitations, land use and ownership status, socio-economic conditions, and a profile of adjacent lands.
- Description of silvicultural and/or other management systems, based on the ecology of the forest in question and information gathered through resource inventories.
- Rationale for rate of annual harvest and species selection.
- Provisions for monitoring of forest growth and dynamics.
- Environmental safeguards based on environmental assessments.
- Plans for the identification and protection of rare, threatened and endangered species.
- Maps describing the forest resource base including protected areas, planned management activities and land ownership.
- Description and justification of harvesting techniques and equipment to be used.

Per the CE, the Plan includes:

- Forest management objectives
- Forest management guidelines on riparian buffers, harvest opening sizes (See Appendix H)
- Minimum post-harvest stand structure, maximum harvest volumes by decade (See Appendix I)
- Operations on steep or unstable slopes (See Appendix M)
- Development and maintenance of the ERN
- Forest stand descriptions at a level of detail feasible for review of operations pursuant to the CE, including site classes, stand volumes, and map (included in individual THP summaries created by the Forester and distributed on public tours)
- Descriptions and mapped locations of soil types, as based on published reports
- Estimates of slope, landslide hazard and erosion potential described and mapped (See Appendix M)
- Descriptions and mapped locations of existing and planned roads and gravel pits, including plans for construction, maintenance and decommissioning thereof
- Descriptions and mapped locations of known significant fish and wildlife habitats, especially species listed as threatened or endangered at the federal or state level, rare plants, oak woodlands areas, serpentine grassland areas, watercourses, wetlands and other water bodies, including management considerations thereof
- Descriptions and mapped locations of known archaeological, cultural or historic sites, including management considerations thereof
- Description of property management history, occurrences of disease, insect infestation and fires based on best available knowledge (See section 5.1.2)
- Silvicultural and harvest methods, schedules and anticipated harvest equipment (see Appendices H and I)
- Descriptions of products and projected harvest yields (See Appendix I)

- Reforestation and other forest health improvement activities (See Appendices H and I)
- Erosion control activities
- Other management activities consistent with and in furtherance of the CE Performance Goal and other terms and conditions of the CE, with consideration for the impacts of all management activities on the conservation values of the Forest

3.2 Plan Revisions

Consistent with the principles of an adaptive management approach, the Plan will be updated periodically, not less than every ten years, to reflect the condition of the Forest as it changes over time and as management activities are implemented. Local experts, advisors, agency staff, and community members will be included in the revision process. Revisions and/or amendments will be provided to TNC and SCC for review prior to adoption.

3.3 Adaptive Management

Adaptive management is the process of continually adjusting management in response to new information, knowledge or technologies (Walters and Holling, 1990). Adaptive management recognizes that unknowns and uncertainties exist in the course of achieving any natural resource management goals.

The complexity and interconnectedness of ecological systems, combined with technological and financial limitations, make a complete understanding of all the components and linkages virtually impossible. In addition, the systems themselves are constantly changing through both natural and human caused mechanisms, making the effort to comprehend ecosystem dynamics and foretell their trajectories even more challenging (Gunderson et al, 1995).

Uncertainty will always be a part of the management of ecosystems, and adaptive management provides a mechanism by which uncertainty can become, "the currency of decision making instead of a barrier to it" (Walters, 1986). Effective implementation, and attainment of this project, will require a commitment to adaptive management; research and monitoring will be given a high priority, and newly gathered information will be fed back into a basic data management system and incorporated into all future plans.

This Plan identifies two information streams for adaptive management: a) monitoring of implementation benchmarks established for streams and roads, forest management, and community involvement described in this Plan; and b) monitoring the effectiveness of achieving the implementation benchmarks on selected ecological conditions (principally water quality and forest inventory and structure). Each of the proposed indicators for monitoring viability of conservation and restoration effectiveness will need to be evaluated by the following criteria:

- Cost efficiency – getting the most information for the least cost;
- Quality control – data collection and compilation has accepted quality control standards and can be applied consistently and effectively across all data collection points and efforts;
- Scientific defensibility and credibility – designs for data collection, quality control efforts, and data analysis techniques meet standards commonly used by the relevant regulatory agencies; and

- Timely yield of information – the monitoring program must yield information for management in a timely manner.

4. Forest Setting and Current Conditions

4.1 Forest Orientation

4.1.1 Forest Location

The Garcia River Forest is located in the coastal mountain range of southwestern Mendocino County, California, closest to the towns of Boonville to the east, and Point Arena to the west. The general location is longitude 123 degrees 44' W and latitude 38 degrees 56' N, approximately 120 miles north of San Francisco and 40 miles south of Fort Bragg (see Location Map). The Forest is contained within three 7.5-minute USGS quad maps: Zeni Ridge, McGuire Ridge, and Eureka Hill. The Forest is located within the central portion of the Garcia River watershed, encompassing approximately one-third of the entire 73,223-acre Garcia River watershed; it includes 70 percent of the North Fork Garcia River, over seven miles of Garcia River mainstem, 85 percent of the Signal Creek watershed, 82 percent of the Inman Creek watershed, and the majority of Blue Waterhole Creek West. Elevations range from 46 to 2,290 feet. Access is via adjoining county roads, Mountain View Road and Fish Rock Road, as well as an internal system of dirt and rocked roads. The Forest encompasses approximately 23,780 acres and is made up of portions of 173 tax assessor parcels (see Location Map and General Map, which follow).

4.1.2 Neighbors and Adjacent Lands

Much of the land adjacent to the north, west, and south are large forestland holdings that are actively managed for timber production. Neighboring owners include the Mailliard Ranch, Mendocino Redwood Company, Congaree River Limited Partner, and smaller interests. Another large timberland owner, Gualala Redwood Timber, LLC, is nearby but not adjacent. Nearby sizable landowners include Mountain View Ranch, the United States Point Arena Air Force Station, United States Coast Guard Point Arena Lighthouse, and the Manchester Rancheria (Bureau of Indian Affairs). Nearby public lands include Bureau of Land Management lands (the Stornetta Public Lands, which were recently added to the California Coastal National Monument, as well as several smaller inland tracts), Manchester Beach State Park and Marine Reserve (760 acres), Schooner Gulch State Beach, Mailliard Redwood State Reserve (seven miles to the east), and several additional state beaches (all California Department of Parks and Recreation). Properties to the east are generally drier and are used for cattle pasture or vineyards. The Manchester and Point Arena Rancherias (tribal lands approximately 200 acres each) are located west of the GRF. Including the Fund, 75 percent of the Garcia watershed is owned by large family ranches and timber interests. Fifteen percent is under agricultural use, and ten percent is held in small private ownerships.

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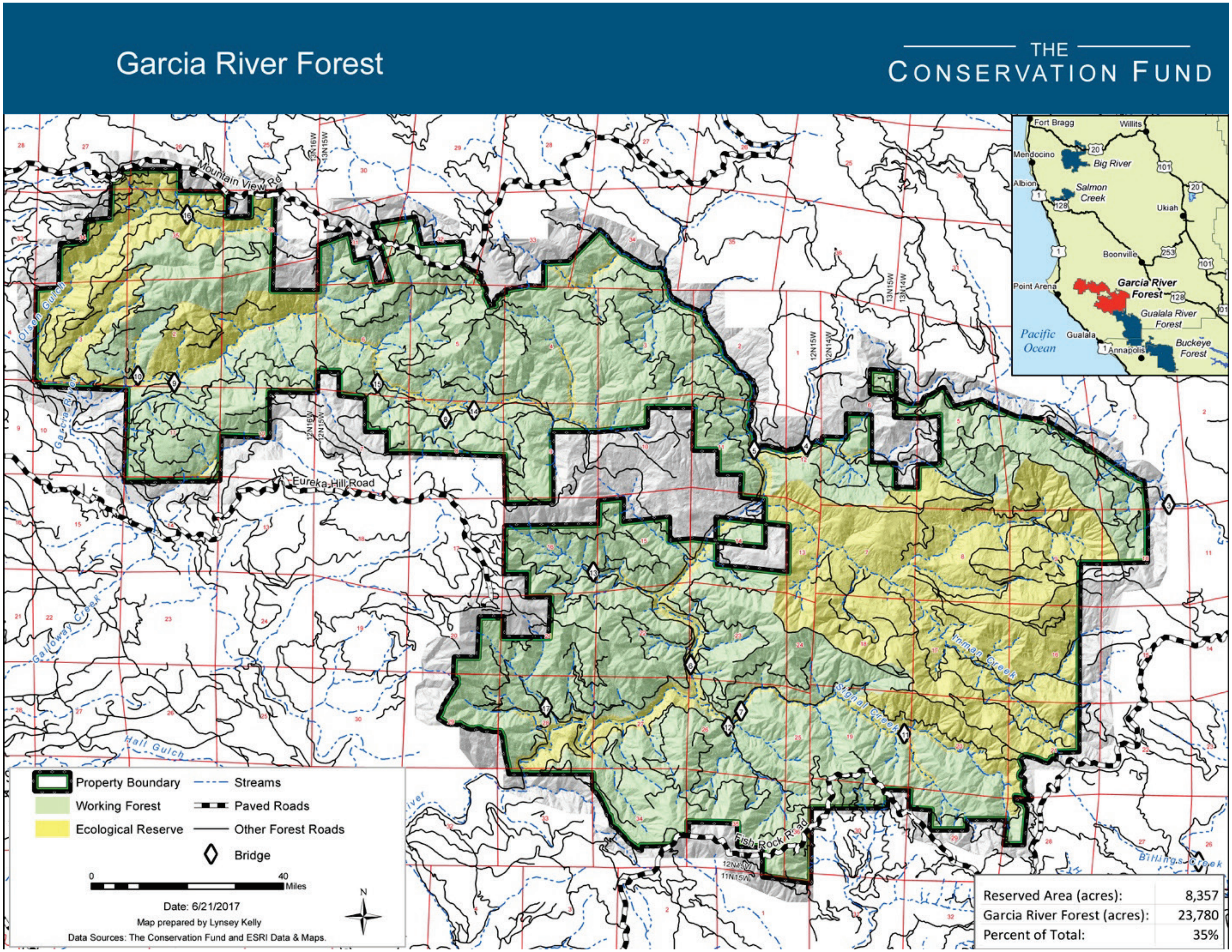
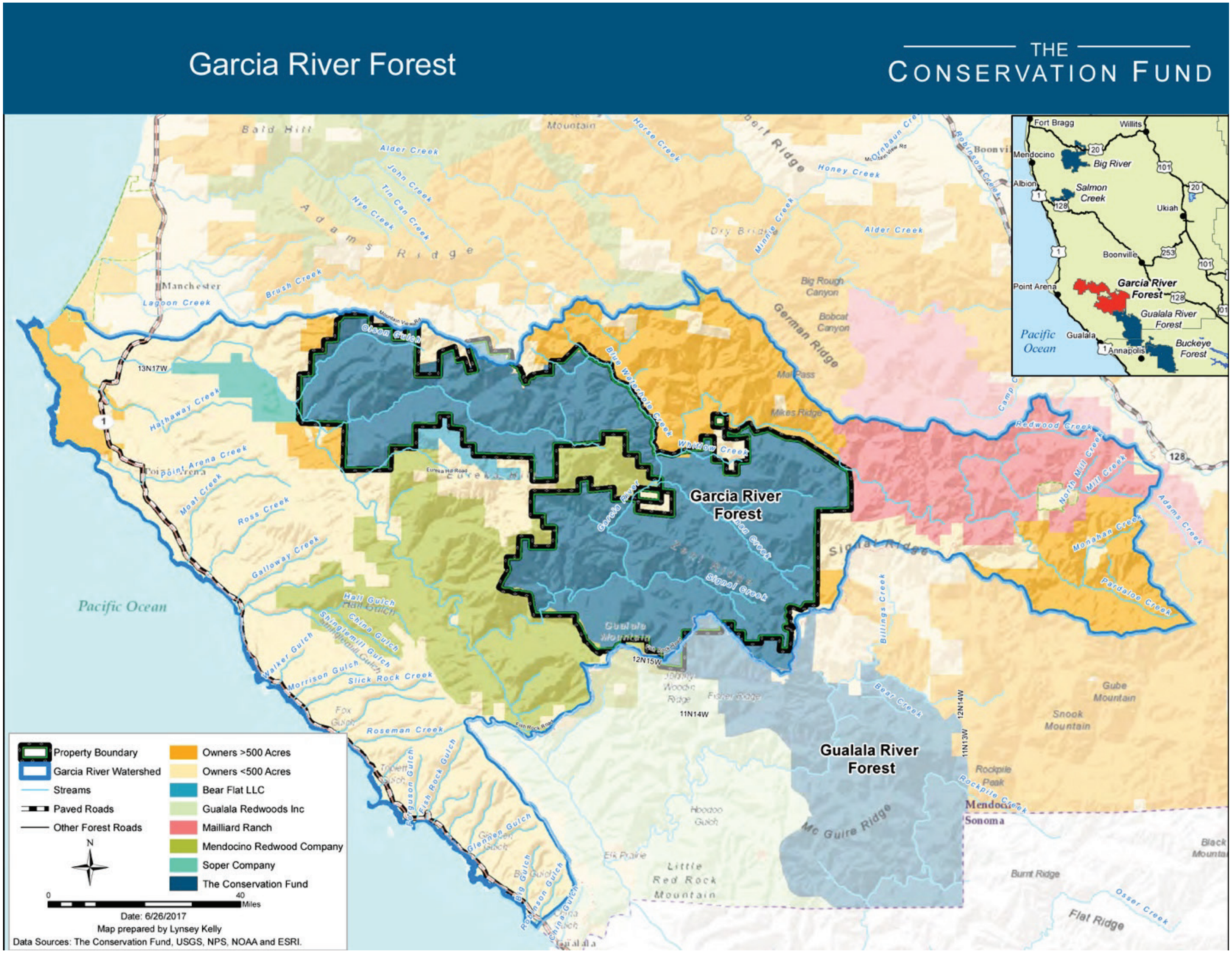
4.1.3 Physiographic Setting

4.1.3.1 Description of Watershed

The Garcia River watershed is a forested watershed with a coastal influenced climate, in the lower half of the drainage, and a Mediterranean-type climate in the upper half of the drainage. The watershed drains approximately 72,000 acres (114 square miles). The mainstem of the river is approximately 44 miles from the mouth to its headwaters at Pardaloe Peak. The combined length of the mainstem and its perennial tributaries is approximately 105 miles. The River flows northwest along the San Andreas Fault Zone for nearly ten miles before bearing west to the Pacific Ocean. Elevations range from 2,470 feet at Pardaloe Peak to sea level.

The upper watershed is characterized by steep and rugged forestland, much of which has been harvested, and is scarred by erosion, primarily from past logging practices and associated road construction predating the Z'Berg Negedly Forest Practice Act in 1973. The more gently sloping lower portion, with coastal terraces and alluvial bottomlands, is more commonly used for agricultural production, including potatoes, silage, forage, livestock grazing, and dairy. Residential development is modest. The relatively small estuary area (approximately 80 acres of open water and mud flats and 150 acres of more upland type vegetation) serves as an important habitat for anadromous and other fish, many species of shore birds and waterfowl, and numerous other forms of wildlife. Species of special interest in the Garcia watershed are the whistling swans, Olor columbianus, which winter in the area near the estuary, and the Point Arena Mountain Beaver, Aplodontia rufa (Hood, 1977) a federally listed endangered species. Other nearby stream systems to the south are the Gualala River and a number of smaller coastal drainages. To the north are Brush, Alder, Mallo Pass, Elk, and Greenwood Creeks.


Garcia River Forest
THE
CONSERVATION FUND
Fort Bragg
Willits
Mendocino
Big River
Albion
Salmon Creek
Ukiah
Boonville
Point Arena
Garcia River Forest
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
Mountain View Rd
Olson Gulch
Garcia River
Eureka Hill Road
Galloway Creek
Hall Gulch
Inman Creek
Signal Creek
Fish Rock Road
Billings Creek
Property Boundary
Working Forest
Ecological Reserve
Streams
Paved Roads
Other Forest Roads
Bridge
0
40
Miles
Date: 6/21/2017
Map prepared by Lynsey Kelly
Data Sources: The Conservation Fund and ESRI Data & Maps.
Reserved Area (acres): 8,357
Garcia River Forest (acres): 23,780
Percent of Total: 35%


Garcia River Forest
THE
CONSERVATION FUND
Garcia River Forest
Gualala River Forest
Pacific Ocean
Property Boundary
Garcia River Watershed
Streams
Paved Roads
Other Forest Roads
Owners >500 Acres
Owners <500 Acres
Bear Flat LLC
Gualala Redwoods Inc
Mailliard Ranch
Mendocino Redwood Company
Soper Company
The Conservation Fund
0
40
Miles
Date: 6/26/2017
Map prepared by Lynsey Kelly
Data Sources: The Conservation Fund, USGS, NPS, NOAA and ESRI.
Fort Bragg
Willits
Mendocino
Big River
Albion
Salmon Creek
Ukiah
Boonville
Point Arena
Garcia River Forest
Gualala River Forest
Gualala
Annapolis
Buckeye Forest
Pacific Ocean

4.1.3.2 Climate

Located within the Oregonian Biotic Province, the watershed has a Mediterranean climate, characterized by a pattern of low-intensity rainfall in the winter and cool, dry summers with coastal fog. Temperatures in the Point Arena area, among the most constant in the state, reflect the strong maritime influence. The mean annual temperature is 54 degrees Fahrenheit, with a difference of less than ten degrees, in mean temperatures, of the coolest and warmest months. Mean annual precipitation is 30 inches at the coast and up to 100 inches per year on the inland peaks. Ninety percent of this precipitation generally falls between October and April with the highest average precipitation in January. The USGS maintained a stream gauging station on the Garcia at river mile 8.2 from August 1, 1962 to September 30, 1983 (reflecting a drainage area of 98.5 square miles). Mean annual flows during the period of record varied from 712 cubic feet per second (cfs) in water year 1974 to 20 cfs in 1977. The lowest recorded flow was 2.3 cfs on September 16, 1977. The largest flood recorded on the Garcia River during the period of record was 30,300 cfs, recorded January 16, 1974 (KRIS Garcia, 2003).

4.1.3.3 Geology

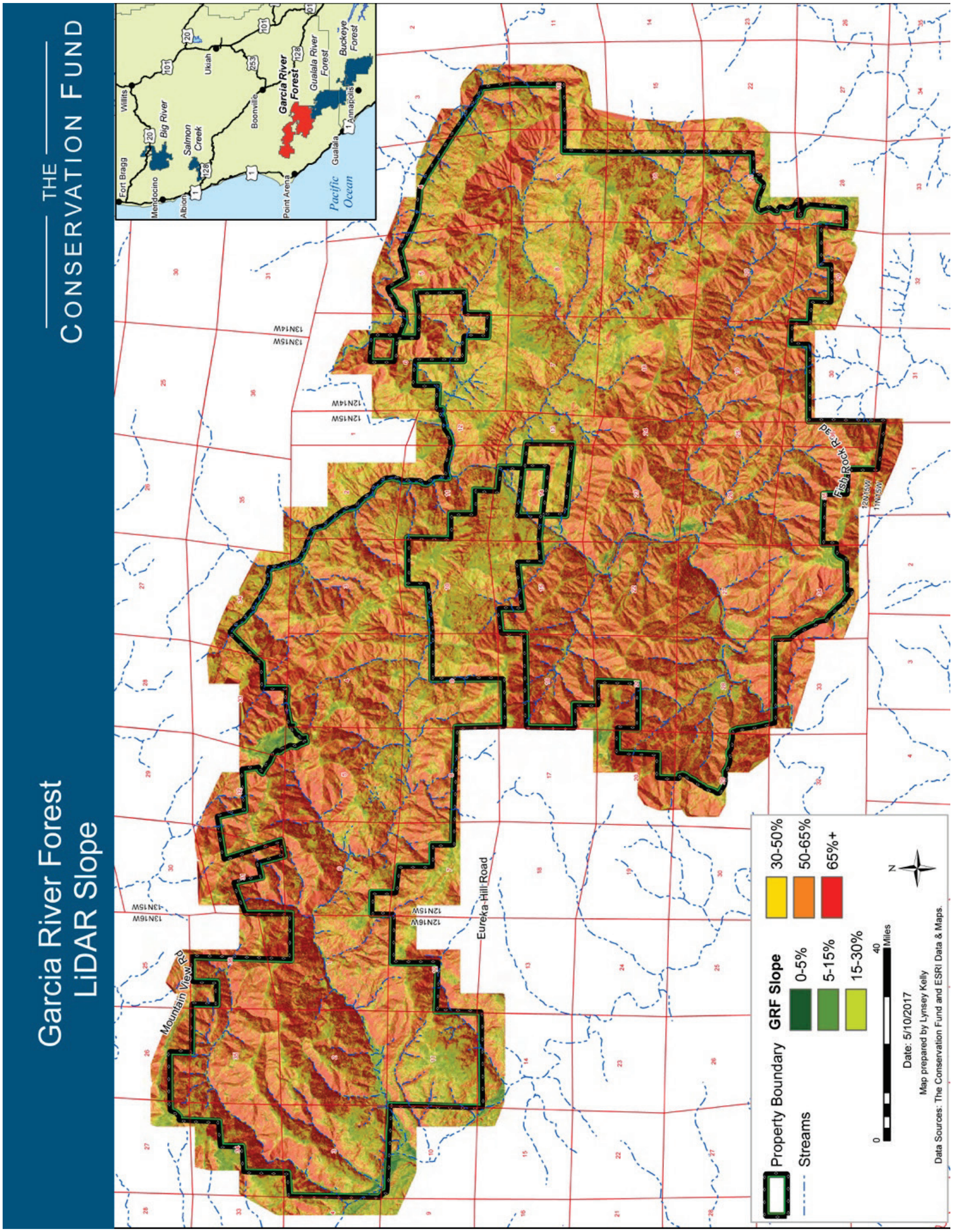
The North Coast of California is geologically young. The landscape has been shaped by the collision of the Gorda and North American tectonic plates, resulting in steep terrain. The contact zone between the two plates is the San Andreas Fault. The lower Garcia River follows the San Andreas Fault for nearly ten miles before entering the ocean. The upper watershed areas are deeply incised by tributaries. High rainfall and the steep gradient of these streams give them a high capacity to transport sediment.

The watershed east of the San Andreas, including all of GRF, is generally composed of the Franciscan Complex. The parent rock in these formations is often weakly consolidated or sheared sandstone, leading to a high erosion risk. The exception is the Inman Creek sub watershed, which is comprised of a more erosive metamorphic geology, with a higher clay component. Grasslands and oak woodlands are well adapted to the soils derived from the metamorphic geology in the Inman Creek watershed.

4.1.3.4 Soils

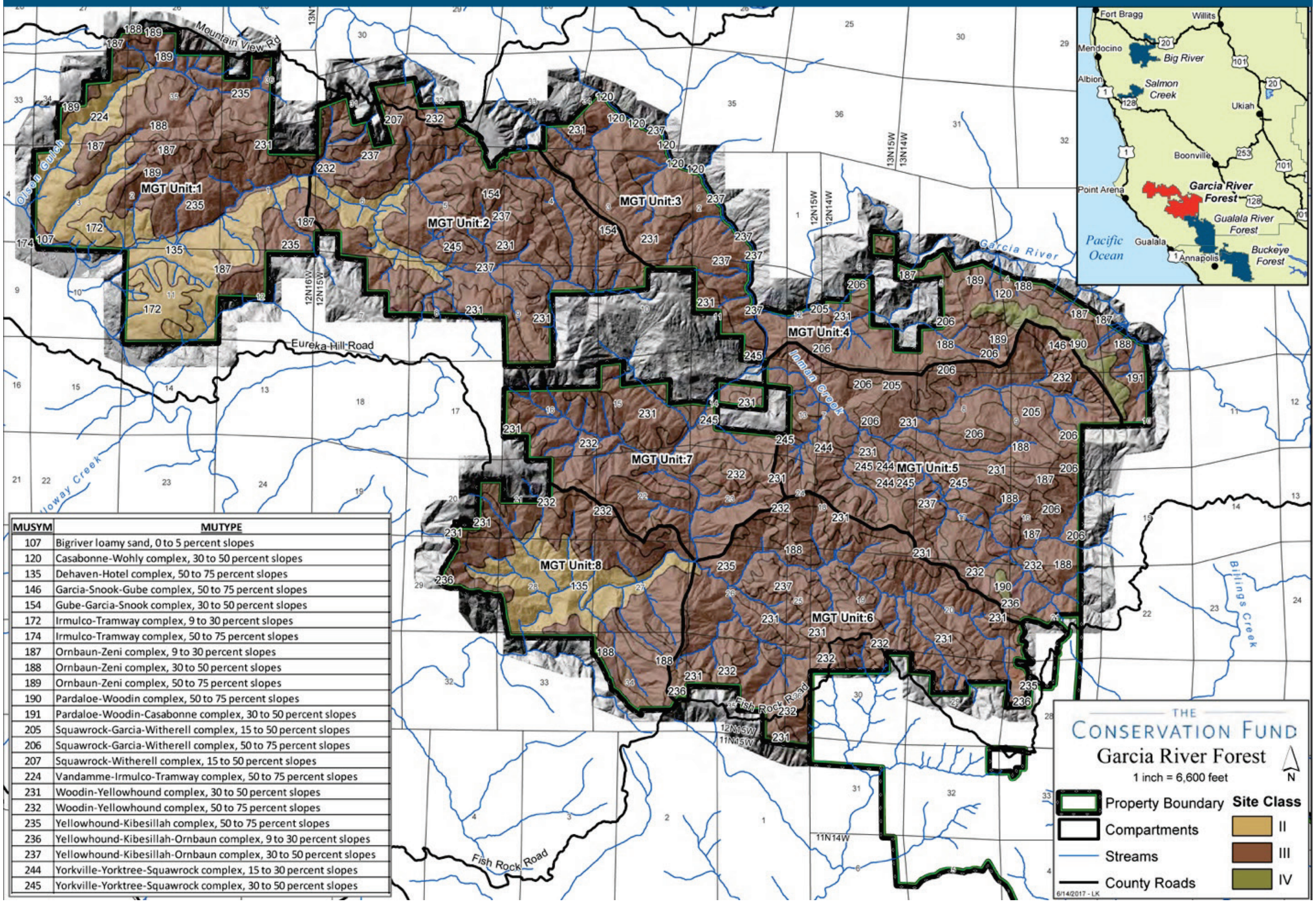
Soil types are identified and described in detail in Appendix A, "Soil Types and Descriptions." The Natural Resource Conservation Service soil survey depicts 13 soil complexes in the project area. Nine of these soils are capable of producing commercial-quality timber, although of varying potential. The other four non-timber soil types support grasslands, brush, and hardwoods.

Soils capable of growing commercial quality timber occupy 22,034 acres (92 percent of the total forest acreage). The following four primary timber soil types comprise over nine-tenths of this timber-producing acreage: Yellowhound-Kibesillah, Woodin-Yellowhound, Ornbaun-Zeni, and DeHaven-Hotel complexes.


Garcia River Forest
LiDAR Slope
THE CONSERVATION FUND
Fort Bragg
Willits
Mendocino
Albion
Big River
Salmon Creek
Ukiah
Boonville
Point Arena
Gualala
Garcia River Forest
Gualala River Forest
Buckeye Forest
Annapolis
Pacific Ocean
Mountain View Rd
Eureka Hill Road
Fish Rock Road
13N15W
13N16W
12N15W
12N16W
13N14W
12N14W
Property Boundary
Streams
GRF Slope
0-5%
5-15%
15-30%
30-50%
50-65%
65%+
0
40
Miles
N
Date: 5/10/2017
Map prepared by Lynsey Kelly
Data Sources: The Conservation Fund and ESRI Data & Maps.

Garcia River Forest - SSURGO Soils

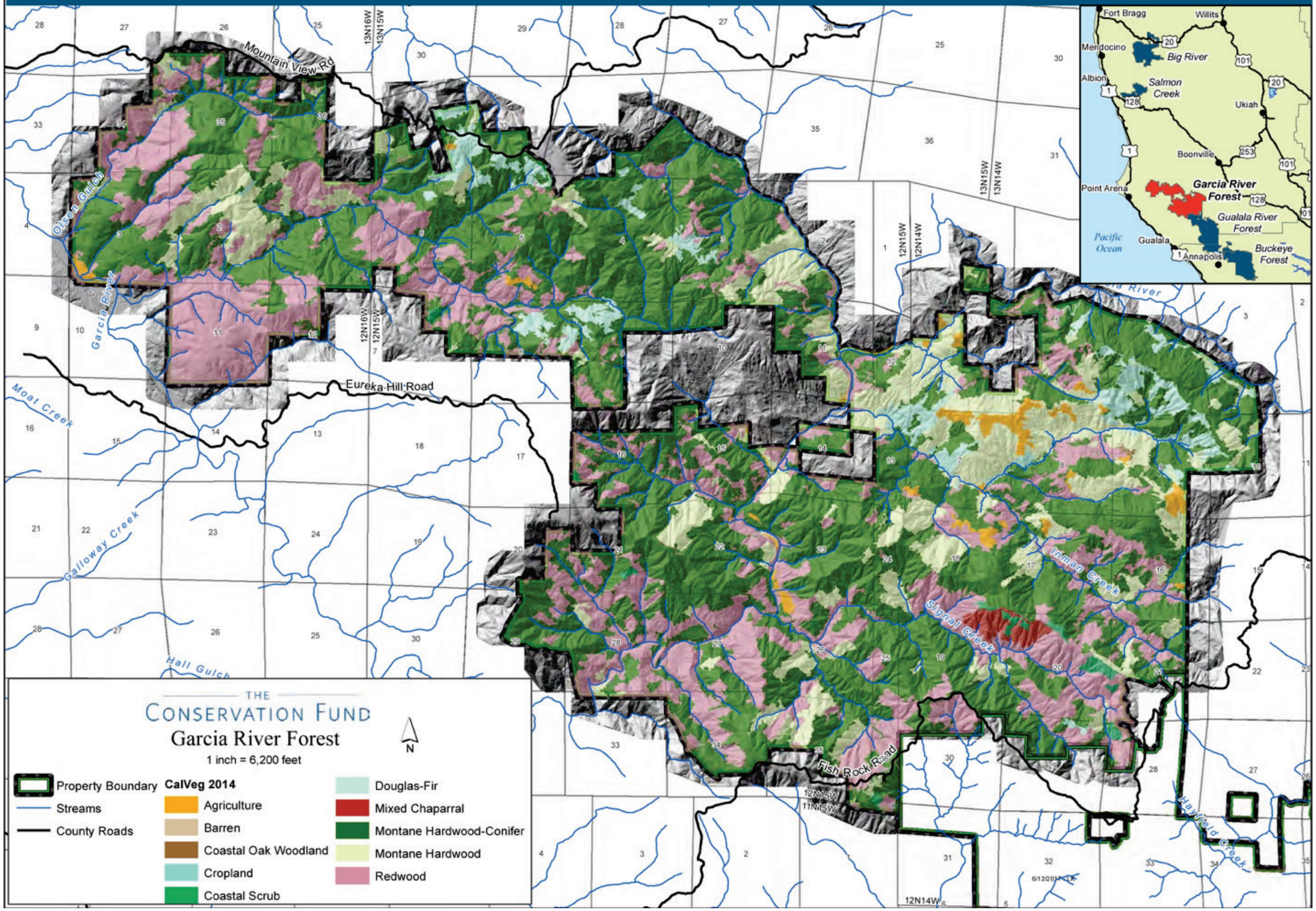
THE CONSERVATION FUND



MUSYM	MUTYPE
107	Bigriver loamy sand, 0 to 5 percent slopes
120	Casabonne-Wohly complex, 30 to 50 percent slopes
135	Dehaven-Hotel complex, 50 to 75 percent slopes
146	Garcia-Snook-Gube complex, 50 to 75 percent slopes
154	Gube-Garcia-Snook complex, 30 to 50 percent slopes
172	Irmulco-Tramway complex, 9 to 30 percent slopes
174	Irmulco-Tramway complex, 50 to 75 percent slopes
187	Ornbaun-Zeni complex, 9 to 30 percent slopes
188	Ornbaun-Zeni complex, 30 to 50 percent slopes
189	Ornbaun-Zeni complex, 50 to 75 percent slopes
190	Pardaloe-Woodin complex, 50 to 75 percent slopes
191	Pardaloe-Woodin-Casabonne complex, 30 to 50 percent slopes
205	Squawrock-Garcia-Witherell complex, 15 to 50 percent slopes
206	Squawrock-Garcia-Witherell complex, 50 to 75 percent slopes
207	Squawrock-Witherell complex, 15 to 50 percent slopes
224	Vandamme-Irmulco-Tramway complex, 50 to 75 percent slopes
231	Woodin-Yellowhound complex, 30 to 50 percent slopes
232	Woodin-Yellowhound complex, 50 to 75 percent slopes
235	Yellowhound-Kibesillah complex, 50 to 75 percent slopes
236	Yellowhound-Kibesillah-Ornbaun complex, 9 to 30 percent slopes
237	Yellowhound-Kibesillah-Ornbaun complex, 30 to 50 percent slopes
244	Yorkville-Yorktree-Squawrock complex, 15 to 30 percent slopes
245	Yorkville-Yorktree-Squawrock complex, 30 to 50 percent slopes

Garcia River Forest - Vegetation Map

THE CONSERVATION FUND



4.1.4 Regulatory Setting

Numerous statutes have been enacted to protect water quality and associated aquatic habitat and terrestrial species including plants and animals and their habitat in California. Table 4-1 below summarizes the state and federal environmental laws and regulations that pertain to forest management on the North Coast.

Table 4-1: State and Federal Laws Applicable to Forest Management

Regulation California Coastal Act	State or Federal State	Responsible Agency California Coastal Commission
California Endangered Species Act	State	California Department of Fish & Wildlife (CDFW)
California Environmental Quality Act (CEQA)	State	CalFire, CDFW, State Water Resources Control Board, California Geological Survey, and other agencies as needed
Clean Water Act	Federal	U.S. Environmental Protection Agency, U.S. Army Corps of Engineers
Coastal Zone Management Act	State and Federal	National Oceanic and Atmospheric Administration (NOAA), California Coastal Commission
Endangered Species Act	Federal	NOAA, U.S. Fish and Wildlife Service
Porter-Cologne Water Quality Act	State	State Water Resources Control Board
Z'Berg-Nejedly Forest Practice Act	State	California Department of Forestry and Fire Protection

The federal Endangered Species Act (ESA) establishes a process by which animal and plant species can be listed for federal protection. That protection limits any activity that may result in a "taking" – causing death to one or more individuals of a particular species, either through direct action (such as hunting) or indirect action (such as destruction of its habitat). A species may be listed as "threatened" or "endangered," depending on the level of peril and the status of the remaining population; an "endangered" designation carries a greater degree of protection. The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) has authority for enforcement of marine and anadromous species under ESA, such as Coho Salmon and steelhead trout. The U.S. Fish and Wildlife Service (USFWS) has authority for enforcement of the ESA for freshwater and terrestrial species such as the northern spotted owl.

The California Endangered Species Act (CESA) is the state law that complements the federal ESA; it is enforced by CDFW. Many of the protected species in the North Coast – including northern spotted owl and Coho Salmon – are listed under both federal and state acts, and thus are protected by both federal and state agencies.

The state Z'berg Nejedly Forest Practice Act was passed in 1973: Public Resources Code; Division 4, Chapter 8. section 4512(c) The Legislature thus declares that it is the policy of this state to encourage prudent and responsible forest resource management, calculated to serve the public's need for timber and other forest products, while giving consideration to the public's need for watershed protection, fisheries and wildlife, and recreational opportunities alike in this and future generations. CAL FIRE promulgates rules to implement the law. Over time, the legislature and CAL FIRE have passed laws and regulations increasing the Forest Practice Act scope and detail. The process to permit timber harvest now involves a multi-agency review, which may involve up to four state and local agencies, and two or more federal agencies – depending on the location and potential issues involved in the plan. Additional permits from other agencies – both state and federal – may be required.

The federal Clean Water Act (CWA) establishes the broadest framework for water quality regulations, including the protection of wetlands. The Porter-Cologne Water Quality Act is the state corollary. Regulatory authority is coordinated between federal and state agencies, primarily the EPA and SWRCB. The U.S. Army Corps of Engineers has permitting authority under Section 404(d) of the CWA, which regulates discharges into U.S. waters, including wetlands. Section 303(d) of the CWA describes the regulation of "impaired water bodies," a designation given a water body that fails to meet specific water quality standards. Each state is required to maintain a list of impaired water bodies and to develop Total Maximum Daily Loads (TMDLs) for each impaired water body, to address point and nonpoint sources of pollution. An implementation plan, also known as an action plan, identifies a program for implementing the necessary pollution load reduction requirements to meet water quality standards. While not strictly a requirement of the TMDL as described by the Clean Water Act and associated regulations, the action plan is required under the State Porter-Cologne Water Quality Control Act. In California, there are 509 water bodies listed as impaired; 28 of these are within the North Coast Region. The North Coast Regional Water Quality Control Board (NCRWQCB) is charged with developing most TMDLs in the region.

Many of the TMDLs in the North Coast are primarily focused on sediment and temperature pollution, both of which are usually generated from nonpoint sources, such as storm water run-off and erosion from roads – especially logging roads and unpaved rural residential roads. Poor timber harvest practices in the past have impacted stream health by causing loss of riparian vegetation and increased sedimentation.

The Garcia River was listed in 1993 under the Clean Water Act section 303(d) List of Impaired Water bodies for excessive sedimentation and subsequent anadromous salmonid habitat loss. Portions of the Garcia River are listed for excessive high water temperatures. The TMDL and implementation plan was adopted by the State Water Resources Control Board in 2000, was approved by the Office of Administrative Law in 2002, and is now in effect.

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4.2 Forest and Terrestrial Conditions

4.2.1 Forest Overview

The GRF landscape is typical of the North Coast of California—dominated by native conifers, primarily redwood and Douglas-fir. Other common species include sugar pine, grand fir and western hemlock. The terrain is characterized by steep slopes influenced by heavy rainfall that typify the region. The Forest is richly productive and supports significant wildlife, including many imperiled species, such as Coho Salmon, steelhead trout, and northern spotted owls. The majority of the Forest has been harvested at least twice since the arrival of European settlers around the turn of the 20th century. Some of the forest stands are 80 years old, but most are much younger—the result of significant harvesting in the 1950s to present day. The timber inventory on the Forest is depleted compared to historic levels, but has comparable stocking to other industrial timberland in the region. However, due to its unique properties and appearance, redwood is still one of the most valuable lumber species in the world.

The Forest is well situated for continued Improved Forest Management (IFM)—there is good road infrastructure, average site productivity for forests in the redwood region, and a mixture of mature forest and rapidly growing young stands. Due to the low volume per acre inherent in young stands less than half of the Forest can support a viable timber harvest. However over time the trees will grow and become merchantable. Many of the roads and stream crossings will need upgrading in the next twenty years to facilitate timber harvesting and reduce water quality impacts. The forest is an excellent candidate for long-term restoration because, despite over 60 years of intensive timber management, there is still viable aquatic habitat and a high diversity of plant communities (including riparian forests, coastal redwood forest, well-stocked riparian areas, and mixed hardwood/conifer forest) in addition to sensitive plant and animal species— including Coho Salmon and steelhead trout.

4.2.2 Operational Constraints

It is important to understand several key facets of forest management on the GRF (and coastal Mendocino County forestland, in general) that constrain potential forest management operations—especially low-impact ecological silviculture that is proposed on GRF. These include:

- <u>Steep slopes.</u> The steep slopes characteristic of the Coast Range routinely require specialized cable yarding equipment to move logs from the forest to the landing with minimal soil disturbance. This style of harvesting operation is considerably more expensive than ground-based (tractor) logging, which is only possible on gentle slopes. In addition, care must be taken to properly identify and protect slopes with high potential to fail – through landslide or debris torrent – so as to avoid potential impacts to riparian and aquatic habitats.
- <u>Low volumes.</u> The history of industrial management has resulted in stands with considerably less merchantable timber volume than desired. This is typically because young even-aged stands have not had the time to develop more fully or because uneven-aged stands had much of the valuable timber already removed. Almost all stands are well stocked with conifers that are healthy and growing well but will require several decades of patient management and thinning before the Forest as a whole develops the desired timber volumes. In the meantime, many silvicultural options are precluded because of the low stocking and/or value of available timber.
- <u>Hardwood competition.</u> In some stands the development of the desired characteristics (e.g. closed canopy of large conifers) is hampered by excessive competition from brush and non-merchantable trees. In almost all cases this competition is from native species (e.g. tanoak) which is an early successional species and may occupy heavily disturbed sites for many decades following timber harvesting. Reduction in hardwood competition through manual treatments (sawing) or chemical applications (herbicides) is effective but expensive. Achievement of our long-term objectives will require the dedication of financial and personnel resources to thoughtfully and patiently reduce hardwood competition to levels more closely approximating their natural distribution in the redwood/Douglas-fir forest type.
- <u>Operating season.</u> The high rainfall that helps make the forest so productive also means harvesting and road improvement operations almost completely cease during the rainy season, thus avoiding damage to the road infrastructure and potential delivery of sediment to streams. This means almost all activities need to be completed during the summer, and logging contractors have a very limited window in which they can support their businesses.
- <u>Limited markets for products.</u> Currently, timber markets are good, following a low period during the 2008 recession. The number of sawmills in the region purchasing conifer saw logs has declined since the height of the logging industry in the 1960’s and 70’s (although the remaining mills are efficient and well-capitalized). The export log market has slowed since 2014 however mills from the north, such as Schmidbauer Lumber and South Coast Lumber, are making inroads

into the local log market by establishing reload yards in Willits and Ukiah. This increased competition has benefited non-industrial timberland owners such as the Fund. Virtually no markets exist for conifer pulpwood or hardwoods (of any size), which reduces the feasibility of improvement or sanitation-type harvests that typically generate low-quality wood in order to improve future stand conditions.

- Complex regulations. The permitting process for timber harvests and associated road usage is time-consuming, inefficient and complex. While intended to prevent environmental damage, many of the requirements are very challenging to assess, report, implement, and/or monitor. The Fund budgets $30,000 to $50,000, across six months (in addition to Northern spotted owl surveys for the prior two years), to prepare and administer a timber harvest plan (THP). THP's within California cost about five to ten times more than the cost of a similar operation in Oregon or Washington. Enhancements to the regulatory process could free up significant time and money to benefit other projects.

4.2.3 Forest Inventory System

The Fund maintains linked forest inventory and geographic information system (GIS) databases in order to assess, document, and monitor the forest conditions. Since acquiring the Forest, the Fund has acquired high definition digital imagery LiDAR data, used to provide high resolution timber stand classification, as well as providing the Fund with improved mapping capabilities. These tools are critical for understanding forest conditions, habitat availability, road plans and landslide vulnerability. This updated forest inventory system was used in the Option A, Plan to Demonstrate Long Term Sustained Yield (TCF, 2014).

As part of the Fund's carbon certification, timber cruising will take place annually through implementation of a Continuous Forest Inventory (CFI) to provide a more accurate picture of the standing carbon stocks, as well as more traditional metrics like board feet per acre and forest species composition. The Forest and Stand Evaluation Environment (FORSEE) software is used to compile and grow the forest inventory in a spatially explicit manner that is subject to our specific silvicultural prescriptions.

To increase our ability to understand and evaluate forest growth and development, we have installed a system of permanent plots, wherein all the trees are individually numbered so as to enable the long-term monitoring of growth and mortality of individual trees at the plot level. This plot information is very important in being able to confirm and/or calibrate the growth model.

4.2.4 Current Stand Conditions

The GRF currently maintains two timber inventories, one collected in 2010 and one collected in 2015. The 2015 inventory utilizes four timber strata; working forest, watercourse and lake protection zone (WLPZ), non-timber and the ecological reserve. The strata were developed to capture change in the forest inventory over time, based on the management regime expected to be used within the strata (Appendix J). The older 2010 inventory used for the Option A is a more traditional stratification system based on stand characteristics rather than management regimes (Appendix H). Due to the complexities of managing two inventory stratification systems it is expected that the Fund will use the 2015 inventory for timber projects starting in 2023 when the 10-year anniversary and first Option A review and update will be performed.

Table 4.2: Inventory Summary

	2010 Inventory Summary	2015 Inventory Summary
Species	MBF/acre	MBF/acre
Hardwoods	3.67	4.55
Doug-fir	5.88	7.53
Redwood	3.36	4.97
Sugar pine	0.62	0.95
White woods	0.12	0.27

4.2.5 Productivity and Site Index

The GRF is generally redwood and Douglas-fir site class 3 and 4 lands. The average measured site index at base age 50 from the 2015 inventory is Douglas-fir = 100, redwood = 91, and sugar pine = 100.

4.3 Terrestrial Habitat and Species

4.3.1 Habitat Overview

The Forest includes a significant representation of the vegetation types associated with the region. A 2017 search of the California Natural Diversity Database (CNDDB) revealed a total of 19 animal species and 35 special status plant species are predicted to occur on the Forest. The Forest is dominated by California Department of Fish and Wildlife's (CDFW's) Wildlife Habitat Relationship (WHR) category "RDW" (redwood habitat type), which accounts for approximately 64 percent of the land-base. Primary conifer species are coastal redwood and Douglas-fir, with some sugar pine, western hemlock, and grand fir. The principal hardwood species is tanoak, with a mixture of madrone, oak (*Quercus sp.*), California laurel, and other California hardwoods. In most areas redwood would dominate if vegetation succession were allowed to proceed naturally. The WHR indicates the redwood habitat type has been shown to provide food, cover, or special habitat elements for 492 wildlife species including a variety of sensitive species.

In addition to the redwood habitat type, oak woodlands (i.e. *Quercus* forests), riparian habitat, meadow/prairie, chaparral, and coastal scrub occur on the Forest to varying degrees, each providing unique elements beneficial to many wildlife species. Oak woodlands are important food sources for resident populations of quail, squirrels, and deer. Riparian habitats have an exceptionally high value for many wildlife species, providing water, thermal cover, migration corridors, and diverse nesting and feeding opportunities.

Table 4-3: Wildlife Habitat Relationship (WHR) types on the Garcia River Forest

Habitat Patch Type	Representative Acreage on Forest
Annual Grassland (AGS)	310
Coastal Scrub (CSC)	108
Coastal Oak Woodland (COW)	7
Douglas-Fir (DFR)	855
Mixed Chaparral (MCH)	111
Montane Hardwood-conifer (MHC)	13,128
Montane Hardwood (MHW)	3,121
Redwood Forest (RDW)	6,135
Non-forest	4
Total Acreage:	**23,780**

4.3.2 Special Status Species

The California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants of California lists 72 special status plant species with the potential to occur on the Forest. Five rare vascular species and one rare lichen species were confirmed during rare plant surveys conducted in 2005-2017 (see Appendix C, "Rare Plant Survey"). The highly diverse vascular flora of the Forest is represented by at least 618 species in 325 genera and 91 families; approximately 22 percent of the flora is comprised of exotic species, primarily non-native annual grasses in the meadows and oak woodlands. (Hulse-Stephens, 2017).

Federally threatened listed species confirmed in the forest include Coho Salmon, steelhead trout, and northern spotted owl. The northern spotted owl is believed to be the most imperiled, and is intended to benefit from our management actions; it is described in more detail below.

Table 4-4: Terrestrial Rare, Threatened, Endangered, Sensitive and Species of Concern Which May Potentially Occur on the Garcia River Forest per the CNDDB

Species	Listing Status
Animals	
California Red-Legged Frog (*Rana draytonii*)	FT CDFW: SSC
Coastal Giant Salamander (*Dicamptodon tenebrosus*)*	CDFW: SSC
Northern Spotted Owl*	FT, ST
Coho Salmon (*Oncorhynchus kisutch*) Central California Coast Evolutionarily Significant Unit (ESU)*	FE SE
Sonoma Tree Vole (*Arborimus pomo*)*	CDFW: SSC
Steelhead Trout (*Oncorhynchus mykiss*) Central California Coast ESU*	FT
Plants	
American Manna Grass (*Glyceria grandis*)	None
Humboldt Milk-Vetch (*Astragalus agnicidus*)	SE
Marsh Pea (*Lathyrus palustris*)*	None
Nuttall's Ribbon-Leaved Pondweed (*Potamogeton epihydrus*)	None
Santa Cruz Clover (*Trifolium buckwestiorum*)*	BLM: Sensitive

Listing Status Codes:

FE= Federally Endangered, FT=Federally Threatened; SE=State Endangered
CDFW: SSC = California Species of Special Concern
BLM: Sensitive
*Known to occur on the Forest

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4.3.3 Management Considerations for the Northern Spotted Owl

The northern spotted owl (NSO) range is north of the San Francisco peninsula, throughout the coastal and inland ranges of California and throughout the coastal and Cascade mountain ranges of Oregon and Washington to southern British Columbia. The Redwood Region accounts for only about nine percent of the northern spotted owl's range.

Thirteen NSO activity centers are located on the GRF based on current surveys, with four additional activity centers located on neighboring properties. According to CDFW, NSOs prefer dense, old-growth, multi-layered mixed conifer, redwood, and Douglas-fir forests. Prime NSO habitat consists of moderate-to-dense stands of medium-to-large trees and multi-layered stands of redwood and Douglas-fir, with mature, multi-layered stands required for breeding. Based on a study conducted in northwestern California, however, the greatest foraging habitat for NSOs is a mix of mature and late-seral forests, interspersed with open vegetation types like brush and younger forest (NCRM, 2011).

Primary prey species for NSO include dusky-footed woodrat, flying squirrels, mice, voles (including the red tree vole), small rabbits, small birds, bats, and large arthropods. NSOs roost in forests with a dense, multi-layered canopy for seclusion and appear to prefer north-facing slopes in summer due to intolerance for high temperatures. NSOs require a large home range of 100-600 acres of mature forest with permanent water and suitable nesting trees and snags with broken tops or cavities (NCRM, 2011).

The NSO was listed as a threatened species under the federal ESA in 1990 as concern mounted over the continuing loss of habitat, which the owls require for reproductive success and survival. In accordance with the ESA listing, landowners within the range of the NSO are required to survey for their presence if any kind of habitat altering activity, such as a timber harvest plan, is proposed. Historically the USFWS has overseen the administration and consultations with regard to species protected under the ESA. This responsibility is now shifting to CAL FIRE. The USFWS developed an NSO survey protocol in 1991 (revised in 1992), which is followed today. In order to address the presence of barred owls, the USFWS issued an update to the NSO survey protocol in 2011, which was subsequently revised in 2012. CAL FIRE has been charged with reviewing NSO data submitted within THPs to determine if harvesting will result in the take of NSO.

The California Forest Practice Rules define minimum foraging and nesting/roosting habitat conditions and require minimum habitat retention levels at the 500-foot, 1,000-foot, 0.7-mile, and 1.3-mile radii of the activity center. Additionally, prior to commencing timber operations, surveys for NSO must be completed in conformance with the USFWS guidelines.

The Fund is fortunate to have Mike Stephens, one of the region's NSO experts, responsible for NSO surveys, habitat classification review, and USFWS and CAL FIRE permit coordination. In addition to what is required by the ESA, the Fund has undertaken exhaustive survey efforts to locate all NSO on our forest to facilitate timber harvest, as well as road improvement projects and stream habitat improvement projects. The Fund's commitment to predominantly uneven-aged selection silviculture is designed to maintain and increase habitat values. The biggest threat to the future of the forest's owls is not habitat loss, but rather the invasive barred owl which displaces the NSO (Kelly et al., 2003) and suppresses its calling behavior (Crozier et al., 2006), while its presence steadily increases in Mendocino County.

A detailed report on the life history and habitat requirements of the northern spotted owl, with particular attention to the Forest's owls, is included as Appendix D.

4.4 Watershed Conditions

4.4.1 Water Quality Overview

The GRF lands have been managed for industrial timber production for many decades. The Recovery Strategy for California Coho Salmon prepared by the Department of Fish and Game (Coho Strategy) states, "Historical forestry practices and some current forestry practices have been shown to impact several freshwater habitat components important to anadromous salmonids in general, and Coho Salmon specifically. These impacts include increased maximum and average summer water temperatures, decreased winter water temperature, and increased daily temperature fluctuations; increased sedimentation; loss of LWD [large woody debris]; decreased DO [dissolved oxygen] concentrations; increased instream organic matter; and decreased stream-bank stability" (CDFG, 2004).

Past and potentially current forest management practices have been identified as a principal source of sediment delivery in the Redwood Region. According to the NPS Implementation Plan, "Silviculture contributes pollution to 17 percent of the polluted rivers… in California (SWRCB). Without adequate controls, forestry operations may degrade the characteristics of waters that receive drainage from forestlands. For example, a) instream sediment concentrations can increase due to accelerated erosion, b) water temperatures can increase due to removal of overstory riparian shade, c) dissolved oxygen can be depleted due to accumulation of slash and other organic debris, and d) concentrations of organic and inorganic chemicals can increase due to harvesting and fertilizers and pesticides." (SWRCB, 2000)

While past forest management has been a significant contributing cause of impairment of North Coast water bodies, there is broad agreement that preventing fragmentation of large tracts of coastal forests, and implementing management measures relating to road maintenance and sustainable forest practices, is the most feasible means of enhancing water quality in the region. These measures are implemented at the GRF and described in detail in Section 5.

4.4.2 Stream Conditions

There is a dense riparian corridor along the North Fork Garcia River, Garcia River mainstem Signal, Inman and other lessor fish bearing streams. Many of the smaller tributary streams are intermittent and do not show much distinctive riparian tree development.

Table 4.5, below, is a summary of the total miles of stream in each Cal Water Planning Watershed, for the Garcia River watershed, based on USGS data. Shaded boxes represent greater than average values (Best et al. 1997). Note: figures represent watershed-wide information, and are not specific to the Forest.

Table 4-5: Summary of Total Stream Miles in the Garcia River Planning Watersheds

Planning Watershed	Predominant Stream	Square Miles	Class I (mi/mi^2)	Class II (mi/mi^2)	Class III (mi/mi^2)	Unclass. Perennial (mi/mi^2)	Unclass. Intermittent (mi/mi^2)
113.70010	Pardaloe	16.36	0.47	0.33	2.29	0.19	1.83
113.70011	Larmour	10.23	0.50	0.80	1.71	0.48	0.99
113.70012	Stansbury	6.21	1.03	1.23	4.22	0.00	0.00
113.70013	Blue Waterhole	7.70	0.67	0.96	2.47	0.58	0.14
113.70014	Inman	8.56	0.88	1.86	6.56	0.00	0.00
113.70020	Signal	6.18	0.84	1.48	4.35	0.00	0.12
113.70021	Graphite	5.35	1.01	1.65	4.45	0.00	0.00
113.70022	Beebe	4.10	0.74	2.42	3.13	0.00	0.00
113.70023	South Fork	8.74	0.35	0.26	0.51	0.85	0.63
113.70024	Rolling Brook	12.50	0.53	0.71	1.23	0.32	0.33
113.70025	North Fork	16.21	0.76	1.82	3.94	0.03	0.00
113.70026	Hathaway	12.26	0.28	0.86	1.00	0.45	0.19
113.700	Garcia Basin	114.40	0.67	1.20	2.99	0.24	0.35

In 2007, TNC and the NCRWQCB embarked on the first year of the Garcia River Aquatic Monitoring Program, based on the U.S. Environmental Protection Agency's (U.S. EPA) Environmental Monitoring and Assessment Program (EMAP-West) and elements of California's Surface Water Ambient Monitoring Program (SWAMP). Comprehensive surveys were completed across the Forest in 2008 and 2012, and include measures of sediment, riparian canopy cover, instream fish habitat, fish presence, and large wood loading among other variables. The initial reporting on the results of the monitoring are currently in draft form and will be incorporated by appendix into this IRMP when they become available.

In the winter of 2008/2009, CDFW began implementation of regional salmonid spawner survey abundance estimates. For independent population streams, such as the Garcia River, CDFW survey reaches (1-4 km stretches of stream) using a spatially balanced design until they have at least six in each system. A sample size of six reaches in a watershed is the minimum needed to estimate returning adult abundance. Annually, CDFW surveys one reach on lower Signal Creek and one reach on lower Inman Creek and four other varying reaches throughout the Garcia. To estimate abundance, spawning surveys are conducted fortnightly in selected survey reaches from mid-November through April each year. CDFW counts and measures all redds and fish encountered. The average annual Coho Salmon spawner: redd ratios are used from the life cycle monitoring stations at Pudding Creek and SF Noyo River to convert bias corrected redd counts into fish numbers for each reach surveyed (Gallagher et al. 2010a).

Table 4-6: Garcia River Coho Salmon Returning Adult Abundance Estimates

2009	2010	2011	2012	2013	2014	2015	2016	2017
69	9	90	0	211	3	163	125	93

North Fork Garcia River, Garcia River mainstem

GRF encompasses approximately 70 percent of the North Fork Garcia River and over seven miles of the Garcia River mainstem. Stream habitat surveys by CDFG in 2004 reveal that while in the North Fork canopy cover was generally good, pool frequency and pool shelter (particularly woody cover) both need improvement (CDFG 2005). Shade canopy is not at acceptable levels in the Garcia mainstem and needs restoration (CDFG 2005).

Large numbers of juvenile anadromous salmonids (predominantly steelhead) have been observed in the North Fork Garcia below a 20-foot-high bedrock falls, which precludes migration to the uppermost two miles of the Class I system (Mendocino County Resource Conservation District 1992, North Coast Resource Management [NCRM] 2002b). Both the North Fork and the mainstem of the Garcia contain steelhead, Coho and Chinook Salmon, habitat (NCRM 2002a). TNC and the North Coast Water Quality Control Board (NCRWQCB) confirmed the presence of Coho Salmon in North Fork Garcia River in 2008, 2009, and 2012.

Steelhead trout have been regularly observed in the Garcia mainstem throughout the Forest in recent years by TNC and the NCRWQCB. Coho salmon have been observed in the Garcia mainstem at the downstream end of the property near the confluence with the North Fork Garcia in 2008, 2009, 2011, and 2012.

Signal Creek

The Forest encompasses approximately 85 percent of Signal Creek, 82 percent of Inman Creek, 65 percent of Graphite Creek sub-watersheds and approximately 50 percent of Blue Waterhole Creek. Steelhead and Coho Salmon have been observed by TNC and the NCRWQCB in all 4 of these major sub-watersheds, however data indicates that temperatures in these Class I streams are often above what is suitable for anadromous fish (Maahs and Barber 2001, IFR 2003, CDFG 2005).

Signal Creek represents 3.47 miles of Class I stream habitat (NCRM 2002b). In 2002, NCRM updated 1997 stream habitat quality assessment work done by Best et al, 1997. Evaluations were for Class I streams only and were based on canopy closure percentage, percent of sand in riffles, and quantity and volume of large woody debris. (For more information on habitat quality assessment protocols see Best et al. 1997.) Overall, channel conditions in Signal Creek were rated relatively good and fair numbers of juvenile steelhead and very small numbers of Coho Salmon have been observed here in recent years (Bell 2003, NCRM 2002b, CDFG 2005). TNC and NCRWQCB confirmed the presence of Coho Salmon in Signal Creek in 2011 and 2016. CDFG survey work in 2004 indicates that Signal Creek has streambank erosion problems in places, and needs improved pool frequency and shelter (particularly woody cover) (CDFG 2005).

Inman Creek

Inman Creek includes 7.08 miles of Class I stream, with moderate channel conditions (NCRM 2002b). CDFG survey work in 2004 indicates that Inman has streambank erosion problems in places where shade canopy is not at acceptable levels. Furthermore, the work relays that Inman needs improved pool frequency and shelter (particularly woody cover) (CDFG 2005). Small numbers juvenile salmonids were observed during channel assessment fieldwork done in 1996, 2004 and 2013 (NCRM 2002b, CDFG 2004). And TNC and NCRWQCB have observed juvenile Coho salmon in Inman Creek in 2008, 2011, and 2012.

Graphite Creek

Graphite Creek needs improvements in pool frequency and shelter (particularly woody cover), as well as supplementation of spawning gravels (CDFG 2005). Steelhead have been regularly observed in recent years by TNC and NCRWQCB, but Coho have not been detected.

Blue Waterhole Creek

Blue Waterhole Creek includes 5.33 miles of Class I stream (NCRM 2002b). Blue Waterhole Creek has consistent temperatures above those acceptable for anadromous fish (Maahs and Barber 2001, IFR 2003, CDFG 2005), and needs significant riparian forest planting to improve riparian canopy cover and shading, as well as restoration to improve pool frequency and shelter (particularly woody cover) (CDFG 2005). The North Coast Water Quality Control Board confirmed the presence of Coho Salmon in Blue Waterhole Creek in 2011 and 2016. This was a significant find because it was previously believed that Blue Waterhole was too warm to support Coho Salmon.

Headwater Streams

Intermittent and small non-fish bearing perennial streams on the Forest retain a natural hydrological regime, feed lower anadromous fish habitat, and are important habitat for native species of amphibians. They also provide habitat for a large number of invertebrate species (e.g. mayflies, stoneflies, caddis flies) that only require the presence of water for part of the year. Protection of these headwater streams is important for improving water quality, while also reducing erosion and sedimentation in the watershed.

4.4.3 Aquatic Species Affecting Management

As mentioned previously, the focus of this Plan is on the salmonid species known to, or currently, inhabiting the Garcia River watershed: steelhead (Oncorhynchus mykiss) and Coho Salmon (Oncorhynchus kisutch). In California's North Coast watersheds, salmonids are used as an indicator of watershed and ecosystem health. Information and management recommendations provided throughout this plan are predominantly relevant to salmonid habitat and populations (GRWC, 2013).

Table 4-7: Aquatic Threatened, Endangered, and Species of Concern in the Vicinity of the Forest per CNDDB quad search

Species	Listing Status
Anadromous Fish	
Coho Salmon (*Oncorhynchus kisutch*) Central California Coast Evolutionarily Significant Unit (ESU)*	FE SE
Steelhead (*Oncorhynchus mykiss*) Central California Coast ESU*	FT
Pink Salmon (Oncorhynchus gorbuscha)*	
Freshwater Fish	
Gualala Roach (*Lavinia symmetricus parvipinnis*)	CDFW: SSC
Estuarine Fish	
Tidewater Goby (Eucyclogobius newberryi)	
Amphibians	
Coastal Giant Salamander (Erysimum concinnum)*	
Southern Torrent Salamander (*Rhyacotriton variegatus*)	
Red-bellied Newt (*Taricha rivularis*)*	
Black Salamander (*Aneides flavipunctatus*)*	
Tailed Frog (*Ascaphus truei*)*	FT CDFW: SSC
Western Toad (*Anaxyrus boreas)**	
California Red-legged Frog (*Rana draytonii*)	FT CDFW: SSC
Foothill Yellow-legged Frog (*Rana boylii*)*	CDFW: SSC

Listing Status Codes:

FE= Federally Endangered, FT=Federally Threatened; SE=State Endangered
CDFW: SSC = California Species of Special Concern
*known to occur on the Forest

Coho Salmon (Oncorhynchus kisutch)

Coho Salmon need riverine habitats with cool clean water, appropriate water depth and flow velocities, riparian vegetation to stabilize soil and provide shade, clean gravel for spawning and egg-rearing, large woody debris to provide resting and hiding places, adequate food and varied channel forms.

Coho Salmon have been definitively observed by TNC and the NCRWQCB in Signal Creek in 2011 and 2016; North Fork Garcia River in 2008, 2009 and 2012; Inman Creek in 2008, 2011, 2012 and 2013; Blue Waterhole Creek in 2011 and 2016; and Olsen Gulch in 2012. The Coho Salmon (Oncorhynchus kisutch) was listed as federally threatened on December 2, 1996 within the Central California Coast Evolutionary Significant Unit (ESU) and was listed as state and federally endangered in 2005. This ESU includes all naturally spawned populations of Coho Salmon in coastal streams, south of the Mattole River to the San Lorenzo River in Santa Cruz County. Coho Salmon are anadromous fish that require migration access to streams with cold, clean, well oxygenated water and prefer the cover of overhanging vegetation, undercut banks, submerged vegetation, rocks, logs, and deep, slow-moving water. Coho Salmon typically initiate upstream migration between late October and mid-February (CDFG, 2004). Coho generally prefer cooler water temperatures, with optimal rearing conditions at MWMTs below 16° C (Carter, 2008), and presence thresholds at 16.8° C MWAT and 18.0° C MWMT (Welsh et al., 2001). Redds are laid in gravel that range in size from 1.3 to 10.2 centimeters in diameter (Bjornn and Reiser, 1991). Intergravel mortality occurs when fine sediments exceed 13 percent of the substrate composition (CDFG, 2004). After emergence from gravels, juveniles spend the rest of the year in the freshwater environment. This makes the species reliant on over-winter and over-summering habitat, within rivers and streams, thus creating susceptibility to impacts from degraded freshwater habitat. Favored summer habitat is deep cold-water pools, often formed by the presence of large woody debris and sufficient cover. Winter habitat includes low velocity stream habitats (alcoves, backwaters, side channels and floodplains) where juveniles can weather high winter flows. Coho Salmon migrate to the ocean at age one and return to fresh water to spawn after two to three years (CDFG, 2004).

Steelhead Trout (Oncorhynchus mykiss)

Steelhead trout inhabit all anadromous fish bearing perennial streams on the forest. The steelhead (*Oncorhynchus mykiss*) was listed as federally threatened on June 7, 2000, within the Northern California Coast (NCC) ESU which includes steelhead in California coastal river basins, from Redwood Creek in Humboldt County south to the Gualala River. The vast majority of steelhead stocks present in the North Coast are winter-run with adult upstream spawning migrations occurring from December through March. Spawning takes place shortly after the fish arrive at the spawning grounds. Unlike Chinook and Coho Salmon, most steelhead do not die after spawning, but migrate back to the marine environment and return to spawn in following years. Steelhead have flexible life histories with most spending between one and three years in freshwater before migrating to the ocean as smolts. They also spend a variable amount of time (one to four years) in the marine environment before returning to spawn. While this provides flexibility to adapt to variable stream conditions, it makes juvenile steelhead susceptible to adverse over-summer and over-winter stream conditions. Adverse conditions concerning this species are elevated water temperatures and sedimentation of spawning gravels. Steelhead mortality at the different life stages is closely affiliated with water temperatures (Moyle, 2002). Steelhead can tolerate higher temperatures than Coho, and the recent National Marine Fisheries Service Recovery Plan for NCC steelhead set a MWAT threshold of 17° C, and a MWMT threshold of 20° C (NMFS, 2016). Carter (2008) recommends a MWMT threshold of 16° C for optimal rearing conditions for all salmonids (Carter, 2008).Steelhead prefer to spawn in gravels 0.6-10.2 cm. in diameter, with eggs developing in approximately 31 days (CDFG, 1996). When fine sediments exceed 13 percent of the substrate composition, intergravel mortality can occur.

Steelhead do not necessarily migrate at any set age. Some individuals will remain in a stream, mature, and even spawn without ever going to sea, others will migrate to sea at less than a year old, and some will return to fresh water after spending less than a year in the ocean (Moyle, 2002).

Steelhead habitat requirements are very similar to Coho Salmon. They need cool clean water and adequate flow for migration and summer rearing, clean gravels and cobble for spawning and winter refugia, deep pools with large wood for shelter, and healthy riparian vegetation for shade and nutrients (GRWC, 2013).

Pink Salmon (Oncorhynchus gorbuscha)

Pink salmon (*Oncorhynchus gorbuscha*) are a CDFW species of special concern. Once believed to be extinct in California, they were identified in 2003 and 2004 by Craig Bell in the lower reaches of the Garcia River. Pink salmon live for two years, although occasionally three-year-old fish are reported. Adults move into fresh water between June and September and spawn from mid-July to late-October. As most pink salmon spawn in the intertidal or lower reaches of streams and rivers, it is unlikely that pink salmon would be found on this Forest. It is possible, however, as they have been found to spawn 100-700 kilometers upstream in some rivers. Spawning occurs in gravelly riffles with water depths between 20-60 cm. and temperatures of 4.4 -13° C. Embryos hatch after four to six months and fry emerge in April or May and immediately begin migrating downstream. Embryos require fast-flowing (21-101 cm/sec.) and well-oxygenated water (>6 mg/l.) for normal development. Once in an estuary, they school and remain in inshore areas for several months before moving out to sea (Moyle, 2002).

4.4.4 Existing Road Conditions

The GRF has an extensive network of maintained roads. Most roads have locked gates to control access. The Location Map shows the Forest's primary roads. In addition to frontage on county-maintained roads (Mountain View and Fish Rock), there is an extensive system of gravel and dirt roads on the Forest, which were developed for timber harvesting, including servicing the old Hollow Tree Mill (aka "Mill D") near the confluence of Signal Creek and the Garcia River. Due to past construction practices, the presence of the mill, and increased traffic associated with the mill, many of the roads are wider than those constructed in forest settings today. More recently progress has been made to improve the forest roads. Many bridges have been installed on the larger watercourses, road surfaces have been rocked, rolling dips installed and in some cases road widths have been reduced. The roads on the Forest at the time of the Fund's purchase could generally be characterized as average forest roads. The rock surface applied by previous owners protected the permanent roads and prevented major failures from occurring due to gullying and culvert diversions. However, the road system is in need of maintenance and upgrading to conform to modern design criteria, including the installation of rolling dips, critical dips, and outsloping the running surface.

Sediment Source Assessments have been completed for the entire Forest. These assessments are available at http://www.conservationfund.org/projects/north-coast-forest-conservation-initiative/north-coast-reference-documents. Common problems noted include: perched or raveling fills on the outside edge; gullying of fills at watercourse crossings; shot-gunned culverts or short culverts; inadequate or missing downspouts; and plugged inside ditches. Some secondary roads are impassable due to brush encroachment. Due to the past harvesting history there is an extensive, and mostly unmapped, network of skid trails (used for tractor logging). Many of these roads are on steep slopes, where new construction would not be appropriate. Roads are currently being maintained and upgraded by the Fund to meet current standards, in a phased approach. Some mainline roads have been identified for permanent maintenance and other roads will be assessed on a variety of factors, including future timber harvests and potential for adverse environmental effects. Since acquiring the Forest in 2004 the Fund has made significant improvements to the roads and infrastructure. A summary report of road upgrades to date is attached as Appendix E.

Bridges

The majority of the bridges on the Forest were originally constructed with redwood log stringers and decked with soil. Over time the soil surface was replaced with pressure-treated cross members and a wooden running surface. Bridge conditions vary greatly on the Forest; repair and replacement have been executed in some areas, while others still need maintenance. See Appendix F for details on bridge status, repair and estimated replacement costs. Since acquiring the Forest seven bridges have been repaired or replaced.

Rock Pits

Numerous rock pits are known to occur on the Forest and have been used as a source of rock for road surfacing and bridge construction (see descriptions in Appendix G). Many other pits exist but have not been identified or mapped. Hundreds of small road cutbanks have also served (and will continue to serve) as minor sources of rock and have not been mapped. The use and development of new rock pits will be necessary for the future road construction and maintenance needs of the Forest and as a source of rip-rap for erosion control. These needs cannot be accurately forecast, but will be described in the future in annual road maintenance plans and in updates to the Plan.

4.5 Archaeology and Cultural History

The Garcia watershed lies within the Pomo ethnographic province and was inhabited by a native people known as Bokeya, or Central Pomo. The ancestral lands of this tribe extended along the coast from just north of the Navarro River, southward about 35 miles to near the mouth of the Gualala River. A permanent village was located on the Garcia River, not far from the present Rancheria, known as "pdahaw" (translated as "at the stream mouth"). The village population was estimated at around 200. These factors and the various previously recorded sites indicate that the prehistoric resources most likely to be encountered on the Forest are lithic scatters with groundstone present. Native American sites are commonly situated along trending ridgelines or spurs, broad mid-slope terraces, and areas adjacent to seasonal and perennial watercourses, including springs.

Archaeological and cultural resource surveys have been conducted by previous landowners during the preparation of timber harvest plans; over 30 cultural sites have been located on the Forest. Existing cultural resources are protected from management activities through exclusion of heavy equipment operation in the immediate vicinity. Specific areas proposed for timber harvest are surveyed during the timber harvest planning process to detect and protect any previously unknown sites or artifacts. In accordance with the American Indian Religious Freedom Act and the Antiquities Act, the State of California cultural records data base (maintained at Sonoma State University) will be consulted prior to any land disturbance activities. Continued assessments will be made to locate cultural resources before any significant activity in the Forest, and personnel trained in archaeological inventory methods will inventory all sites before timber harvest activity. These Acts require that site locations and descriptions are kept confidential to protect the resources; therefore, no listing is included in this Plan.

The most likely types of historic sites to be encountered within the Forest are those related to timber harvest. These types of site range from simple logging camps and historic trails to mill sites and infrastructure related to timber transport. Logging railroads are common in the lower Garcia River Watershed but have not been documented in the Fund's ownership.

5. Forest Management Goals and Measures

5.1 Forest Management Overview

The following forest management policies and strategies have been developed to guide the long-term management of the forest resources of the GRF to ensure sustainability and fulfill the overall project purpose. Forestry is an inherently site-specific endeavor and policies must retain the flexibility to adapt to individual stand conditions, market characteristics, or logging contractor capabilities.

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5.1.1 Forest Management Strategies

- Silviculture practiced on the Forest will be primarily uneven-aged single-tree or small group selection in order to develop and maintain a range of tree sizes and ages within a stand – with the goal of producing valuable saw timber and utilizing natural regeneration. Even-aged variable retention harvests (to retain large trees and habitat features) may be used to rehabilitate conifer sites now dominated by hardwood, in future salvage situations, or group selection. Variable retention will likely be used on Douglas-fir sites; all regeneration harvests will encourage natural conifer regeneration. See Appendices H and I for further discussion of silvicultural methods and practices.
- The Forest must generate sufficient revenue to cover management costs and invest in restoration and enhancement measures (e.g. restoration projects, road upgrades).
- Harvest levels will be significantly less than growth rates over the next ~40 years so as to increase timber inventory and carbon storage.
- Special attention will be given to developing and retaining critical wildlife habitat features, such as snags, downed wood, and trees of significant size.
- While the Forest presently contains smaller trees and more hardwoods than would have occurred naturally, over time the selected silvicultural methods are intended to ensure the Forest more closely approximates natural conditions.

- There are no undisturbed old-growth stands on the Forest; there are individual trees that are residual old growth—these and other very large trees and true oaks will be maintained [see retention requirements in 5.1.5].
- Include ample internal and external review of proposed and completed THPs through the Field Consultation, Annual Operations Review, and public tours [described further in 6.2].
- The Fund has obtained, and will continue to maintain, certification under the FSC and Sustainable Forestry Initiative (SFI®) standards.
- The Fund will continue to report carbon sequestration through the Air Resources Board.

5.1.2 Forest Pests

There are relatively few diseases that impact trees throughout the Forest and most impact individual or small groups of trees. At this point, landscape scale disease outbreaks resulting in significant and widespread mortality have not been observed. The following is a list of diseases known to occur on the ownership which may result in declining tree vigor and mortality:

- Red Ring Rot (*Phellinus pini)* causes heartwood and sapwood decay in a wide range of conifer species and is the most common form of wood decay seen in coastal California forests. Infections in Douglas-fir are common on the property and it is also seen in sugar pine. Visual indicators of infestation include brownish, bracket-like conks on the bole of the tree and swollen branch nodes. Damage is most prevalent in older stands (generally over 50 years) and in areas that have been subject to multiple partial harvest entries as broken limbs and bole scars serve as entry points for the disease.
- Black stain root disease (*Leptographium wagneri* var *psedutsugae)* is a vascular root disease common Douglas-fir throughout the ownership. It does not cause a decay but rather disrupts the trees vascular system and leads to declining vigor and often death. The disease causes a black staining in the sapwood of the roots and lower bole. Outward signs of infection include chlorotic foliage and reduced leader growth. Patches of trees infested with this disease are most commonly seen in areas with disturbed soil, such as adjacent to truck roads, landings, and skid trails.
- Velvet top fungus (*Phaeolus schweinitzii)* causes a root and butt rot in Douglas-fir and sugar pine. This disease is most common in older trees and often leads to loss of structural support and windthrow. There are few outward signs of infection other than clumps of brownish, irregularly lobed caps that emerge from roots around the base of infected trees.
- Brown cubical rot (*Poria sequoia)* and white ring rot (*Poria albipellucida)* cause heart rot in redwood, but almost never lead to tree mortality.
- Sudden Oak Death is caused by the exotic oomycete *Phytophthora ramorum.* The disease has a very wide host range and mortality has been seen in tanoak, Shreve's oak, interior live oak, California black oak, and canyon live oak. Tanoak is the most highly susceptible species to this disease and tanoak mortality caused by sudden oak death has been observed on the ownership. Mortality in true oaks on the ownership due to sudden oak death has not been observed. Outward signs of infection include reddish, oozing stem cankers and foliage dieback. Tanoak mortality associated with this disease is almost always in close proximity to California bay trees. California bay trees are not killed by the disease, but are suitable hosts and important sources of inoculum.

- *Armillaria mellea* infects a wide range of species across the ownership including Douglas-fir, sugar pine, tanoak, and true oaks. *Armillaria* colonizes the roots of infected trees causing a white rot. *Armillaria* root disease caused tree mortality has been observed across the ownership, but it is relatively uncommon and not considered to be problematic. Fading crowns and chlorotic foliage are common symptoms in infected trees. However, definitive identification is difficult without seeing the characteristic clusters of yellow-brown 2-5' mushrooms around the base of infected trees.

5.1.3 High Conservation Value Feature Protection

Most of the forest management policies are intended to guide the management of those areas of the GRF that will support commercial timber harvesting operations. However, one of the most important steps in determining how to manage a forest is recognizing which areas have unique ecological values that outweigh their potential contribution from a commercial harvest perspective, especially given the CE Performance Goal. The protection of these features is critical to achieving the program objectives of restoring habitat for species of concern and increasing the natural diversity and ecological health of these forests, and meeting the CE Performance Goal.

Specific policies to address these features include the following:

- All true oak (*Quercus* spp.) woodlands and native grasslands will be preserved. Where these vegetation communities grade into adjoining conifer forest, the surrounding forest is to be managed to buffer and protect the unique ecological attributes of oak woodlands and native grasslands.
- There are no large wetlands on the Forest, but springs, seeps, and small wetlands shall receive protection measures as required by the FPR.
- Riparian forests, particularly along Class I streams, will be managed to provide for closed canopy mature forest with a high component of downed logs and other late-seral features. [Some removal of timber can be consistent with this objective - see WLPZ Protection Measures in Section 5.3, below.]
- Nest sites for NSOs are to be managed in accordance with the requirements of the USFWS and the Fund's biological consultant, Mike Stephens (see Section 4.3.3 and Appendix D for details). All Activity Centers recognized by the USFWS will be protected.
- Forests in the ERN will be managed to advance ecological (e.g. development of late-seral conditions) rather than economic objectives.

Additional information on the identification and protection of these features can also be found in the High Conservation Value Features Program Memo, which is included in the North Coast Forest Conservation Program Policy Digest (Appendix H).

5.1.4 Ecological Reserve Network

The over-riding goal of the project is to protect significant natural, ecological, and aesthetic values in the context of developing and implementing a commercially viable working forest with sustainable forestry practices. A key to this goal is to establish an "Ecological Reserve Network (ERN, or "Reserve") within the Forest, which protects features of high ecological value and supports large-scale ecological processes. The CE and the State Coastal Conservancy grant agreement requires that at least 35 percent of the land base shall be included in the ERN. The Ecologic Reserve area encompasses the entirety of the Inman Creek Drainage within the boundaries of the GRF. Also, included in the reserve are expanded Class I riparian zones which exceed the FPR minimum retention requirements. The Reserve area was chosen to include areas of high ecological diversity as well as areas crucial to water quality and anadromous fisheries. The Fund and TNC endeavored to design and manage the ERN in accordance with the latest understanding of conservation biology.

The Fund will manage the Reserve to address the following:

- Maintain and enhance viability of conservation targets within the ERN.
- Identify areas most suitable for habitat restoration.
- Maintain and enhance high-quality spawning and rearing habitat for anadromous salmonids.
- Maintain network of habitat types present on the Forest, including late-seral and (eventually) old growth forest habitats, high-quality grassland, aquatic, anadromous fish, and other habitats totaling at least 35 percent of Forest area.
- Timber harvest and other intensive management activities (e.g. herbicide treatment, prescribed fire) will be applied within the Reserve only to further ecological objectives, such as thinning to accelerate development of late-seral conditions (e.g. large trees, canopy closure, structural diversity, snag and down woody debris recruitment, in-stream woody debris). Activities, including improving or relocating existing roads to serve the larger goal of an operating forest, and to reduce sediments and enhance water quality, will occur.
- Structures permitted by the CE, including one home and an educational facility will not be constructed within the Reserve, unless otherwise agreed to by the easement holder.

In addition, where feasible the Fund will manage the Reserve to address the following:

- Identify and prioritize stands where silvicultural prescriptions could accelerate the development of complexity, diversity, and ecological values associated with late-successional forests.
- Identify and prioritize the removal or decommissioning of unnecessary roads that have high potential to deliver sediment.
- Improve existing road condition and reduce incidence of road-related sediment delivery to aquatic ecosystems.
- Identify and prioritize areas where silvicultural prescriptions could reduce the risk of catastrophic wildfire.
- Ecological enhancement and restoration opportunities throughout the Forest shall be prioritized based on a number of criteria, including severity or threat, with some restoration activities centered in the Reserve and others spread over the Forest.

To date only minor harvesting designed to promote late seral habitat, has been implemented within the reserve. Specifically, harvesting in the Olsen Gulch watershed, where single tree selection (primarily thinning from below) and selection harvest employing variable density thinning (VDT) – sometimes called “skips and gaps” – has been employed. Under VDT prescriptions, trees are thinned at varying intensities throughout the project area with the objective of increasing vertical and horizontal structural complexity and accelerating the development of late seral forest characteristics. Thus far, the Fund has only implemented approximately 100 acres of VDT within the western portion of the North Fork Garcia Planning watershed. In practice this prescription entailed removal of primarily intermediate sized trees, throughout most of the project area, to accelerate large tree development. In addition, across approximately 10% of the project area gaps ranging from 1/10-1/4 acre in size were created. Across another 10% of the project, no harvest ‘skips’ ranging from 1/10-3/4 acre were designated, which were excluded from all harvest activities. Extensive grant funded road upgrades were implemented in the Inman Creek watershed in 2008 and 2012, treating over 20 miles (approximately 85%) of roads in the watershed. Additional road improvements were made in association with the Olsen Gulch timber harvest plan in 2017. Instream large wood was augmented twice in Inman Creek, in 2009 and 2012, installing 195 pieces of LWD along 10 miles of stream.

While permitted under the Conservation Easement, no modification of the Ecological Reserve Network boundaries is proposed as this time.

5.1.5 Harvest Levels

For the GRF, growth forecasting and harvest scheduling was completed as part of development of the Option A for the ownership. The Option A, “A plan to Demonstrate Long Term Sustained Yield, (LTSY)” was developed for the GRF, BRSC and Gualala forests as a requirement of the FPR (TCF, 2014). The rules require that LTSY must be demonstrated for each landowner owning more than 50,000 acres. The plan is composed of a forest inventory and state of the art modeling, to demonstrate that harvest levels do not exceed growth (and in fact are substantially less) over a 100-year planning horizon. The forest inventory is stratified by timber type, utilizing a unique stratification system based on LIDAR imagery to delineate stand boundaries. Growth and harvest assumptions, along with all of the appurtenant FPR restrictions, are input into the FORSEE growth and yield model to develop a harvest schedule unique to GRF. For more information please see the entire Option A as Appendix I.

The original IRMP identified an annual allowable cut of 1.5mmbf/yr in the first decade of ownership and 1.65mmbf/yr in the second decade. Actual harvest has been less than 1mmbf/yr. For reference, the Option A models the estimated growth for 2014-2023 as 10.8mmbf/yr.

5.1.6 Silvicultural Objectives

The principal silvicultural objectives are to grow large high-quality conifer trees, increase structural complexity and natural diversity and establish a high level of sustainable timber production through selective harvests. These measures should maximize value growth and develop and maintain important late-seral habitat characteristics for wildlife and non-timber forest vegetation in the future. Future “crop tree” target diameters are 30 to 36 inches for redwood and 22 to 28 inches for Douglas-fir. Forest management will seek to emulate late-seral ecological functions and processes to the extent feasible, within a managed forest. Ultimately, these measures are intended to develop stands that have high canopy closure, some large mature trees, and a high degree of structural diversity. Once they are on an appropriate trajectory, certain stands, primarily within the WLPZ of Class I streams, may be excluded from harvest, so as to fully return to old growth conditions.

For additional information on silviculture decisions, THP development, harvest operations, and contractor selection please see the North Coast Policy Digest attached as Appendix H.

5.1.7 Harvest Retention Requirements and Guidelines

Within a harvest area, the Fund will permanently retain or recruit downed wood, snags, and trees with high wildlife value, given their recognized ecological role and ability to enrich the surrounding stand. The following policies for downed wood, snags, and wildlife trees are meant to implement this strategy by providing clear rules and numerical targets for certain types of features. [The Forest Practices Rules (FPR) do not categorically address general wildlife habitat retention trees (although there are some requirements for protection of active raptor nests), but additional guidance is available from CDFW.] Retention trees will be painted with a "W" or tagged by the field foresters as they are marking the timber harvest; this will communicate the value of these features not just to the loggers but also the public and future foresters. A harvest can include many retention trees and thus, not all are mapped or recorded unless they are suspected to be an NSO nest tree. While maintaining trees with high wildlife value is important, it is also critical to recognize the wildlife value of the surrounding stand and the conserved landscape; harvest stands do not always mimic or contain all features, which may be better represented in other areas of the Forest.

Downed Wood

<u>Target:</u> two pieces per acre (at least one conifer: 18 inch minimum diameter and 10 feet minimum length).

<u>Actions:</u>

- Retain existing downed wood, except in situations of recent windfall or fire, outside of Watercourse and Lake Protection Zones (WLPZ). (In most stands this should be sufficient to meet the target.)
- Retain snags and mark trees for recruitment snags to eventually become downed wood.
- Redistribute cull conifer logs from the landing where practical (unless used for instream restoration projects)

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Snags and Wildlife Trees

Target: an average of four trees per acre, across a stand, which may be composed of any combination of trees from the list below.

Criteria for mandatory retention:

- Snags (minimum 18 inch DBH and 20 foot height).
- Conifers greater than 48 inch DBH (Retain a minimum of one and not more than three per acre for recruitment).
- Old-growth trees (generally in the upper 20% diameter class for the species on site, deep bark patterns, flattened or irregular crowns, large limbs, crown debris accumulation).
- Raptor nest trees.
- Hardwoods over 20 inches.

- Murrelet habitat trees (low elevation old-growth and mature conifers, multi-layered canopies, mistletoe, other deformations or damage present for nest platforms).
- Den trees (cavity greater than three-inch diameter and greater than ten feet above ground).
- Trees with basal hollows or other significant features (cavities, acorn granaries, significant burn scars, significant or unusual lichen accumulation, signs of deformity, decadence, unusual bark patterns, or other unique structure or features).

Actions:

- Retain all mandatory trees and snags, except where necessary to fall for operator safety, and protect with screen trees if appropriate.
- If below the target number, mark and retain additional recruitment trees. [Additional wildlife trees will likely be marked in the future from the surrounding stand as it develops.]

General Harvest Retention Guidelines

- Marked wildlife trees should be considered "escapement" trees—they are not intended for future harvest and are allowed to grow beyond the crop tree target size.
- In the absence of mandatory retention trees, on average at least one conifer per acre should be retained from the largest ten percent of the diameter distribution of the stand.
- Marking of the wildlife trees (with paint or tags) is intended to communicate the recognition of the importance of that stem to future foresters, agency reviewers, and the public.
- For the next 20 years, some preference for snag and downed log creation and wildlife tree recruitment, will be given to cull trees and whitewoods (because of their low financial value) even though they may have a shorter lifespan.
- All retention is subject to operational considerations; the felling of any tree is permitted when necessary for firefighting, operator safety, road right of way, or yarding corridors. Field foresters will attempt to avoid locating yarder corridors where they would conflict with mandatory retention wildlife trees.
- Targets shall be assessed across the entire harvest stand, not on an individual acre basis.
- Preference is for spatial grouping (clumps of downed wood, snags, and/or wildlife trees).
- The above criteria shall apply to selection harvests. When marking variable retention harvests extra screen trees may be appropriate.

All of the foregoing requirements and guidelines are subject to further review and amendment as the science and practice of forest management evolves and new research is developed and applied. Due to past practices, some portions of the Forest do not have sufficient wildlife features and the initial targets set forth above are intended to guide the long-term retention and recruitment of these features. Two or three of any type of tree per acre is an admittedly arbitrary number chosen to put the Forest on the right trajectory for the development and maintenance of late-seral habitat characteristics within a managed forest. The achievement of some of these targets will likely take multiple entries. These distribution and size targets are not expected to be the ultimate value, but merely what is appropriate to select and recruit in the next twenty years. The development of late-seral habitat elements is ultimately a long-term process, which will be shaped over several harvest entries.

5.1.8 Timber Marking Guidelines

Timber marking (designating individual trees for harvest) is the art of shaping future forest stand conditions by extracting merchantable trees from the forest. The intention is for the remaining trees to be vigorous, and free to grow, while protecting and enhancing wildlife habitat. The result being a well-stocked forest; rapidly growing, and healthy with abundant and diverse wildlife habitat features. Approaches to timber marking vary by stand condition and silvicultural objective, and it is thus difficult to identify a universal prescription.

When in the field, foresters make thousands of individual judgment calls while marking a stand. Thus, even individual foresters with the same objective would inevitably make slightly different decisions. The general goal of timber marking by the Fund is relatively simple: current (pre-harvest) conditions should be improved by the time of the next entry (typically ten to twenty years). "Improved" is a subjective term, but for the purposes of this Plan, it means increased values for conifer basal area, merchantable volume, snags and downed logs per acre. These are also some of the values to be used to monitor forest trends across the Forest.

The North Coast Policy Digest (Appendix H) includes criteria drafted by experienced foresters, which strive to capture the art of achieving the desired balance between habitat recruitment and retention, while removing sufficient conifer volume to satisfy the economic needs of the project. Timber marking will be conducted with these criteria in mind. One of the purposes of the Field Consultations (both pre- and post- harvest) is for the forestry team to discuss the timber marking, particularly in riparian stands, understocked areas, and near NSO activity centers.

5.1.9 Hardwood Management

In addition to ecological imbalance, the high concentration of tanoak significantly reduces conifer growth and stocking, and therefore the future financial value of the Forests, since tanoaks have effectively no commercial value (it costs more to log and deliver than to simply sell tanoak as firewood). The long-term goal is to reduce the current level of tanoak relative to softwoods and the remaining stand. To achieve these objectives, the following management measures will be implemented:

- All true oak (Quercus spp.) woodlands, individual true oaks, Madrone, Chinquapin, California Bay and Red or White Alder are to be retained wherever possible. All hardwood wildlife trees are to be retained (which includes all of the above and tanoak 20 inches or greater), except where removal is required for safety concerns or necessary for yarding or road corridors.
- Where the post-harvest hardwood basal area would exceed 30 square feet of basal area per acre (averaged across the stand), hardwoods shall be controlled through manual falling, girdling, or herbicide treatment – through direct basal injection ("hack-and-squirt") or stump treatment – to provide a post-harvest hardwood basal area of 15 to 30 square feet per acre. This may take more than one entry to achieve. These targets may be adjusted once additional forest inventory has been completed.
- Most hardwood reduction will be achieved within a selection or thinning harvest, by selective falling or herbicide application, of tanoaks to release existing conifers. While the cut tanoak stumps will likely re-sprout, the conifers should establish dominance and will eventually shade-out most of the sprouts. In this type of incremental treatment, clumps of hardwoods and individual hardwoods that do not compete with desirable conifers – will be left alone.
- Smaller areas of intact hardwoods would be intentionally retained (for biodiversity reasons). Preference for hardwood retention will be given to large trees (greater than 20 inches), true oaks, chinquapins and madrones, and groups of hardwoods. Rehabilitation treatments

(including the use of herbicides) are intended to be one-time interventions and should not need to be repeated because of the decreased openings and ground disturbance associated with subsequent harvests.

- The only herbicide to be used in hardwood control treatments currently is Imazapyr (Tradename Arsenal). Only licensed and insured contractors, with a good track record for safety and compliance, may apply herbicides. All herbicide application must be in conformance with label guidelines and applicable laws. Additional herbicides may be considered in the future as they are developed and tested and reviewed with respect to FSC and SFI standards.
- Any planned use of herbicide will be clearly identified in the THP.
- Any area where herbicide use is proposed shall be clearly posted in the forest at least 30 days prior to application.
- Reduction in the use of herbicides is an important objective; alternatives to herbicide treatment have been and will continue to be evaluated on a periodic basis. A comparison of herbicide treatment and cutting of tanoaks for hardwood control was conducted on the Jarvis Camp THP on the Big River Forest. Compared to stem injection of herbicide, cutting and logging of the hardwoods resulted in significantly greater disturbance and re-sprouting.
- There will be no hardwood control with herbicides in WLPZs; manual falling or girdling of small hardwoods may only be used as part of a riparian shade enhancement project (likely with conifer underplanting).
- Priority for rehabilitation treatments will be given to high site, tractor-operable ground, with existing desirable conifer growing stock. Hardwood control measures will be reviewed periodically, and revised as appropriate, based on knowledge and experience gained in the field. Herbicides are also used to control certain exotic invasive plants, primarily jubata grass, western star thistle, French Broom and Scotch Broom.

5.1.10 Fire Management

Fire is both a natural and human-caused presence on the North Coast landscape, which requires careful consideration and preparation. The included Fire Plan Map illustrates relevant fire management features, including drafting sites, water sources, and helicopter landing sites. The Fund has developed a Fire Management Plan (included as Appendix J) to specify the fire prevention and response measures to be used on the Forest. This plan was submitted to CAL FIRE and is provided to all equipment operators working on-site and to the local volunteer fire departments. Decisions about fire control strategy and remediation will be made on a case-by-case basis by the Fund’s North Coast Timberland Manager. The 2008 Jack Fire on the Garcia River Forest was lightning-caused and resulted in a mostly benign low-intensity burn across 700 acres. Dangerous fuel and potential wind conditions meant the damage could have been much worse.

5.1.11 Monitoring and Forest Certification

Ongoing monitoring, of both activity implementation and program effectiveness, is a critical part of adaptive management and successful initiatives. Several monitoring strategies will be utilized to ensure thorough review across multiple sectors and different temporal and geographic scales. There is a detailed discussion of the aquatic monitoring strategies in Section 5.3.2, which are critical to, and complementary, of the forest monitoring strategies described in this section. Three broad categories of forest monitoring will be utilized: short-term harvest monitoring, long-term forest monitoring, and forest management certification. These are described in detail below. Easement compliance monitoring by TNC will continue on an annual basis.

5.1.11.1 Short-term Harvest Monitoring

Due to the sensitivity and significance of the timber harvest program, it will receive more detailed monitoring than other program activities. Numerous efforts are undertaken before, during, and after a timber harvest to ensure it is completed in accordance with the Fund's management policies. This includes safety, regeneration, residual stand quality, and aesthetic issues. This monitoring process begins before the harvest operation, with each THP's Field Consultation, which brings together all of the Fund's resource management team, to identify any sensitive issues that deserve additional attention. In addition, there is a public THP tour, prior to operation and again following completion, to solicit suggestions and answer questions from interested stakeholders.

During the harvest the supervising forester is on-site on a weekly basis, to review the performance of the Licensed Timber Operator and address any issues that may arise. Following the harvest, the Fund's resource management team is convened to inspect completed operations to evaluate conformance with the Fund's policies and discuss any special issues. During field consultations, weekly harvest inspections, and/or the required agency reviews, certain sites or issues may be identified for continued specialized monitoring (e.g. Erosion Control Plan sites are typically monitored for three winters). Results of THP inspections or monitoring are available from Fund staff by request.

5.1.11.2 Long-term Harvest Monitoring

As part of the objective of increasing the forest inventory, and restoring late-seral wildlife habitat characteristics, there are several targets that will be evaluated within the forest inventory. Due to the continuous nature of the inventory updates and the long response time of the forest, reporting on these metrics will occur approximately every ten years. As the primary forest management goals are to increase inventory, forest productivity and late-seral characteristics, the monitoring targets are oriented around associated indicators.

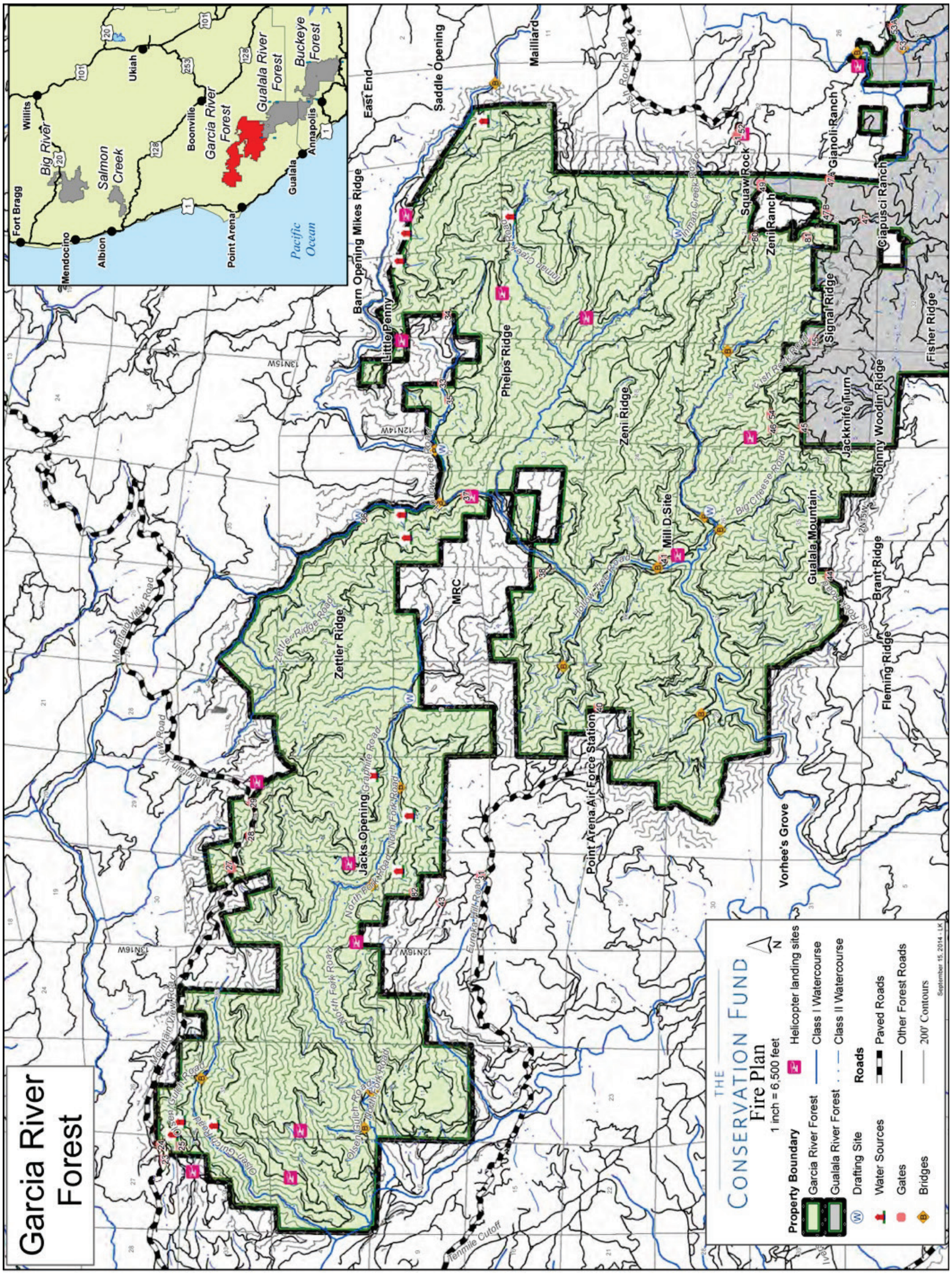
Garcia River Forest
THE CONSERVATION FUND
Fire Plan
1 inch = 6,500 feet
Property Boundary
Garcia River Forest
Gualala River Forest
Drafting Site
Water Sources
Gates
Bridges
Helicopter landing sites
Class I Watercourse
Class II Watercourse
Roads
Paved Roads
Other Forest Roads
200' Contours
September 15, 2014
Fort Bragg
Willits
Ukiah
Mendocino
Albion
Boonville
Big River
Salmon Creek
Garcia River Forest
Gualala River Forest
Buckeye Forest
Point Arena
Gualala
Annapolis
Pacific Ocean
Barn Opening
Mikes Ridge
East End
Saddle Opening
Mailliard
Little Penny
Phelps Ridge
Zeni Ridge
Squaw Rock
Zeni Ranch
Gianoli Ranch
Ciapusci Ranch
Signal Ridge
Fisher Ridge
Jackknife Turn
Johnny Woodin Ridge
Mill D Site
Gualala Mountain
Brant Ridge
Fleming Ridge
MRC
Zettler Ridge
Zettler Ridge Road
Jacks Opening
Point Arena Air Force Station
Vorhee's Grove
Mountain View Road
North Fork Road
Olsen Gulch Road
Tenmile Cutoff
Eureka Hill Road
Big Cheese Road
Fish Rock Road
Inman Creek Road
13N16W
12N16W
13N15W
12N14W

Table 5-1 summarizes the long-term harvest monitoring criteria in terms of current condition and desired future targets.

Table 5-1: Long-Term Forest Monitoring Targets

Objective	Metric	2005 Inventory	2015 Inventory	50-Year Target Value	Criteria
Conifer volume	Thousand board feet/acre	9.1	13.7	30+	Net Scribner log scale, across all forested acres
Conifer growth	Board feet/ acre/year	442	463 (10 year avg)	1,000+	Across all acres, post-harvest
Snags	Number/acre	0.8	0.66	>2	All species, >18" DBH
Hardwood Component	Percent basal area of forest	43	46% (all hardwoods);36% (tanoak)	<15*	Average across all forested acres, all diameters
Harvest volume	Percent of inventory	0	0.6%	<2.0	10-year rolling average. Average harvest/average inventory

* Given the large proportion of hardwood-dominated stands, this target may no longer be practical or desirable and will be revisited in future IRMPs.

5.1.11.3 Forest Certification

Since 2007, The Fund's North Coast Forest Conservation Program has been certified as in conformance with the FSC and SFI standards for sustainable forest management by the accreditation firms Scientific Certification Systems and NSF International Strategic Registrations. These broad-ranging standards are intended to ensure all forest management activities are planned and conducted to meet the established sustainability criteria, which include hundreds of individual indicators, covering everything from water quality protection and biodiversity conservation to worker training and community involvement. Re-certifications are scheduled to occur every five years with surveillance audits annually. The standards are publicly available at: www.fscus.org and www.sfiprogram.org; the reports of the Fund's auditors are available at http://www.conservationfund.org/projects/north-coast-forest-conservation-initiative/north-coast-reference-documents or from the Fund's North Coast office.

The GRF is also an approved and verified Improved Forest Management Project (IFM) through CAR. In 2015 the project was transitioned to an IFM Project through the California Air Resources Board (ARB) compliance market. This program, allows the Fund to quantify and sell greenhouse gas emission reduction credits generated as a result of the improved forest management on this Forest. To demonstrate permanence, the Fund is subject to annual audits, during which independent auditors review the forest inventory system, the growth and yield modeling, and greenhouse gas reporting system to ensure that the forest stocks contain the greenhouse gas emission reduction credits claimed. General information on the ARB Forest Project Protocol can be found at https://www.arb.ca.gov/cc/capandtrade/offsets/offsets.htm Specific project details are available at https://www.climateactionreserve.org.

This rigorous system of third-party audits is intended to help land managers evaluate and improve their practices and communicate their success. The Fund views participation in these programs as an important measure of program effectiveness and its commitment to advancing sustainable forestry.

5.2 Watershed Management Overview

As noted above, fundamental goals of the purchase and subsequent management of the forests are to "protect, restore and enhance water quality and salmonid habitat, improve forest structure and increase natural diversity [and] provide a sustainable harvest of forest products…" Described in detail in the pages that follow, the primary means of restoring water quality and salmonid habitat will be to: a) reduce direct and potential sediment inputs b) increase riparian canopy; c) minimize Class I diversions; and d) increase stream habitat complexity.

The primary means of improving forest structure, increasing natural diversity, and providing a sustainable harvest of forest products will be to implement unevenage silviculture where possible, and to develop and maintain large trees and increased stand inventories across the landscape, which will take time.

5.2.1 Road Management

As part of individual THPs previously conducted on the Forest, roads were inventoried and assessed for erosion potential. All GRF roads were inventoried in two phases as part of sediment source assessments conducted by Pacific Watershed Associates from 2006 - 2009. These assessments were funded by the California Department of Fish & Wildlife's Fisheries Restoration Grant Program. The road assessments utilize the CDFW-approved "Upslope Assessment and Restoration Practices" methodologies described in the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 2004). The methodologies provide a uniform, standardized and accepted protocol for identifying existing and potential erosion problems, prioritizes recommendations, while prescribing cost-effective treatments.

One of the goals of the sediment source assessments was to develop an erosion control plan as required by the TMDL Action Plan. The erosion control planwill: a) substantially reduce the potential for future sediment delivery to nearby streams by improving road surface drainage; b) upgrade or decommission road drainage structures to accommodate a 24-hour, 100-year storm discharge; c) where roads are recommended for upgrading, provide for year-round, safe use of the inventoried road routes; and d) reduce long-term road maintenance requirements and landowner costs.

5.2.2 Road Management Implementation Plan Timeframe

Road improvement (upgrading and decommissioning) and repairs will be conducted annually as part of the Fund's ongoing maintenance and as part of larger initiatives identified in the erosion control and erosion prevention plan described above. The Fund also will continue to upgrade roads consistent with the Garcia River TMDL Action Plan, TCF's Site Specific Management Plan and Erosion Control Plan. Due to the size of the Forest and the costs of implementation, these measures may take up to twenty years to complete; securing cost-share funding from CDFW and other sources will accelerate these time-frames.

Sediment Reduction Plan

To reduce sediment delivery from the road system, emphasis will be placed on increasing the number of drainage points along roads and reducing the potential for diversion at culverted watercourse crossings. Reducing diversion will be accomplished by the following management practices:

- New culverts and culverts proposed for replacement will be sized to meet the 100-year storm event.
- New or replaced culverts will be installed at stream grade with a critical dip.
- A trash rack or stake shall be installed upstream of the culvert to catch or turn debris prior to reaching the pipe. The stake shall be centered upstream of the culvert at a distance equal to the culvert diameter; e.g. the stake shall be two feet upstream of a 24-inch diameter culvert.
- Rock armored fill or temporary crossings will be used on secondary roads, which see only periodic activity, to reduce maintenance requirements. Minor crossings on permanent roads may be converted to rock armored fill crossings over time.
- New roads will be designed with gentle grades, and long rolling dips will be constructed into the road and outsloped to relieve surface runoff. Where possible, watercourse crossings will be designed such that road grades dip into the crossing and then climb out of the crossing, eliminating the need for abrupt critical dips.

<u>Permanent Roads:</u> Roads used year-round shall be designed, constructed, reconstructed, or upgraded to permanent road status – with the application of an adequate layer of competent rock for surface material, as well as the installation of permanent watercourse crossings and road prism drainage structures. These roads shall receive regular and storm period inspection and maintenance as required throughout the winter period.

<u>Seasonal Roads:</u> Roads used primarily during the dry season, but to a limited extent during wet weather, shall be designed, constructed, reconstructed, and upgraded to provide permanent watercourse crossings – either culverts or rock armored fill crossings and road surface drainage structures. Roads shall be upgraded as necessary with the application of spot-rocking where needed to provide a stable running surface during the specified period of use. These roads shall receive inspection at least once during the wet weather period and shall receive at least annual maintenance.

Temporary Roads: Roads designated as temporary shall be designed to prevent erosion, such that regular and storm period maintenance is not needed to prevent sediment discharges to a watercourse. All watercourse crossings, except rock armored fill crossings, shall be removed prior to October 15 of each year of installation. Inspections of these roads will occur for three years after use. Ordinary maintenance will be performed when the road is opened for use.

"The Handbook of Forest and Ranch Roads" prepared by Weaver and Hagans (2014) will be used as a guideline for all proposed road construction and improvement projects.

<u>Road Decommissioning:</u> Two types of "at risk" roads have been identified as a priority for decommissioning: temporary or seasonal near-stream roads, and roads on unstable slopes (typically those that traverse headwall swales). As road assessments are conducted, "at risk" roads will be identified and evaluated for decommissioning. Where alternative haul roads exist or can be constructed that replace the need for maintaining "at risk" roads, the "at risk" road will be scheduled for decommissioning. Alternatively, if no alternate access can be identified, then the "at risk" road may be upgraded or temporarily decommissioned.

5.2.3 Road Improvement Monitoring

Effectiveness monitoring to evaluate road upgrades and sediment inputs associated with THPs are conducted annually, in keeping with the Garcia River TMDL Action Plan. Annual monitoring reports are sent to the NCRWQCB every June which lists the sites treated and describes the mitigation employed and whether the mitigation action is working as designed. To the extent possible, all permanent and seasonal roads will be checked for erosion problems after large storm events, and all opened roads will be checked at least once a year for erosion problems. Corrective action will be taken as necessary to maintain crossings in a condition that will not deliver sediments.

Long-term monitoring will consist of mapping and tracking watercourse crossings using GIS, in which each crossing will be mapped with Global Positioning System (GPS) tools and the condition of the crossing shall be noted. Any changes made, and the year they were made, shall also be noted in the GIS database. Over time, a complete inventory of all road watercourse crossings will exist in the GIS database. The data can then be used to detail annual or cumulative sediment reduction activities on the Forest.

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5.3 Riparian Habitat Protection and Restoration Measures

5.3.1 Riparian Habitat Protection

The California FPR and other requirements of the NCRWQCB and CDFW provide extensive and complex protections for watercourses. By most estimations, combined, they are the world's most comprehensive and restrictive regulations governing forestry operations near watercourses. These rules are designed to protect against changes in sediment delivery, shade, large wood recruitment, late seral wildlife habitat, bank stability, and many other issues. The rules were developed in response to major declines in salmonid habitat conditions over the last three decades.

In general, aquatic conditions seem to be slowly recovering from past practices, and current regulatory protective measures should prevent further degradation. However, it is unclear whether aquatic conditions are recovering quickly enough to recover and sustain salmonids, particularly in light of human impacts on ocean conditions. The acceleration of both aquatic and terrestrial restoration measures proposed in this Plan are intended to improve the prospects for the recovery and maintenance of salmonids in the GRF.

The placement of large wood (LWD) in streams is a high priority for salmon habitat restoration. The addition of LWD enhances spawning and rearing habitats by providing cover and refuge from peak winter flows, increasing pool complexity, depth and frequency, and sorting and collecting spawning gravels, all of which will increase the quality and quantity of rearing habitat within the project reach. To date the Fund and TNC have added 435 pieces of LWD to five Class I streams on GRF, totaling 14.5 miles within the reserve. See LWD Map below.

As stated above, improvement of spawning and migration habitat for salmonid species is a key management goal for the Fund and one of the principal motivations for the acquisition of the Forest. Prohibiting development and agricultural uses on the Forest, will preclude the largest possible impacts on water quality. Comprehensive Forest-wide road assessments have been completed to identify and prioritize sites with sediment delivery potential. See Appendix E for a full list of sediment projects that have been implemented. In addition, the following silvicultural practices (discussed previously in Section 5.1.4) also will be implemented to improve water quality:

- Upslope silviculture. Practicing principally uneven-age single-tree selection silviculture to grow and maintain a mature forest across the GRF – with minimal openings – will reduce the potential hydrologic impacts often associated with even-aged management. Studies at Caspar Creek have linked this to temporary increases in peak flows, sediment yields, and ambient temperature (see http://www.fs.fed.us/psw/topics/water/caspar/). Uneven-aged management does, however, require more frequent entries and increased road infrastructure, which is why the next strategy is so important.
- Commitment to improving the road infrastructure including upgrading stream crossings, stabilizing the road running surface, and hydrologically disconnecting the roads from the streams.

Watercourse and Lake Protection Zone Measures

The Watercourse and Lake Protection Zones (WLPZ) and protection measures originally agreed upon by the Fund and TNC in 2006 have in some cases been surpassed by the Anadromous Salmonid Protection (ASP) Rules adopted by the California Board of Forestry in 2009. For example the original IRMP required that all class I and II streams maintain a 25 foot "no harvest" zone adjacent to the watercourse. The ASP Rules require a 30 foot "no harvest" zone adjacent to class I streams and large class II streams. The result of these two separate requirements is a hybrid WLPZ composed of ASP Rules and conservation easement requirements.

In addition to the regulatory requirements outlined below the Ecological Reserve Network encompasses the class I streams within the Fund's ownership of the GRF. Therefore, in addition to the protection measures listed below all class I streams require a 200 foot "no harvest" zone except the Garcia River mainstem, which requires a 300 foot "no harvest" zone.

The Outer Zone, outer 100 feet for class I and outer 200 feet for the Garcia River mainstem, which is located in the Ecological Reserve shall be managed to promote the development of a late seral stage forest consistent with the goals and requirements of the ERN. The Inner Zone of the ERN that overlaps the ASP Rules shall be managed to meet the regulatory requirements of the California Forest Practice Rules and shall be managed to promote the development of a late seral stage forest consistent with the goals and requirements of the ERN.

Class I Watercourses:

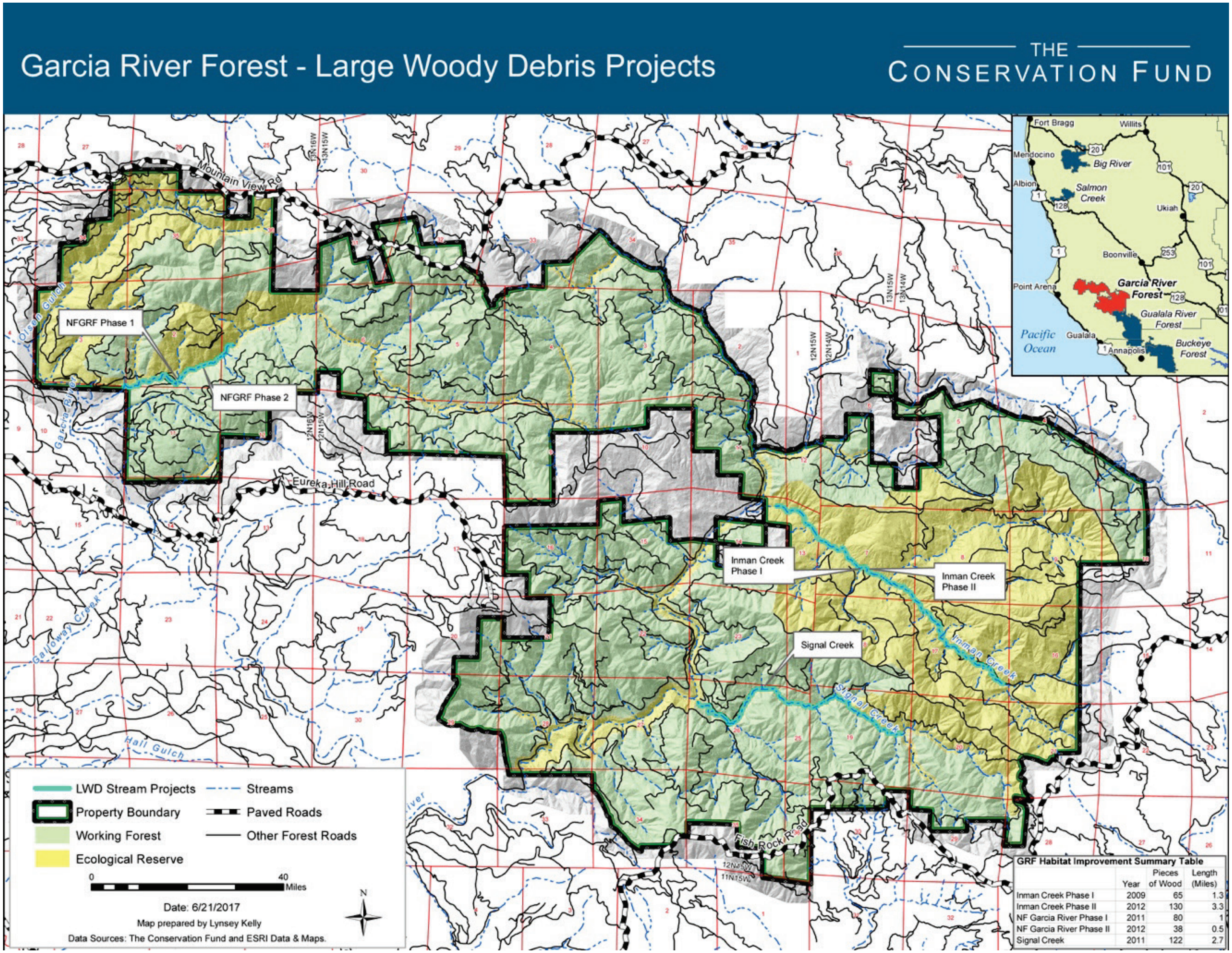
Timber operations within the Class I WLPZ have been designed, and will be conducted to protect, maintain, and contribute to restoration of properly functioning salmonid habitat and listed salmonid species. To achieve this goal, timber operations will:

- Prevent significant sediment load increase to a watercourse system or lake;
- Prevent significant instability of a watercourse channel or of a watercourse or lake bank;
- Prevent significant blockage of any aquatic migratory routes for any life stage of anadromous salmonids or listed species;
- Prevent significant adverse effects to stream flow;
- Protect, maintain, and restore trees (especially conifers), snags, or downed large woody debris that currently, or may in the foreseeable future, provide large woody debris recruitment needed for instream habitat structure and fluvial geomorphic functions;
- Protect, maintain, and restore the quality and quantity of vegetative canopy needed to provide shade to the watercourse or lake to maintain daily and seasonal water temperatures within the preferred range for anadromous salmonids or listed species where they are present or could be restored; and provide a deciduous vegetation component to the riparian zone for aquatic nutrient inputs;
- Prevent significant increases in peak flows or large flood frequency.

The following measures describing Watercourse and Lake Protection were taken directly from the California Forest Practice Rules.

Garcia River Forest - Large Woody Debris Projects

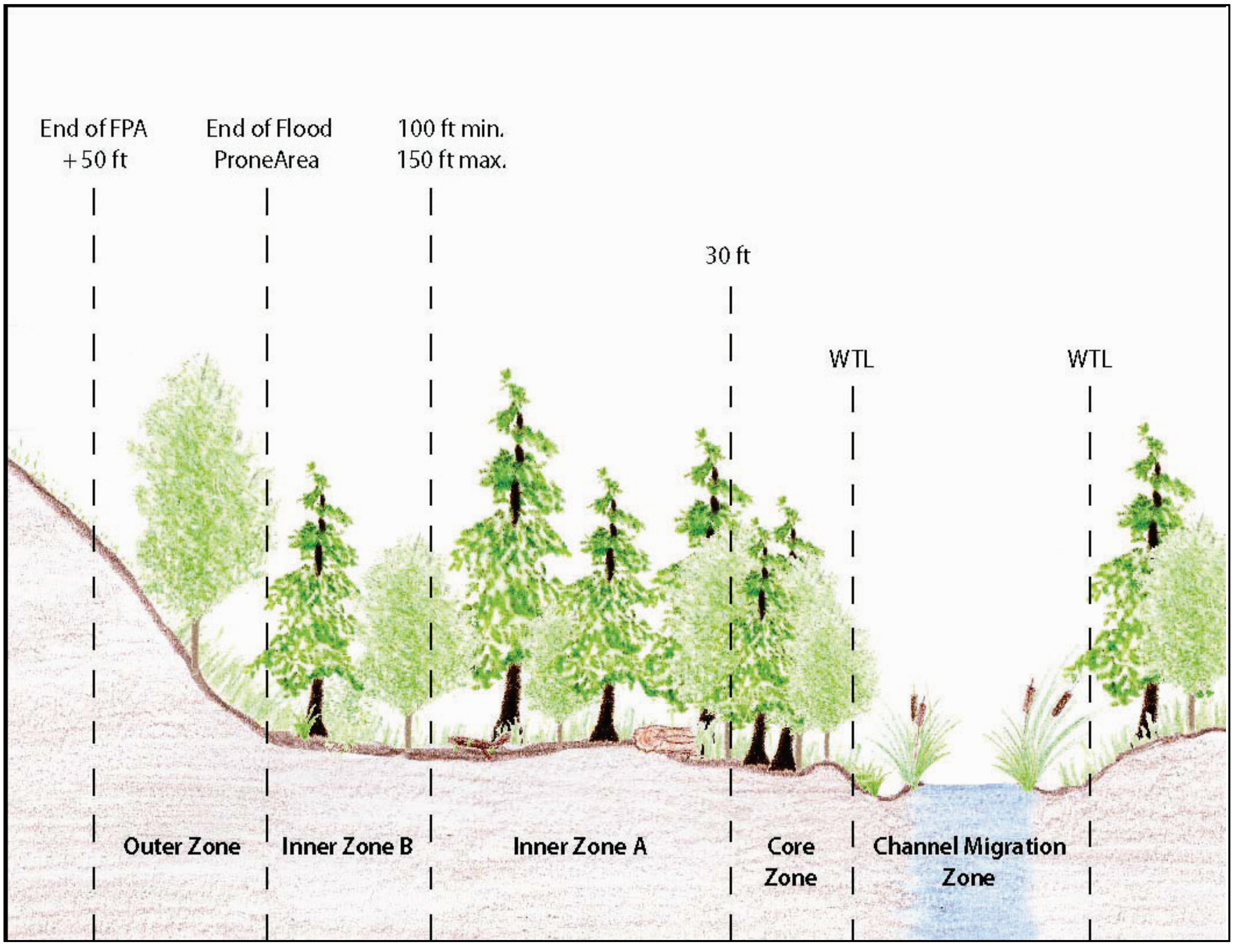
THE CONSERVATION FUND



GRF Habitat Improvement Summary Table

	Year	Pieces of Wood	Length (Miles)
Inman Creek Phase I	2009	65	1.3
Inman Creek Phase II	2012	130	3.3
NF Garcia River Phase I	2011	80	1
NF Garcia River Phase II	2012	38	0.5
Signal Creek	2011	122	2.7

Figure 5-2: Profile View of Class I WLPZ in Flood Prone Areas and Channel Migration Zones (not to scale)



Channel Migration Zone: When a channel migration zone (CMZ) is present upslope of the watercourse transition line (WTL), it is incorporated into the Core Zone. No timber harvesting is proposed in this zone.

Core Zone: The primary objective for this zone is streamside bank protection to promote bank stability, wood recruitment by bank erosion, and canopy retention. Timber operations are generally excluded from this zone and limited to actions which meet the objectives stated above or improve salmonid habitat consistent with 14 California Code of Regulations (CCR) 916.9 subsections (a) and (c). The width of the Core Zone is 30 feet measured from the watercourse transition line or lake transition line. No timber harvesting is proposed within the 30 foot wide core zone.

Inner Zone A: The primary objective for this zone is to develop a large number of trees for large wood recruitment, to provide additional shading, to develop vertical structural diversity, and to provide a variety of species (including hardwoods) for nutrient input. This is accomplished through the establishment of high basal area and canopy retention by retaining or more rapidly growing a sufficient number of large trees. Additional specific objectives include locating large trees retained for wood recruitment nearer to the Core Zone and maintaining or improving salmonid habitat on flood prone areas and CMZs when present. Timber operations within WLPZs are limited to those actions which meet the objectives stated above or to improve salmonid habitat consistent with 14 CCR 916.9 subsection (a) and (c).

The Inner Zone A generally encompasses the portion of the flood prone area from 30 feet beyond the WTL (Core Zone perimeter) up to 150 feet from the WTL. The minimum width of the Inner Zone A shall be the greater of the area from the landward edge of Core Zone to the landward edge of the Inner Zone B or 70 feet. The maximum width is 120 feet. **Within Inner Zone A, harvesting is subject to the following additional restrictions:**

- The silvicultural method in this area is single tree selection.
- The post-harvest stand shall have a minimum 80% overstory canopy cover.
- The post-harvest canopy may be composed of both conifers and hardwood species and shall have at least 25% overstory conifer canopy.
- The post-harvest stand shall retain the 13 largest conifer trees (live or dead) on each acre of the area that encompasses the Core and Inner Zones.
- Large trees retained shall be the most conducive to recruitment to provide for the beneficial functions of riparian zones (e.g. trees that lean towards the channel, have an unimpeded fall path toward the watercourse, are in an advanced state of decay, are located on unstable areas or downslope of such an unstable areas, or have undermined roots) are to be given priority to be retained as future recruitment trees.
- Harvesting is planned so the quadratic mean diameter (QMD) of the timber stand, within the flood prone area, will increase.

When no floodplain or Channel Migration Zone is present the maximum width of the WLPZ is 100 feet, the harvest restrictions in the core zone and inner zone A apply.

<u>Inner Zone B:</u> The Inner Zone B is applicable when there are very wide flood prone areas. The Inner Zone B encompasses the portion of the flood prone area from the landward edge of the Inner Zone A (i.e.150 feet from the WTL) to the landward edge of the flood prone area. The landward edge of the Inner Zone B (i.e. the landward perimeter of the flood prone area) shall be established in accordance with flood prone area. Timber operations are permitted in this zone when conducted to meet the goals of this section, including those for the Inner Zone as follows: The primary objective for this zone is to develop a large number of trees for large wood recruitment, to provide additional shading, to develop vertical structural diversity, and to provide a variety of species (including hardwoods) for nutrient input. This is accomplished through the establishment of high basal area and canopy retention by retaining or more rapidly growing a sufficient number of large trees. Additional specific objectives include locating large trees retained for wood recruitment nearer to the Core Zone and maintaining or improving salmonid habitat on flood prone areas and CMZs when present. Timber operations within WLPZs are limited to those actions which meet the objectives stated above.

Within Inner Zone B harvesting is subject to the following additional restrictions:

- The silvicultural method in this area is single tree selection.
- The post harvest stand will retain the 13 largest conifer trees (live or dead) on each acre of the Core and Inner Zones.
- Post-harvest stand shall have a minimum 50% overstory canopy cover.

- The post-harvest canopy may be composed of both conifers and hardwood species and will have at least 25% overstory conifer canopy.
- Harvesting is planned so that the QMD of the timber stand, within the flood prone area, will increase.

Outer Zone: The Garcia SSMP requires a 200-foot Riparian Management Zone (RMZ) for Class I streams, therefore an outer zone between 50 and 100 feet shall be applied at the outer edge of inner zone A on the ground in which the silvicultural systems for harvesting are limited to the use of commercial thinning or single tree selection, modified to meet the following requirements:

- Post-harvest stand shall have a minimum 50% overstory canopy cover. The post-harvest canopy may be composed of both conifers and hardwood species.
- Priority shall be given to retain wind firm trees.

Preferred Management Practices in the Inner and Outer Zones: When timber operations are considered pursuant to 14 CCR 916.3 [936.3, 956.3], subsection (c) and 916.4 [936.4, 956.4], subsection (d), the following Preferred Management Practices should be considered for inclusion in the Plan by the Registered Professional Forester (RPF) and by the Director:

- Pre-flagging or marking of any skid trails before the preharvest inspection;
- Heavy equipment should be limited to slopes less than 35% with low or moderate erosion hazard rating (EHR);
- Use feller bunchers or hydraulic heel boom loaders which do not drag/skid logs through the zone;
- Minimize turning of heavy equipment, which would result in increased depth of ground surface depressions; and
- Use mechanized harvesting equipment, which delimb harvested trees on pathway, over which heavy equipment would travel.

Table 5-2: Summary of Watercourse and Lake Protection Zone and Equipment Limitation Zone Widths

Slope Class	Class II-S WLPZ Zone Width (feet) Core/Inner Zones	Class III ELZ Width (feet)	Wet Area ELZ Width (feet)
<10%	0 / 50	30	30
10 - 30%	15 / 35	30	30
30 - 50%	15 / 60	50	50
>50%	15 / 85	50	50

Class II Watercourses: All Class II WLPZs shall be composed of two zones regardless of the watercourse type: a Core Zone and an Inner Zone. The Core Zone is nearest to the water; the Inner Zone is contiguous to the Core Zone and is furthest from the water. The width of the Core and Inner Zones vary depending on the following three factors: a) side slope steepness in the WLPZ, b) whether the watercourse is a Class II-S or Class II-L watercourse type, and c) whether the watercourse is within a watershed in the coastal anadromy zone or outside the coastal anadromy zone (all watercourses within the Fund's ownership are within the coastal anadromy zone).

Class II Large:

Core Zone: 30 feet in which no harvest may occur.

Inner Zone: The widths of the Inner Zone are 70 feet and adjacent to the core zone forming a total zone of 100 feet for all Class II-L watercourses. Harvesting within the inner zone is allowed providing the 13 largest trees per acre are retained and at least 80% canopy is retained. Silvicultural systems for harvesting are limited to the use of commercial thinning or single tree selection.

Class II Standard:

Core Zone: Variable zone (0-15 feet) based on slope in which no harvesting can occur.

Inner Zone: Variable zone (35-85 feet) based on slope at least 50% of the total canopy covering the ground shall be left in a well distributed multi-storied stand configuration composed of a diversity of species similar to that found before the start of operations. The residual overstory canopy shall be composed of at least 25% of the existing overstory conifers.

Class III Watercourses: Using the variable width Equipment Limitation Zone (ELZ) defined by the FPR, where there are no overstory retention requirements under the FPR, the Fund will retain at least 50 percent canopy and a minimum of 25 percent overstory conifer. [Note: conformance with all canopy requirements will be measured as an average across not less than a 200-foot lineal WLPZ segment—the same as the FPR.]

5.3.2 Aquatic Habitat Restoration

Aquatic habitat degradation has resulted from increased bedload and excess stream siltation caused by erosion, and increased water temperature caused by pool filling and a reduction in riparian vegetation. Aquatic habitat restoration includes reducing sediment inputs and increasing shade canopy as described in the previous sections. Baseline data that will be used to measure anticipated improvements in aquatic habitat include stream habitat surveys and spawning surveys conducted by CDFW.

Due to the complexity of the stream environment and difficulty of working directly in stream channels, aquatic habitat restoration is expected to progress naturally as stored sediment loads are transported downstream and potential sediment inputs are removed or mitigated. It is anticipated that the riparian management strategy described herein will result in increased stream shading over time and reduced water temperature. Direct instream habitat enhancement may occur if and when logical opportunities present themselves and stream survey data indicates that direct action is warranted.

The primary instream restoration activity will be the introduction of LWD in small order Class I channels where the likelihood of success is high. The placement of large wood (LWD) in streams is a high priority for salmon habitat restoration. The addition of LWD enhances spawning and rearing habitats by providing cover and refuge from peak winter flows, increasing pool complexity, depth and frequency, and sorting and collecting spawning gravels, all of which will increase the quality and quantity of rearing habitat within the project reach. To date the Fund and TNC have added 435 pieces of LWD to five Class I streams on GRF, totaling 14.5 miles within the reserve. See LWD Map.

Gravel extraction can be beneficial in some systems with high levels of gravel aggradation because it can promote gravel movement and pool development in some cases. However, because of the potential technical and regulatory challenges, instream gravel removal is likely to be a low priority.

5.3.3 Aquatic Habitat Restoration Monitoring

In 2006 staff from The Nature Conservancy and the NCRWQCB began collaborating to develop and implement a new water quality monitoring program to identify the current status of the watershed and track trajectory of its condition over time. In 2007, TNC and the NCRWQCB embarked on the first year of the Garcia River Aquatic Monitoring Program. The Garcia River Aquatic Monitoring Program was developed by TNC and NCRWQCB staff to provide context to the watershed's condition and history, as well as to identify the current physical, chemical and biological status of the watershed in its progression towards recovery. The Garcia River Aquatic Monitoring Program is based on the U.S. Environmental Protection Agency's (U.S. EPA) Environmental Monitoring and Assessment Program (EMAP-West) and elements of California's Surface Water Ambient Monitoring Program (SWAMP). The EMAP-West and SWAMP protocols provide standardized operating procedures to collect a large amount of monitoring information regarding the physical, biological, and water chemistry conditions of a surveyed stream reach. The EMAP approach (through spatially balanced probability-based sampling design – a.k.a. stratified random design), provides a statistically-valid basis for determining aquatic ecological baseline conditions, and for tracking trends over time.

The initial reporting on the results of the monitoring are currently in draft form and will be incorporated by appendix into this IRMP when they become available.

The Fund expects positive changes from the road and stream practices mentioned in the previous sections. However, instream habitat is slow to respond to even the best intended management practices. Therefore, measuring stream habitat more than once every ten years is generally not recommended.

5.4 Invasive Weed Management

Many of the more conspicuous exotics are associated with the roads that traverse the Forest and represent disturbed habitat. Two species, pampas/jubata grass (*Cortaderia jubata*) and French Broom (*Genista monspessulana*) are on the California Invasive Plant Council (Cal-IPC) List A-1 (Most Invasive Wildland Pest Plants: Widespread) and have been observed along the roadways. These species, once established, have the most potential to displace native species. The California Invasive Plant Council (Cal-IPC) has rated these species as "high" because they "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. Cal-IPC rated distaff thistle (*Carthamus lanatus*) as a "Red Alert" species—a species with the potential to become widely invasive in the state or has been recently reported as expanding in their range within California (Pirosko, 2003). Red Alert species have a reproductive biology given to high rates of dispersal but are not yet widespread in distribution in the county. Mendocino County conducts an eradication program for distaff thistle removal.

The Fund may employ chemical and mechanical control techniques to slow and possibly reverse the spread of invasive species, with a preference for mechanical (including manual) control measures where they will be effective. Only licensed and insured contractors with a good track record for safety and compliance may apply herbicides. All herbicide application must be in conformance with label guidelines and applicable laws.

The highest priority for treatment will be areas planned for upcoming timber harvest or road improvement projects so as to discourage the further spread of invasives. If done prior to flowering, the physical removal of plants during road grading can reduce the spread of invasive species. However, this generally does not permanently remove the plant from a site once established, and subsequent treatments to reduce the population will be required. General road maintenance such as grading and roadside brushing will be the second line of defense to prevent invasives from re-invading a site once the initial treatment has occurred.

Addressing the invasives promptly is a high priority; ultimately, forest management which promotes dense forest cover to shade out invasive plants like jubata grass and broom will have the greatest and most long-lasting impact on controlling invasive species.

5.4.1 Invasive Weed Monitoring

Ongoing monitoring will focus on the distribution of invasive plants and the effectiveness of treatment efforts. Project botanists and field foresters will continue to identify and record locations of invasives. Additional evaluation projects will monitor the effectiveness of treatment efforts by long-term survivorship of individual populations, similar to the monitoring occurring along Olsen Gulch Road on the GRF (Heise and Hulse-Stephens, 2008).

5.5 Role of Forests and the Atmosphere

A rapidly growing forest can absorb a remarkable amount of carbon dioxide, a greenhouse gas and the driver of global climate change. As a result, how forests are managed has a significant effect on our atmosphere.

The latest Intergovernmental Panel on Climate Change (IPCC) report estimated that 18 percent (and increasing) of global greenhouse gas emissions are the result of deforestation and subsequent release of carbon to the atmosphere; the report recognizes financial incentives to reduce deforestation and to maintain and manage forests as one of only a handful of policy measures proven to be effective at reducing emissions (IPCC, 2007). The Redwood Region is an important and impactful location to promote forest conservation and growth because the forests of the North Coast have an almost unparalleled ability to grow and store carbon dioxide. The careful management of these redwood forest “carbon sponges” can play a role in reducing net greenhouse gas emissions.

As a conserved working forest, the GRF can have a positive climactic impact on several fronts.

In addition to carbon storage in standing forests, the use of wood building materials has a lower carbon footprint compared to concrete or steel (because of the much greater amount of energy utilized in manufacturing and distributing metal and masonry and because wood products act as carbon reservoirs). Thus, increasing the use of California’s native species as lumber and long-lived wood products can also result in decreased greenhouse gas emissions.

5.5.1 Climate Action Reserve

Due to the Fund’s recognition of the need to take action on climate change, the GRF was registered and verified as an IFM Project through CAR. In 2015 the project was transitioned to an IFM project through the California Air Resources Board (ARB) compliance market. Verification requires landowners model the long-term carbon storage of their forests and report emission reductions resulting from storing more carbon than required by law and common practice. This requirement necessitates a verifiable field inventory system that generates statistically reliable estimates of carbon within the forest (including living trees, snags and downed logs, shrubs, and below-ground carbon). General information on the ARB

Forest Project Protocol can be found at https://www.arb.ca.gov/cc/capandtrade/offsets/offsets.htm Specific project details are available at https://www.climateactionreserve.org.

5.5.2 Preparing for Likely Climate Change

Planning for the future of the Forest must include a realistic assessment of the likely implications of climate change on management objectives and strategies. A recent study on the implications of expected climate change on California's native plants found, with the exception of some particularly sensitive oak species, the Redwood Region is not likely to experience significant losses in plant diversity (Loarie et al., 2008).

While details of the future climate cannot be known with certainty, the general indication is summers will get hotter (hence more arid), winter storms will likely increase in severity, and there will be significant changes in species' ranges (some expanding, some contracting, for both plants and animals). Some practical conclusions can be drawn relative to management of the Forest in anticipation of climate change:

- Managing for ecological resiliency will become even more important— especially maintaining the full range of natural diversity and ecological succession processes. Practically speaking, Douglas-fir may become a more significant component of the Forest, and efforts to exclude or discourage it from redwood stands (as was common in recent history) would be unwise. Establishing redwoods in large openings, especially south-facing slopes, will likely become more difficult. Even on sites with moderate moisture, retaining summer soil moisture will be important, in turn increasing the importance of maintaining shade, downed logs, and soil nutrients. Silvicultural practices on the Forest, therefore, should continue to be focused on maintaining mixed species stands that are well-stocked and maintained through selection silviculture that retains wildlife habitat features.
- Invasive species will become more prevalent, especially those that originate from warmer climates. Monitoring and treatment of invasive plants and animals is already part of this Plan, but climate change will increase the importance and challenge of this responsibility. It also means greater emphasis should be placed on prevention of non-native species introductions and effective early control efforts, since those approaches are considerably more cost-efficient than later eradication efforts. Control of jubata (pampas) grass, broom, and other weeds will continue to be our highest priorities.
- An expected increase in the severity of winter storms only increases the importance of storm-proofing the road system, an effort already well underway.
- If severity of winter storms increases, and/or fewer storms come in more concentrated rainfall events, providing winter-time flow refuge habitat for juvenile salmonids will become more important. Adding LWD is one important way to reconnect stream channels to their floodplains and provide flow refuge habitat.
- Fires, both natural and human-caused, will likely increase in frequency and severity. The Fund will need to maintain the capacity and expertise gained during previous fire seasons.

6. COMMUNITY USE AND INVOLVEMENT

The Fund will provide a range of opportunities for community use and involvement consistent with the protection of natural resources, long-term restoration and enhancement, and active forest management.

To foster community involvement and support, the Fund provides guided tours of areas intended for timber harvests, road improvement and restoration projects, and native plant interpretive walks, as well as tours tailored for youth education. These programs familiarize the public with sustainable management methods and goals and build community partnerships. The Fund has developed a program for unsupervised public access.

6.1 History of Community Use and Involvement

Beginning in the 1850s and continuing until purchase by the Fund, the GRF was managed as private industrial timberland. The landowner officially had “no trespassing” policies, including warnings on forest boundaries and security patrols, but trespass was difficult to prevent and a range of unauthorized recreational and illegal activities occurred on the Forest, including hunting and dirt bike/off-highway vehicle use. Trespass marijuana growers cause pollution through the use of unauthorized herbicides and insecticides, break gates and locks to gain access, can be a safety concern for field personnel and other users, and can divert water for irrigation from important salmon-bearing streams. Motorcycle usage can tear up the roads, causing erosion and potentially damaging streams. The dumping of trash is unsightly, a pollution hazard, and costly to remove. These activities can be disruptive to the Forest’s ecology but are typically difficult to monitor and prevent. When these activities are observed, they will be reported to the proper authorities. Unauthorized activities will be discouraged, but they are an ongoing problem and unrealistic to expect they will ever be completely absent from the Forest.

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6.2 Goals and Objectives for Community Use and Involvement

The Fund intends to provide a range of opportunities for community use and involvement that can be reasonably managed in a manner consistent with the protection of natural resources, long-term restoration and enhancement, and active forest management. These opportunities range from research, education, and demonstrations to participation in restoration activities. The following are the Fund's guidelines for community use and involvement.

- Be a good neighbor by holding to the highest professional standards, cooperating with other neighboring landowners, discouraging illegal trash dumping, patrolling for illegal activities and providing assistance with community-based projects.
- Provide reasonable dispute management. Should a dispute arise with a local citizen, neighbor, partner organization, current or potential contractor, or other interested entity, the Fund will first seek to resolve the dispute through open communication, prior to more formal dispute resolution through mediation or litigation.
- Provide THP tours either before or shortly after submission of harvest plans to CAL FIRE, and again following completion of the operation. Fund staff will actively seek community review of its operations and programs and will be responsive to questions or concerns raised by the local community. THP Summaries will be provided to facilitate community understanding.

- Provide opportunities for on-site demonstrations of watershed restoration projects, sustainable forest management and other best management practices, public participation in research opportunities, educational tours, and restoration workdays.
- Build partnerships with local organizations that are mutually beneficial.

6.3 Recreational Access Activities and Policies

6.3.1 Recreational Uses

Permission for additional recreational activities may be expanded on a case-by-case basis. Potential expanded uses may include equestrian, mountain biking, swimming and wading, hunting, fishing and group events. Evaluations of requests will be based on safety, potential resource damage, community benefit and administrative impact.

6.3.2 Unauthorized Activities

The Fund conducts frequent security patrols of the Forest to deter unauthorized access and illegal uses. These illegal activities include marijuana cultivation, trash dumping, poaching and off-highway vehicle use. Violators may be prosecuted.

6.4 Outreach Activities

The Fund will conduct guided tours of timber harvest areas, road improvements, restoration projects, conduct native plant interpretive walks, and youth educational trips. These events familiarize the public with sustainable management methods and goals and build community partnerships. Tours of THPs serve to demonstrate to the public the planning and process behind managing the Forest sustainably and to solicit feedback on management activities. The Fund has benefited in the past from generous time donations by local naturalists that have resulted in tours focused on such topics as native plants, giving participants a solid connection with the natural world.

Public tours of road and other infrastructure improvements offer opportunities to demonstrate and share information regarding the methods and steps the Fund is taking to improve the ecological conditions on the Forest. The Fund welcomes and appreciates community participation in restoration projects on the Forest.

6.5 Monitoring Strategies for Community Involvement

The goal of monitoring is to provide the Fund with the necessary background and feedback to appropriately manage the natural and cultural resources on the GRF. Monitoring will be conducted continually, analyzed annually and incorporated into policies and annual program reviews.

Glossary

ANADROMOUS: fish that leave freshwater and migrate to the ocean to mature then return to freshwater to spawn (e.g. salmon, steelhead)

BF: Board feet (a measure of wood volume 1"x12"x12")

BANKFULL WIDTH: width of the channel at the point at which overbank flooding begins

BASAL AREA: area in square feet of all conifer stems on an acre

BASIN: see “watershed”

BASIN PLAN: the Water Quality Control Plan for the North Coast Region

BLUE LINE STREAM: a stream that appears as a broken or solid blue line (or a purple line) on a USGS topographic map

BOLE: trunk of a merchantable-sized tree

CALWATER: set of standardized watershed boundaries for California

CANOPY: overhead branches and leaves of streamside vegetation

CANOPY COVER: vegetation that projects over a stream

CANOPY DENSITY: percentage of the sky above the stream screened by the canopy of plants

CLASS I STREAM: watercourse with fish present

CLASS II STREAM: watercourse providing aquatic habitat for non-fish species

CLASS III STREAM: watercourse with no aquatic life present, but capable of sediment transport

COBBLE: stream substrate particles between 2.5 - 10 inches (64 - 256 mm) in diameter

CONIFER: softwood, cone-bearing tree species suitable for commercial timber production (e.g. redwood, Douglas-fir)

CONIFEROUS: any of various mostly needle-leaved or scale-leaved, chiefly evergreen, cone-bearing gymnospermous trees or shrubs such as pines, spruces, and firs

CONSERVATION EASEMENT: a legal agreement between a landowner and a qualified conservation organization that restricts usage rights of the Forest, such as real estate development, commercial, and industrial uses

CORD: measure of fuel-wood volume (a stacked cord occupies 128 cubic feet [4'x4'x8'] and contains about 85 cubic feet of solid wood)

COVER: anything providing protection from predators or ameliorating adverse conditions of streamflow and/or seasonal changes in metabolic costs, such as instream cover, turbulence, and/or overhead cover, for the purpose of escape, feeding, hiding, or resting

CROP TREE: a tree that has been selected for future timber harvest on which we will focus growth and subsequent increases in volume and value

CRYPTOS (Cooperative Redwood Yield Project Timber Output Simulator): a computer program that can model stand growth in redwood forests, including the effects of partial harvests

CWHR (California Wildlife Habitat Relationships): a system developed by CDFW to model the interactions between wildlife species and their habitats

DBH: "diameter at breast height" (tree diameter in inches, measured outside bark 4 1/2' above ground level)

DEBRIS: material scattered about or accumulated by either natural processes or human influences

DEBRIS JAM: log jam, or an accumulation of logs and other organic debris

DEBRIS LOADING: quantity of debris located within a specific reach of stream channel, due to natural processes or human activities

DEPOSITION: the settlement or accumulation of material out of the water column and onto the streambed, occurring when the energy of flowing water is unable to support the load of suspended sediment

DISSOLVED OXYGEN (DO): concentration of oxygen dissolved in water, expressed in mg/l or as percent saturation, where saturation is the maximum amount of oxygen that can theoretically be dissolved in water at a given altitude and temperature

EMBEDDEDNESS: the degree that larger particles (boulders, rubble, or gravel) are surrounded or covered by fine sediment, usually measured in classes according to percentage of coverage of larger particles by fine sediments

EROSION: the group of natural processes, including weathering, dissolution, abrasion, corrosion, and transportation, by which material is worn away from the earth's surface

FILL: a) the localized deposition of material eroded and transported from other areas, resulting in a change in the bed elevation; b) the deliberate placement of (generally) inorganic materials in a stream, usually along the bank

FINE SEDIMENT: fine-grained particles in stream banks and substrate defined by diameter, varying downward from 0.24 inch (6 millimeters)

FISH HABITAT: the aquatic environment and the immediately surrounding terrestrial environment that, combined, afford the necessary biological and physical support systems required by fish species during various life history stages

FLUVIAL: relating to or produced by a river or the action of a river, or situated in or near a river or stream

GEOGRAPHIC INFORMATION SYSTEM (GIS): A computer system for capturing, storing, checking, integrating, manipulating, analyzing, and displaying data related to positions on the Earth's surface. Typically, a GIS is used for handling maps of one kind or another. These might be represented as several different layers where each layer holds data about a particular kind of feature (e.g. roads). Each feature is linked to a position on the graphical image of a map.

GRADIENT: the slope of a streambed or hillside (for streams, gradient is quantified as the vertical distance of descent over the horizontal distance the stream travels)

GRAVEL: substrate particle size between 0.08 - 2.5 inches (2 - 64 mm) in diameter

GULLY: deep ditch or channel cut in the earth by running water after a prolonged downpour

HABITAT: the place where a population lives and its surroundings, both living and nonliving; includes the provision of life requirements such as food and shelter

HABITAT TYPE: a land or aquatic unit, consisting of an aggregation of habitats having equivalent structure, function, and responses to disturbance

HARDWOOD: non-conifer trees (e.g. tanoak, madrone, live oak, black and white oaks)

HERBACEOUS: non-woody seed plant (e.g. grass)

HYDROGRAPHIC UNIT: a watershed designation at the level below Hydrologic Region and above Hydrologic Sub-Area

INDICATORS: measurable reflections of conservation goals such as structure, composition, interactions, and abiotic and biotic processes; these must be maintained to ensure the long-term viability of conservation goals

INGROWTH: volume increase due to pre-merchantable timber attaining size where board foot volume can now be measured (e.g. 10-12" DBH)

INSTREAM COVER: areas of shelter in a stream channel that provide aquatic organisms protection from predators or competitors and/or a place in which to rest and conserve energy due to a reduction in the force of the current

INTERMITTENT STREAM: a seasonal stream in contact with the ground water table that flows only at certain times of the year when the ground water table is high and/or when it receives water from springs or from some surface source such as melting snow in mountainous areas. It ceases to flow above the streambed when losses from evaporation exceed the available stream flow.

LARGE WOODY DEBRIS (LWD): a large piece of relatively stable woody material having a diameter greater than 12 inches (30 centimeters) and a length greater than six feet (two meters) that intrudes into the stream channel. Large organic debris.

LATE SERAL, LATE SUCCESSIONAL: having biological characteristics and functions similar to old growth forests

LIMITING FACTOR: environmental factor that limits the growth or activities of an organism or that restricts the size of a population or its geographical range

LOP: to sever branches and trunks of cut trees so that resulting slash will lie close to the ground

MAINSTEM: the principal, largest, or dominating stream or channel of any given area or drainage system

MEAN ANNUAL INCREMENT (MAI): The average annual growth rate of a forest stand, determined by dividing stand volume (including partial harvests) by stand age. Culmination of mean annual increment occurs at the age when MAI is greatest, and determines the optimal rotation age for maximizing long term yields in even-aged management.

MELANGE: a mix of sheared shale with blocks of other rock imbedded within.

MERCHANTABLE: sound conifer trees at least 10" in diameter

MERCHANTABLE SPECIES: commercial conifer timber species being purchased by local sawmills, including redwood, Douglas-fir, grand fir, western hemlock, sitka spruce, and bishop pine

NET VOLUME: tree volume remaining after deducting unmerchantable and cull material

OLD GROWTH: see attached Appendix G for detailed definitions

PLUGS: seedling stock grown in nursery styrofoam containers.

POLES: trees 4"-11" DBH

PRE COMMERCIAL THINNING: cutting in a pre-merchantable conifer stand (2-10"DBH) to reduce unwanted trees and improve growth on remaining trees

REDD: a spawning nest made by a fish, especially a salmon or trout

REGENERATION: renewal of a tree crop, either by planting or natural seeding

RELEASE: freeing a tree (usually a conifer) from competition by cutting growth (usually a hardwood) surrounding or overtopping it

RESIDUAL GROWTH: mature trees (often of lower quality) left after original logging

RIFFLE: a shallow area extending across a streambed, over which water rushes quickly and is broken into waves by obstructions under the water

RILL: an erosion channel that typically forms where rainfall and surface runoff is concentrated on slopes. If the channel is larger than one square foot in size, it is called a gully.

RIPARIAN: pertaining to anything connected with or immediately adjacent to the banks of a stream or other body of water

RIPARIAN AREA: the area between a stream or other body of water and the adjacent upland identified by soil characteristics and distinctive vegetation. It includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation.

RIPARIAN VEGETATION: vegetation growing on or near the banks of a stream or other body of water on soils that exhibit some wetness characteristics during some portion of the growing season

RUBBLE: stream substrate particles between 2.5 and 10 inches (64 and 256 millimeters) in diameter

SALMONID: fish of the family *Salmonidae*, including salmon, trout, chars, whitefish, ciscoes, and grayling

SAPLINGS: trees 1"-4" DBH

SCOUR: localized removal of material from the stream bed by flowing water – the opposite of fill

SECOND GROWTH TREES: established as seedlings after original old-growth logging (also called young-growth)

SEDIMENT: fragmented material that originates from weathering of rocks and decomposition of organic material that is transported by, suspended in, and eventually deposited by water or air, or is accumulated in beds by other natural phenomena

SEEDLINGS: trees less than 1" DBH

SERAL STAGES: the series of relatively transitory plant communities that develop during ecological succession from bare ground to the climax stage

SILVICULTURE: the care and cultivation of forest trees; forestry

SITE CLASS, SITE INDEX: When used in relation to stocking regulations, it means one of the site classes or indexes listed in Forest Practice Rules 14 CCR 1060. When used in relation to growth modeling, it usually refers to the site system developed by Krumland and Wensel for the CRYPTOS growth simulator.

SITE INDEX: productive capacity of an area to grow trees, based on height of dominant trees at given age; often expressed as a numeral from I (very good site) to V (poor site)

SKID TRAIL: temporary road for tractor/skidder travel to logging landing

SLASH: branches and other residue left on a forest floor after the cutting of timber

SMOLT: juvenile salmonid one or more years old that has undergone physiological changes to cope with a marine environment, the seaward migration stage of an anadromous salmonid

SNAG: dead standing tree

SPAWNING: to produce or deposit eggs

STAND TABLE: graph which shows the number of trees of each diameter class per acre

STAND: tree community sharing characteristics which can be silviculturally managed as a unit

STOCKING: number, or density, of trees in a given area

STREAM CORRIDOR: A stream corridor is usually defined by geomorphic formation, with the corridor occupying the continuous low profile of the valley. The corridor contains a perennial, intermittent, or ephemeral stream and adjacent vegetative fringe.

STUMPAGE: net value of standing timber to owner, exclusive of logging or trucking costs

SUBSTRATE: material (silt, sand, gravel, cobble, etc.) that forms a stream or lakebed

SUSTAINABLE: "Development or resource use that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland 1987)

SUSTAINED YIELD PLAN: yield that a forest can continually produce at a given intensity of management

THALWEG: the line connecting the lowest or deepest points along a streambed

THIN FROM BELOW: selective removal of intermediate and/or suppressed conifers from the understory to allow more space for remaining trees

THRIFTY: describes a healthy and fast-growing tree

UNDERCUT BANK: a bank that has had its base cut away by the water action along man-made and natural overhangs in the stream

V*: measures of percent sediment filling of a stream pool with deposits such as silt, sand, and gravel compared to the total volume

VEXAR: plastic mesh tube used to protect young trees from animal browsing

WATERSHED: total land area draining to any point in a stream, as measured on a map, aerial photograph or other horizontal plane (also called catchment area, watershed, and basin)

WATERSHEDS WITH THREATENED OR IMPAIRED VALUES: any planning watershed where populations of anadromous salmonids that are listed as threatened, endangered, or candidate under the State or Federal Endangered Species Acts with their implementing regulations, are currently present or can be restored

WETLAND: an area subjected to periodic inundation, usually with soil and vegetative characteristics that separate it from adjoining non-inundated areas

WHITE WOODS: grand fir and hemlock.

WORKING FOREST: forest managed for or including timber production

YARDER: logging machine which uses a suspended cable to lift logs

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APPENDIX A

SOIL TYPES AND DESCRIPTIONS

Descriptions from Rittiman, C, and T. Thorson, 2002. *Soil Survey of Mendocino County, California, Western Part.* Natural Resources Conservation Service. Available online: http://www.ca.nrcs.usda.gov/mlra02/wmendo/

I. Primary Timber Soils

Yellowhound-Kibesillah complex (235, 236, 237) 9,982 acres.
The soil phase 235 occurs on slopes 50 to 75%, phase 236 occurs on slopes 9 to 30%, and phase 237 occurs on slopes 30 to 50%. This map unit is on hills and mountains. The vegetation is mainly Douglas-fir, redwood, and tanoak. Elevation ranges from 200 to 2,000 feet.

This unit is about 45 percent Yellowhound gravelly loam and 35 percent Kibesillah very gravelly loam. The Yellowhound and Kibesillah soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included with these soils in mapping are small areas of Ornbaun and Zeni soils and small areas of soils that have been drastically altered by logging activities. Also included are small areas that have slopes of 30 to 50 percent or 75 to 99 percent. Included areas make up about 20 percent of the total acreage of the unit. The percentage varies from one area to another.

The Yellowhound soil is deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1 inch thick. Permeability is moderate in the Yellowhound soil. Available water capacity is low. The effective rooting depth is limited by bedrock at a depth of 40 to 60 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

The Kibesillah soil is moderately deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1/2 inch thick. Permeability is moderate in the Kibesillah soil. Available water capacity is very low. The effective rooting depth is limited by bedrock at a depth of 20 to 40 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

This unit is used for timber production or as watershed.

Douglas-fir, redwood, and tanoak are the main tree species on this unit. Sugar pine commonly occurs on this unit in the southern part of the survey area. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 140 on the Yellowhound soil and 109 on the Kibesillah soil. The potential annual production from a fully stocked stand of Douglas-fir is 630 board feet per acre on the Yellowhound soil and 335 board feet per acre on the Kibesillah soil. On the basis of a 100-year site curve, the mean site index for redwood is 135 on the Yellowhound soil and 109 on the Kibesillah soil. Trees of limited extent include Pacific madrone and canyon live oak.

The main limitations affecting the harvesting of timber are the slope and the hazard of erosion. When timber is harvested, the slope limits the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally cause less disturbance of the soil. Revegetation of exposed subsoil is difficult on these soils; however, it generally is not needed for control of surface erosion because of the large amount of coarse fragments. Roads may fail and landslides may occur following deep soil disturbance in the steeper areas. Rock for construction of roads generally is available in areas of this unit. Rocks and loose soil material may slide onto roads. This hazard increases the need for road maintenance.

Seedling establishment and plant competition are concerns affecting the production of timber. The droughtiness of the upper 24 inches reduces the seedling survival rate, especially on south- and southwest-facing slopes. Movement of loose surface material can also reduce the seedling survival rate. Reforestation can be accomplished by planting Douglas-fir and redwood seedlings on the Yellowhound soil and planting Douglas-fir seedlings on the Kibesillah soil. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs infrequently. Redwood can regenerate by sprouting after cutting. These sprouts seldom provide optimum stocking. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings.

Among the common forest understory plants are buckbrush, blueblossom ceanothus, tanoak, and California huckleberry. Canyon live oak occurs primarily on south-facing slopes.

Woodin-Yellowhound complex (231, 232) 4,872 acres
The soil phase 231 occurs on slopes 50 to 50%, while phase 232 occurs on slopes 50 to 75 %. This map unit is on hills and mountains. The vegetation is mainly Douglas-fir and tanoak on the Woodin soil and Douglas-fir and redwood on the Yellowhound soil. Elevation ranges from 600 to 2,500 feet.

This unit is about 50 percent Woodin extremely gravelly sandy loam and 25 percent Yellowhound gravelly loam. The Woodin and Yellowhound soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used. Included with these soils in mapping are small areas of Maymen, Ornbaun, Zeni, Kibesillah, and Pardaloe soils and small areas of soils that have been altered by skid trails, landings, and roads.

The Woodin soil is moderately deep to bedrock and is well drained. It formed in material derived from sandstone. The surface layer is very dark brown extremely gravelly sandy loam about 6 inches thick. Permeability is moderate in the Woodin soil. Available water capacity is very low. The effective rooting depth is limited by bedrock at a depth of 20 to 40 inches. Surface runoff is rapid, and the hazard of water erosion is severe if the surface is left bare.

The Yellowhound soil is deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1 inch thick. Permeability is moderate in the Yellowhound soil. Available water capacity is low. The effective rooting depth is limited by bedrock at a depth of 40 to 60 inches. Surface runoff is rapid, and the hazard of water erosion is severe if the surface is left bare.

This unit is used for limited timber production or as watershed.

Douglas-fir, canyon live oak, redwood, and tanoak are the main tree species on this unit. Sugar pine is common on this unit in the southern part of the survey area. Trees of limited extent include Pacific madrone. On the basis of a 100-year site curve, the mean site index is 97 for Douglas-fir on the Woodin soil. On the basis of a 100-year site curve, the mean site index is 140 for Douglas-fir and 135 for redwood on the Yellowhound soil. The potential annual production from a fully stocked stand of Douglas-fir is 245 board feet per acre on the Woodin soil and 660 board feet per acre on the Yellowhound soil. This potential production is rarely achieved, however, because of the inherent tendency of the soils to produce understocked stands. Estimates of the potential annual production for sugar pine and redwood have not been made because these species are widely scattered.

The main limitations affecting the harvesting of timber are the slope and the low volume of commercial species. Because of these limitations, harvesting of trees is generally not feasible on this unit. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally cause less disturbance of the soil in the steeper areas. Rock for construction of roads is generally available in areas of this unit. Revegetation of exposed subsoil is difficult on this unit; however, it generally is not needed for control of surface erosion because of the large amount of coarse fragments. Rocks and loose soil material may slide onto roads. This hazard increases the need for road maintenance.

Seedling establishment is a concern affecting the production of timber. Droughtiness in the upper 24 inches reduces the seedling survival rate, especially on south- and southwest-facing slopes. Plantings on the Woodin soil frequently fail because of the very low available water capacity. Reforestation can be accomplished by planting Douglas-fir, sugar pine, and redwood seedlings on the Yellowhound soil.

Among the common forest understory plants are canyon live oak on the Woodin soil and California huckleberry and bracken fern on the Yellowhound soil.

Ornbaun-Zeni Complex (130, 131) 3716 acres

The soil phase 130 occurs on slopes 9 to 30%, while phase 131 occurs on slopes 30 to 50%. The Ornbaun-Zeni is the third most common soil type found on the GRF. It underlies a wide range of slopes and aspects.

This complex is a combination soil type, with such intricately intermingled components that it is not practical to separately map them.

The Ornbaun soil is a fine-loamy, mixed, isomeric Ultic Haplustalf that forms 40 to 45% of this complex. Derived from sandstone, this is a forest soil capable of growing commercial quality Douglas-fir and redwood. It is a deep, well-drained loam, with an effective rooting depth of 40 to 60 inches. Surface runoff is medium to very rapid, permeability is moderate and the erosion hazard is moderate to severe under bare soil conditions. Available water-holding capacity is high.

The Zeni soil is a fine-loamy, mixed, isomesic Ultic Haplustalf that forms 40% of this complex. Like the Ornbaun soil, it is also derived from sandstone, but it is a shallower soil. It is moderately deep, with an effective rooting depth of 20 to 40 inches. The Zeni soil has a low or moderate available water holding capacity. Runoff, permeability and erosion are similar to the Ornbaun soil.

Douglas-fir, Redwood, tanoak and Pacific madrone are the main tree species that occur on this soil complex. For a fully stocked Douglas-fir stand on the Ornbaun soil, the potential annual production is 770 board feet per acre; on the Zeni soil, it is 525 board feet. On the basis of a 100 year curve, mean site index for redwood is 152 on the Ornbaun soil and 130 feet on the Zeni soil (Site III). .

Steepness of slope, erosion hazard and seasonal soil wetness are the main soil limitations to timber harvest. These concerns can be ameliorated by restricting tractor use on steep slopes and limiting tractor use to existing and stable trails. Where topography permits, cable yarding can be employed to reduce soil disturbance. Use of equipment when the soil is wet produces ruts, compacts the soil, and can damage tree roots. Waterbars and/or mulch cover are essential to prevent rill and gully erosion on skid trails, roads and steep cut and fill slopes. Roads are dusty when dry. During operations, all truck roads will be treated as often as necessary to maintain a relatively dust-free surface to reduce dust build-up.

Plant competition is a concern in the production of timber on this soil. Regeneration of conifers can be delayed due to invasion of brush in canopy openings. Given the high canopy retention level post-harvest, significant brush invasion will be minimized. Additionally, inter-planting of Douglas-fir and redwood seedlings will help augment natural regeneration.

Dehaven-Hotel complex (135) 1780 acres

This map unit is on hills, primarily on slope 50 to75 %. The vegetation is mainly redwood and Douglas-fir. Elevation ranges from 10 to 800 feet.

This unit is about 45 percent Dehaven gravelly loam and 35 percent Hotel very gravelly loam. The Dehaven and Hotel soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included with these soils in mapping are small areas of Tramway and Irmulco soils and small areas of shallow soils. Also included are small areas of soils that have been altered by skid trails, landings, and roads and small areas that have slopes of 30 to 50 percent or 75 to 99 percent. Included areas make up about 20 percent of the total acreage of the unit. The percentage varies from one area to another.

The Dehaven soil is deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 2 inches thick. Permeability is moderate in the Dehaven soil. Available water capacity is low. The effective rooting depth is limited by bedrock at a depth of 40 to 60 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

The Hotel soil is moderately deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 2 inches thick. Permeability is moderate in the Hotel soil. Available water capacity is low. The effective rooting depth is limited by bedrock at a depth of 20 to 40 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

This unit is used for timber production or as watershed.

Redwood and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for redwood is 153 on the Dehaven soil and 123 on the Hotel soil. The potential annual production from a fully stocked stand of redwood is 1,325 board feet per acre on the Dehaven soil and 880 board feet per acre on the Hotel soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 183 on the Dehaven soil and 156 on the Hotel soil. Trees of limited extent include grand fir, tanoak, and canyon live oak.

The main limitations affecting the harvesting of timber are the slope and the hazard of erosion. When timber is harvested, the slope limits the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally cause less disturbance of the soil. Revegetation of exposed subsoil is difficult on this unit; however, it generally is not needed for control of surface erosion because of the large amount of coarse fragments. Roads may fail and landslides may occur following deep soil disturbance in the steeper areas. Rock for construction of roads generally is available in areas of this unit. Rocks and loose soil material may slide onto roads. This hazard increases the need for road maintenance.

Plant competition is a concern affecting the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings. Reforestation can be accomplished by planting redwood and Douglas-fir seedlings. Natural reforestation by redwood sprouts and Douglas-fir seed trees provides variable stocking results. Both overstocked and understocked areas are common. Movement of loose surface material can reduce seedling survival rates in the steeper areas.

II. Secondary Timber Soils

Vandamme-Irmulco-Tramway complex (224) 723 acres
This map unit is on hills, primarily on slopes 50 to 75%. The vegetation is mainly redwood and Douglas-fir. Elevation ranges from 80 to 800 feet.

This unit is about 30 percent Vandamme loam, 30 percent Irmulco loam, and 15 percent Tramway loam. The three soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used. Included with these soils in mapping are small areas of Dehaven and Hotel soils and small areas of soils that have been altered by skid trails, landings, and roads. Also included are small areas that have slopes of less than 50 percent or more than 75 percent. Included areas make up about 25 percent of the total acreage of the unit. The percentage varies from one area to another.

The Vandamme soil is deep and well drained. It formed in material derived dominantly from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1 inch thick. Permeability is moderately slow in the Vandamme soil. Available water capacity is moderate or high. The effective rooting depth is 40 to 60 inches. Some roots penetrate to a greater depth by following fractures in the bedrock. Surface runoff is very rapid, and the hazard of water erosion is severe if the surface is left bare.

The Irmulco soil is deep and well drained. It formed in material derived dominantly from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1 inch thick. Permeability is moderate in the Irmulco soil. Available water capacity is moderate or high. The effective rooting depth is 40 to 60 inches. Some roots penetrate to a greater depth by following fractures in the bedrock. Surface runoff is very rapid, and the hazard of water erosion is severe if the surface is left bare.

The Tramway soil is moderately deep and is well drained. It formed in material derived dominantly from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 2 inches thick. Permeability is moderate in the Tramway soil. Available water capacity is low or moderate. The effective rooting depth is 20 to 40 inches. Some roots penetrate to a greater depth by following fractures in the bedrock. Surface runoff is very rapid, and the hazard of water erosion is severe if the surface is left bare.

This unit is used for timber production or as watershed.

Redwood and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for redwood is 165 on the Vandamme soil, 165 on the Irmulco soil, and 141 on the Tramway soil. The potential annual production from a fully stocked stand of redwood is 1,545 board feet per acre on the Vandamme and Irmulco soils and 1,460 board feet per acre on the Tramway soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 179 on the Vandamme soil, 191 on the Irmulco soil, and 161 on the Tramway soil. Trees of limited extent include grand fir, western hemlock, tanoak, and Pacific madrone.

The main limitations affecting the harvesting of timber are the slope, the hazard of erosion, and seasonal wetness. When timber is harvested, the slope limits the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally cause less disturbance of the soil. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Harvesting systems that lift logs entirely off the ground minimize the disturbance of the protective layer of duff. Roads are dusty when dry. Surface treatment may be desirable during periods of heavy use.

Establishing plant cover on steep cut and fill slopes reduces the hazard of surface erosion. Roads may fail and landslides may occur following deep soil disturbance. In areas where the subsoil is exposed along roads, gullies form readily where water flow is concentrated. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Suitable surfacing of roads is needed for use during wet seasons. Rock for construction of roads generally is not available in areas of this unit.

Plant competition is a concern affecting the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings. Reforestation can be accomplished by planting redwood and Douglas-fir seedlings. Natural reforestation by redwood sprouts and Douglas-fir seed trees provides variable stocking results. Both overstocked and understocked areas are common.

Among the common forest understory plants are rhododendron, California huckleberry, swordfern, and trillium.

Pardaloe-Woodin complex (190,191) 356 acres
The soil phase 190 occurs on slopes 50 to 75%, while phase 191 occurs on slopes 30 to 50 %. This map unit is on hills and mountains. The vegetation is mainly Douglas-fir and tanoak.

This unit is about 45 percent Pardaloe very gravelly loam and 30 percent Woodin extremely gravelly sandy loam. The Pardaloe and Woodin soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used. Included with these soils in mapping are small areas of Maymen, Casabonne, and Wohly soils and small areas of soils that have been altered by skid trails, landings, and roads. Also included are small areas that have slopes of 30 to 50 percent or 75 to 99 percent. Included areas make up about 25 percent of the total acreage of the unit. The percentage varies from one area to another.

The Pardaloe soil is deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface layer is pink very gravelly loam about 11 inches thick. Permeability is moderate in the Pardaloe soil. Available water capacity is low. The effective rooting depth is limited by bedrock at a depth of 40 to 60 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

The Woodin soil is moderately deep to bedrock and is well drained. It formed in material derived from sandstone. Permeability is moderate in the Woodin soil. Available water capacity is very low. The effective rooting depth is limited by bedrock at a depth of 20 to 40 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

This unit is used for timber production or as watershed.

Tanoak, canyon live oak, and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 122 on the Pardaloe soil and 97 on the Woodin soil. The potential annual production from a fully stocked stand of Douglas-fir is 455 board feet per acre on the Pardaloe soil and 245 board feet per acre on the Woodin soil. This potential production is rarely achieved, however, because of the inherent tendency of these soils to produce understocked stands.

The main limitations affecting the harvesting of timber are the slope and the hazard of erosion. When timber is harvested, the slope limits the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally cause less disturbance of the soil. Revegetation of exposed subsoil is difficult on this unit; however, it generally is not needed for control of surface erosion because of the large amount of coarse fragments. Roads may fail and landslides may occur following deep soil disturbance in the steeper areas. Rock for construction of roads is generally available in areas of this unit. Rocks and loose soil material may slide onto roads. This hazard increases the need for road maintenance.

Seedling establishment is a concern affecting the production of timber. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings on the Pardaloe soil. The high soil temperature and low content of soil moisture during the growing season result in a high seedling mortality rate, especially on south- and southwest-facing slopes. Movement of loose surface material can reduce the seedling survival rate in the steeper areas. Plantings on the Woodin soil frequently fail because of the very low available water capacity.

Among the common forest understory plants are canyon live oak, hairy manzanita, and iris.

Irmulco-Tramway complex (172, 174) 329 acres

The soil phase 172 occurs on slopes 9 to 30%, while phase 174 occurs on slopes 50 to 75 %. This map unit is on hills. The vegetation is mainly redwood and Douglas-fir. Elevation ranges from 10 to 800 feet.

This unit is about 45 percent Irmulco loam and 35 percent Tramway loam. The Irmulco and Tramway soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used.

Included with these soils in mapping are small areas of Vandamme, Dehaven, and Hotel soils and small areas of soils that have been altered by skid trails, landings, and roads.

The Irmulco soil is deep to weathered bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1 inch thick. Permeability is moderate in the Irmulco soil. Available water capacity is high. The effective rooting depth is limited by weathered bedrock at a depth of 40 to 60 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

The Tramway soil is moderately deep to weathered bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 2 inches thick. Permeability is moderate in the Tramway soil. Available water capacity is low. The effective rooting depth is limited by weathered bedrock at a depth of 20 to 40 inches. Surface runoff is very rapid, and the hazard of water erosion is very severe if the surface is left bare.

This unit is used for timber production or as watershed.

Redwood and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for redwood is 165 on the Irmulco soil and 141 on the Tramway soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 191 on the Irmulco soil and 161 on the Tramway soil. The potential annual production from a fully stocked stand of redwood is 1,545 board feet per acre on the Irmulco soil and 1,130 board feet per acre on the

Tramway soil. Trees of limited extent include tanoak, grand fir, Pacific madrone, western hemlock, and red alder.

The main limitations affecting the harvesting of timber are the slope, the hazard of erosion, and seasonal wetness. When timber is harvested, the slope limits the use of wheeled and tracked equipment in skidding operations. Cable yarding systems generally cause less disturbance of the soil. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Harvesting systems that lift logs entirely off the ground minimize the disturbance of the protective layer of duff. Establishing plant cover on steep cut and fill slopes reduces the hazard of surface erosion. Roads may fail and landslides may occur following deep soil disturbance in the steeper areas. Roads are dusty when dry. Surface treatment may be desirable during periods of heavy use. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Suitable surfacing of roads is needed for use during wet seasons. Rock for construction of roads generally is not available in areas of this unit.

Plant competition is a concern affecting the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings. Reforestation can be accomplished by planting redwood and Douglas-fir seedlings. Natural reforestation by redwood sprouts and Douglas-fir seed trees provides variable stocking results. Both overstocked and understocked areas are common.

Among the common forest understory plants are swordfern, rhododendron, California huckleberry, and oxalis.

Casabonne-Wohly complex (120) 237 acres
This map unit is on hills and mountains, primarily on slopes 30-50%. The vegetation is mainly Douglas-fir and tanoak. Elevation ranges from 700 to 4,000 feet.

This unit is about 55 percent Casabonne gravelly loam and 30 percent Wohly loam. The Casabonne and Wohly soils occur as areas so intricately intermingled that it was not practical to map them separately at the scale used. Included with these soils in mapping are small areas of Pardaloe and Woodin soils and small areas of soils that have been altered by skid trails, landings, and roads.

The Casabonne soil is deep to bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1/2 inch thick. Permeability is moderate in the Casabonne soil. Available water capacity is moderate or high. The effective rooting depth is limited by bedrock at a depth of 40 to 60 inches. Surface runoff is rapid, and the hazard of water erosion is severe if the surface is left bare.

The Wohly soil is moderately deep to weathered bedrock and is well drained. It formed in material derived from sandstone. Typically, the surface is covered with a mat of leaves and twigs about 1/2 inch thick. Permeability is moderate in the Wohly soil. Available water capacity is low.

The effective rooting depth is limited by weathered bedrock at a depth of 20 to 40 inches. Surface runoff is rapid, and the hazard of water erosion is severe if the surface is left bare.

This unit is used for timber production or as watershed.

Douglas-fir, tanoak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 144 on the Casabonne soil and 118 on the Wohly soil. The potential annual production from a fully stocked stand of Douglas-fir is 665 board feet per acre on the Casabonne soil and 420 board feet per acre on the Wohly soil.

The main limitations affecting the harvesting of timber are the slope, the hazard of erosion, and seasonal wetness. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally cause less disturbance of the soil in the steeper areas. Disturbance of the protective layer of duff can be minimized by the careful use of either wheeled or tracked equipment or cable yarding systems. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Establishing plant cover on steep cut and fill slopes reduces the hazard of erosion.

Using wheeled and tracked equipment when the soils are wet produces ruts, compacts the surface, and can damage the roots of trees. Roads on this unit are dusty when dry. Surface treatment may be desirable during periods of heavy use. Unsurfaced roads and skid trails are slippery when wet and may be impassable during rainy periods. Suitable surfacing of roads is needed for use during wet seasons. Rock for construction of roads generally is not available in areas of this unit.

Plant competition is a concern affecting the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir occurs infrequently. The high soil temperature and low content of soil moisture during the growing season cause a high seedling mortality rate, especially in areas of the Wohly soil on south- and southwest-facing slopes.

Among the common forest understory plants are bracken fern, blue wild rye, and perennial bromes and fescues.

Big River loamy sand (107) 37 acres

This very deep, well drained sandy loam soil is on flood plains, primarily on slopes less than 5 %. It formed in alluvium derived from sandstone. The vegetation is mainly redwood. Elevation ranges from 10 to 125 feet.

Included with this soil in mapping are small areas of Cottoneva soils and areas of Riverwash. These included areas make up about 20 percent of the total acreage of the unit. The percentage varies from one area to another.

Permeability is moderately rapid in the Big River soil. Available water capacity is moderate. The effective rooting depth is more than 60 inches. Surface runoff is slow, and the hazard of water erosion is slight if the surface is left bare. This soil is frequently flooded for brief periods from December through April.

This unit is used mainly for timber production or wildlife habitat. A few areas are used for recreation.
Redwood is the main tree species on this soil. On the basis of a 100-year site curve, the mean site index for redwood is 188. The potential annual production from a fully stocked stand of redwood is 2,050 board feet per acre. Trees of limited extent include red alder.

The main limitation affecting the harvesting of timber is the seasonal wetness. Ponding limits the use of equipment to dry periods. Unsurfaced roads and skid trails are soft when wet. They may be impassable during rainy periods. Suitable surfacing of roads is needed for use during wet seasons. Rock for construction of roads generally is not available in areas of this unit.

Plant competition is a concern affecting the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of planted seedlings. Reforestation can be accomplished by planting redwood seedlings. After it is cut, redwood may regenerate by sprouting, thereby providing adequate stocking.

Among the common forest understory plants are oxalis, swordfern, western thimbleberry, starflower, and trillium.

APPENDIX B

Summary Table Report

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Point Arena (3812386) OR Eureka Hill (3812385) OR Zeni Ridge (3812384) OR Gualala (3812375) OR McGuire Ridge (3812374))

Name (Scientific/Common)	CNDDB Ranks	Listing Status (Fed/State)	Other Lists	Elev. Range (ft.)	Total EO's	Element Occ. Ranks A	B	C	D	X	U	Population Status Historic > 20 yr	Recent <= 20 yr	Presence Extant	Poss. Extirp.	Extirp.
Abronia umbellata var. breviflora pink sand-verbena	G4G5T2 S1	None None	Rare Plant Rank - 1B.1 BLM_S-Sensitive	10 30	57 S:2	0	1	0	0	0	1	2	0	2	0	0
Agrostis blasdalei Blasdale's bent grass	G2 S2	None None	Rare Plant Rank - 1B.2 BLM_S-Sensitive	60 80	58 S:4	0	1	0	0	0	3	1	3	4	0	0
Aplodontia rufa nigra Point Arena mountain beaver	G5T1 S1	Endangered None	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern	20 355	38 S:33	1	16	2	0	0	14	23	10	33	0	0
Arborimus pomo Sonoma tree vole	G3 S3	None None	CDFW_SSC-Species of Special Concern IUCN_NT-Near Threatened	40 2,240	221 S:23	0	1	0	0	0	22	21	2	23	0	0
Astragalus agnicidus Humboldt milk-vetch	G2 S2	None Endangered	Rare Plant Rank - 1B.1 BLM_S-Sensitive SB_BerrySB-Berry Seed Bank SB_RSABG-Rancho Santa Ana Botanic Garden	1,680 1,680	52 S:2	0	1	0	1	0	0	0	2	2	0	0
Bombus caliginosus obscure bumble bee	G4? S1S2	None None	IUCN_VU-Vulnerable	100 2,000	181 S:5	0	0	0	0	0	5	5	0	5	0	0
Bombus occidentalis western bumble bee	G2G3 S1	None None	USFS_S-Sensitive XERCES_IM-Imperiled	100 100	282 S:1	0	0	0	0	0	1	1	0	1	0	0
Calystegia purpurata ssp. saxicola coastal bluff morning-glory	G4T2T3 S2S3	None None	Rare Plant Rank - 1B.2	40 200	30 S:5	0	1	2	1	0	1	1	4	5	0	0
Campanula californica swamp harebell	G3 S3	None None	Rare Plant Rank - 1B.2 BLM_S-Sensitive	30 1,140	132 S:36	1	19	10	1	0	5	4	32	36	0	0
Carex californica California sedge	G5 S2	None None	Rare Plant Rank - 2B.3	915 1,100	28 S:2	0	2	0	0	0	0	0	2	2	0	0
Carex lyngbyei Lyngbye's sedge	G5 S3	None None	Rare Plant Rank - 2B.2	20 20	29 S:1	0	0	0	0	0	1	1	0	1	0	0

Name (Scientific/Common)	CNDDB Ranks	Listing Status (Fed/State)	Other Lists	Elev. Range (ft.)	Total EO's	Element Occ. Ranks A	B	C	D	X	U	Population Status Historic > 20 yr	Recent <= 20 yr	Presence Extant	Poss. Extirp.	Extirp.
Carex saliniformis deceiving sedge	G2 S2	None None	Rare Plant Rank - 1B.2	20 750	15 S:4	1	0	0	0	0	3	3	1	4	0	0
Castilleja ambigua var. humboldtiensis Humboldt Bay owl's-clover	G4T2 S2	None None	Rare Plant Rank - 1B.2 BLM_S-Sensitive	2 2	31 S:1	1	0	0	0	0	0	1	0	1	0	0
Castilleja mendocinensis Mendocino Coast paintbrush	G2 S2	None None	Rare Plant Rank - 1B.2 BLM_S-Sensitive	100 100	47 S:1	0	0	0	0	0	1	0	1	1	0	0
Cerorhinca monocerata rhinoceros auklet	G5 S3	None None	CDFW_WL-Watch List IUCN_LC-Least Concern	20 20	10 S:2	0	0	0	0	0	2	2	0	2	0	0
Coastal and Valley Freshwater Marsh Coastal and Valley Freshwater Marsh	G3 S2.1	None None			60 S:3	0	0	0	0	0	3	3	0	3	0	0
Coastal Brackish Marsh Coastal Brackish Marsh	G2 S2.1	None None			30 S:2	0	0	0	0	0	2	2	0	2	0	0
Coastal Terrace Prairie Coastal Terrace Prairie	G2 S2.1	None None		280 280	8 S:1	0	1	0	0	0	0	1	0	1	0	0
Coptis laciniata Oregon goldthread	G4 S3	None None	Rare Plant Rank - 4.2	180 410	122 S:2	0	1	0	0	0	1	0	2	2	0	0
Corynorhinus townsendii Townsend's big-eared bat	G3G4 S2	None None	BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFS_S-Sensitive WBWG_H-High Priority	480 480	626 S:1	0	0	0	0	0	1	1	0	1	0	0
Cuscuta pacifica var. papillata Mendocino dodder	G5T1 S1	None None	Rare Plant Rank - 1B.2		5 S:2	0	0	0	0	0	2	1	1	2	0	0
Danaus plexippus pop. 1 monarch - California overwintering population	G4T2T3 S2S3	None None	USFS_S-Sensitive	120 230	378 S:3	0	0	0	0	0	3	0	3	3	0	0
Dicamptodon ensatus California giant salamander	G3 S2S3	None None	CDFW_SSC-Species of Special Concern IUCN_NT-Near Threatened	50 1,650	229 S:16	0	0	0	0	0	16	15	1	16	0	0
Erigeron supplex supple daisy	G2 S2	None None	Rare Plant Rank - 1B.2	20 600	21 S:8	1	1	2	1	0	3	2	6	8	0	0

Name (Scientific/Common)	CNDDB Ranks	Listing Status (Fed/State)	Other Lists	Elev. Range (ft.)	Total EO's	Element Occ. Ranks A	B	C	D	X	U	Population Status Historic > 20 yr	Recent <= 20 yr	Presence Extant	Poss. Extirp.	Extirp.
Erysimum concinnum bluff wallflower	G3 S2	None None	Rare Plant Rank - 1B.2	150 150	30 S:1	0	0	0	0	0	1	1	0	1	0	0
Eucyclogobius newberryi tidewater goby	G3 S3	Endangered None	AFS_EN-Endangered CDFW_SSC-Species of Special Concern IUCN_VU-Vulnerable	20 20	117 S:1	1	0	0	0	0	0	1	0	1	0	0
Fratercula cirrhata tufted puffin	G5 S1S2	None None	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern		17 S:1	0	0	0	0	0	1	1	0	1	0	0
Fritillaria roderickii Roderick's fritillary	G1Q S1	None Endangered	Rare Plant Rank - 1B.1 SB_RSABG-Rancho Santa Ana Botanic Garden	80 150	8 S:3	0	0	0	0	1	2	3	0	2	1	0
Gilia capitata ssp. pacifica Pacific gilia	G5T3 S2	None None	Rare Plant Rank - 1B.2		73 S:2	0	0	0	0	0	2	1	1	2	0	0
Glyceria grandis American manna grass	G5 S3	None None	Rare Plant Rank - 2B.3	200 200	10 S:1	0	0	0	0	0	1	1	0	1	0	0
Hesperevax sparsiflora var. brevifolia short-leaved evax	G4T3 S2	None None	Rare Plant Rank - 1B.2 BLM_S-Sensitive	40 65	36 S:3	0	1	0	0	0	2	2	1	3	0	0
Hesperocyparis pygmaea pygmy cypress	G1 S1	None None	Rare Plant Rank - 1B.2 SB_RSABG-Rancho Santa Ana Botanic Garden	120 1,100	36 S:7	0	2	0	0	0	5	5	2	7	0	0
Horkelia marinensis Point Reyes horkelia	G2 S2	None None	Rare Plant Rank - 1B.2	1,275 1,275	36 S:1	0	0	0	0	0	1	1	0	1	0	0
Horkelia tenuiloba thin-lobed horkelia	G2 S2	None None	Rare Plant Rank - 1B.2 BLM_S-Sensitive SB_RSABG-Rancho Santa Ana Botanic Garden	150 1,300	27 S:10	0	2	4	0	0	4	3	7	10	0	0
Kopsiopsis hookeri small groundcone	G4? S1S2	None None	Rare Plant Rank - 2B.3	1,995 1,995	21 S:1	0	1	0	0	0	0	0	1	1	0	0
Lasthenia californica ssp. bakeri Baker's goldfields	G3T1 S1	None None	Rare Plant Rank - 1B.2	20 150	19 S:4	0	0	0	0	1	3	3	1	3	1	0

Name (Scientific/Common)	CNDDB Ranks	Listing Status (Fed/State)	Other Lists	Elev. Range (ft.)	Total EO's	Element Occ. Ranks A	B	C	D	X	U	Population Status Historic > 20 yr	Recent <= 20 yr	Presence Extant	Poss. Extirp.	Extirp.
Lasthenia californica ssp. macrantha perennial goldfields	G3T2 S2	None None	Rare Plant Rank - 1B.2	20 50	59 S:5	0	0	0	0	0	5	5	0	5	0	0
Lasthenia conjugens Contra Costa goldfields	G1 S1	Endangered None	Rare Plant Rank - 1B.1 SB_UCBBG-UC Berkeley Botanical Garden	100 100	33 S:1	0	0	0	0	0	1	1	0	1	0	0
Lathyrus palustris marsh pea	G5 S2	None None	Rare Plant Rank - 2B.2	450 450	13 S:1	0	1	0	0	0	0	0	1	1	0	0
Lavinia symmetricus parvipinnis Gualala roach	G4T1T2 S2S3	None None	CDFW_SSC-Species of Special Concern	1 1	4 S:1	1	0	0	0	0	0	0	1	1	0	0
Lilium maritimum coast lily	G2 S2	None None	Rare Plant Rank - 1B.1	25 1,160	76 S:31	1	10	13	2	0	5	17	14	31	0	0
Lycopodium clavatum running-pine	G5 S3	None None	Rare Plant Rank - 4.1	570 570	120 S:1	0	0	0	1	0	0	0	1	1	0	0
Microseris paludosa marsh microseris	G2 S2	None None	Rare Plant Rank - 1B.2		39 S:1	0	0	0	0	0	1	1	0	1	0	0
Northern Coastal Bluff Scrub Northern Coastal Bluff Scrub	G2 S2.2	None None		50 50	1 S:1	1	0	0	0	0	0	1	0	1	0	0
Northern Coastal Salt Marsh Northern Coastal Salt Marsh	G3 S3.2	None None			53 S:1	0	0	0	0	0	1	1	0	1	0	0
Oenothera wolfii Wolf's evening-primrose	G2 S1	None None	Rare Plant Rank - 1B.1 BLM_S-Sensitive SB_BerrySB-Berry Seed Bank	100 100	29 S:1	0	0	0	0	0	1	1	0	1	0	0
Oncorhynchus gorbuscha pink salmon	G5 S1	None None		40 40	1 S:1	0	0	1	0	0	0	0	1	1	0	0
Oncorhynchus kisutch coho salmon - central California coast ESU	G4 S2?	Endangered Endangered	AFS_EN-Endangered	250 580	22 S:2	0	0	0	0	0	2	2	0	2	0	0
Oncorhynchus mykiss irideus steelhead - northern California DPS	G5T2T3Q S2S3	Threatened None	AFS_TH-Threatened	12 580	6 S:3	0	1	0	0	0	2	2	1	3	0	0
Potamogeton epihydrus Nuttall's ribbon-leaved pondweed	G5 S2S3	None None	Rare Plant Rank - 2B.2		25 S:1	0	0	0	0	0	1	1	0	1	0	0

Summary Table Report

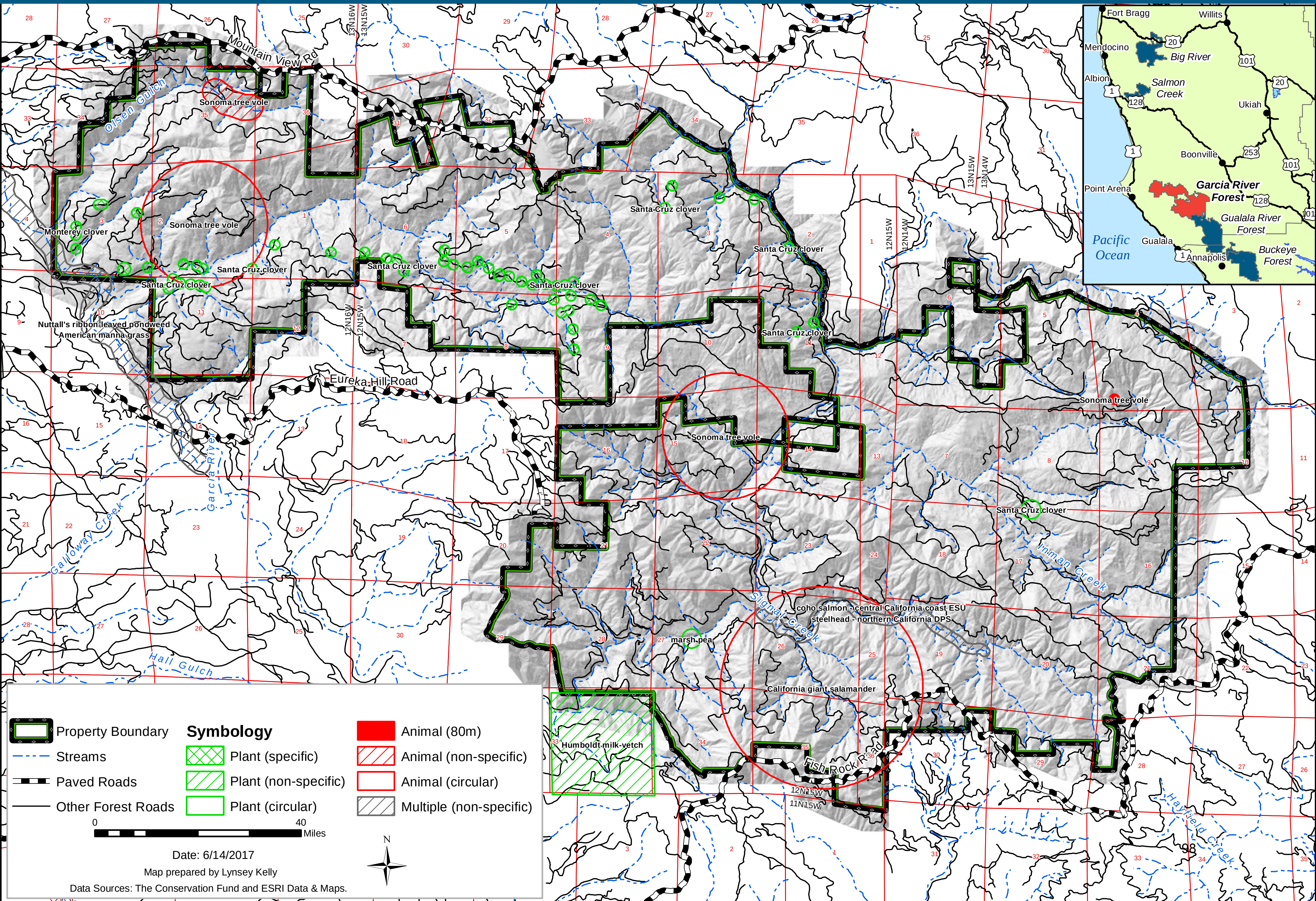
California Department of Fish and Wildlife

California Natural Diversity Database

Name (Scientific/Common)	CNDDB Ranks	Listing Status (Fed/State)	Other Lists	Elev. Range (ft.)	Total EO's	Element Occ. Ranks						Population Status		Presence		
						A	B	C	D	X	U	Historic > 20 yr	Recent <= 20 yr	Extant	Poss. Extirp.	Extirp.
Rana boylii foothill yellow-legged frog	G3 S3	None None	BLM_S-Sensitive CDFW_SSC-Species of Special Concern IUCN_NT-Near Threatened USFS_S-Sensitive	10 1,000	890 S:14	0	1	0	0	0	13	2	12	14	0	0
Rana draytonii California red-legged frog	G2G3 S2S3	Threatened None	CDFW_SSC-Species of Special Concern IUCN_VU-Vulnerable	20 825	1408 S:7	0	2	0	0	0	5	0	7	7	0	0
Rhyacotriton variegatus southern torrent salamander	G3G4 S2S3	None None	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern USFS_S-Sensitive	350 350	415 S:1	0	1	0	0	0	0	0	1	1	0	0
Sidalcea malachroides maple-leaved checkerbloom	G3 S3	None None	Rare Plant Rank - 4.2	20 600	136 S:8	0	0	4	0	1	3	4	4	7	1	0
Sidalcea malviflora ssp. purpurea purple-stemmed checkerbloom	G5T1 S1	None None	Rare Plant Rank - 1B.2		19 S:2	0	0	0	0	0	2	2	0	2	0	0
Speyeria zerene behrensii Behren's silverspot butterfly	G5T1 S1	Endangered None	XERCES_CI-Critically Imperiled	60 265	9 S:5	1	0	0	0	0	4	5	0	2	0	3
Taricha rivularis red-bellied newt	G4 S2	None None	CDFW_SSC-Species of Special Concern IUCN_LC-Least Concern	10 10,000	136 S:2	0	0	0	0	0	2	2	0	2	0	0
Trifolium buckwestiorum Santa Cruz clover	G2 S2	None None	Rare Plant Rank - 1B.1 BLM_S-Sensitive SB_USDA-US Dept of Agriculture	330 1,680	23 S:9	0	3	0	0	0	6	6	3	9	0	0
Trifolium trichocalyx Monterey clover	G1 S1	Endangered Endangered	Rare Plant Rank - 1B.1 SB_USDA-US Dept of Agriculture	200 500	6 S:3	0	2	1	0	0	0	0	3	3	0	0

Garcia River Forest - CNDDB

THE CONSERVATION FUND



APPENDIX C

A Survey of the Vascular Plants on the Garcia River Forest, Mendocino County, California- with Special Emphasis on the Rare and Endangered Species

Prepared by:
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For:
The Nature Conservancy
California Regional Office, North Coast Project

September 29, 2005

Revised
June 12, 2017

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Introduction

In 2005 a survey of the vascular plants with special emphasis on the rare and endangered species was conducted on the Garcia River Forest (GRF). The purpose of the survey was to document the occurrence of rare species and their habitat and to provide a comprehensive list of the vascular plants species. Along with species occurrences other spatially explicit data was collected at numerous sites representing the diverse suite of vegetation types and plant communities on the property. Full descriptions of habitat and species associations along with recommendations to avoid impact were provided for 5 rare vascular species and 1 rare lichen documented at the time.

Between 2006 – 2017 additional surveys were conducted across the GRF resulting in the addition of 114 vascular plant taxa including two new rare species, Bolander's reedgrass (*Calamagrostis bolanderi*), and Monterey clover (*Trifolium trichocalyx*) described herein. Management recommendations are included for these new taxa as well as for previously described taxa where revised recommendation have since been established. At the end of the report an updated list of vascular plant species for the GRF (App. A) is provided reflecting current changes in taxonomy and nomenclature (Baldwin et al. 2012; Jepson Flora Project 2017). Additionally, starting in 2006, survey work included bryophytes and lichens; accordingly a comprehensive list of these taxa are included (App. B).

Since 2005 important changes have been made regarding the description and status of rare plant species in California. First, the California Native Plant Society (CNPS) 8^{th} Ed Online Inventory of Rare and Endangered Species was released in Dec. of 2010. Preparation of environmental documents for review under the California Environmental Quality Act (CEQA) often use the Online Inventory to help determine the potential for resource conflicts, and to develop project-specific lists of rare plants to target during botanical surveys. The Online Inventory is continually updated as the status of rare species changes, thus providing a more timely resource for rare plant protection efforts, conservation planning, and management. Bryophytes (mosses, liverworts, and hornworts) and lichens are now included in the Inventory. A list of potentially occurring rare species for the GRF and surrounding quads is provided in App. C.

CNPS initially created five California Rare Plant Ranks (CRPR), formally "CNPS Lists", in an effort to categorize degrees of concern; however, in order to better define and categorize rarity in California's flora, the CNPS Rare Plant Program and Rare Plant Program Committee developed the new California Rare Plant Ranks (CRPR) 2A and CRPR 2B.

- CRPR 2A: Plants Presumed Extirpated in California, But Common Elsewhere
- CRPR 2B: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

Lastly, the 2nd edition of the Jepson Manual: Vascular Plants of California (Baldwin et al. 2012) was released reflecting significant taxonomic revisions and changes to nomenclature. These have been applied throughout the body of this report and to the species lists that follow.

Changes in rarity status since 2005:

- The white rein orchid (*Piperia candida*) was upgraded from CNPS List 4 to CRPR 1B.2 in 2009.

- The CNPS Rare Plant Program began including Lichens of Conservation Concern in the CNPS *Inventory* in 2014; subsequently Methuselah's beard lichen (*Usnea longissima*) was assigned to CRPR 4.2.

- Sonoma canescent manzanita **(***Arctostaphylos canescens* subsp. *sonomensis)* was discovered on the GRF in 2014 and at that time was a CRPR 1B.2 plant. The following year it was rejected altogether due to its high abundance and widespread distribution.

- Lastly, the Bristly Linanthus (*Leptosiphon acicularis*), a CRPR 4.2 plant has been removed from this document as it was originally discovered outside of the GRF property and no subsequent sitings within the GRF have been made.

2005 Pre-survey

Prior to field surveys a list of rare plant species and plant communities with potential to occur on the 23,780-acres of the study area were developed from materials provided by The Nature Conservancy along with a 9-quad search of the California Natural Diversity Data Base (CNDDB) and the California Native Plant Society Electronic Inventory. None of these species had been confirmed to occur on the property.

Images of all potentially occurring rare species were obtained from various on-line sources including CalPhotos, USDA Flower-Finder and the Missouri University Herbarium. Additional investigations were made using the following references: The Jepson Manual: Higher Plants of California (Hickman), The Intermountain Flora (Cronquist et al. 1986), Flora of the Pacific Northwest (Hitchcock and Cronquist 1973), and the CNPS Inventory of Rare and Endangered Plants (2001).

Scott Kelly of North Coast Resource Management provided aerial photographs of the study area as well as a valuable road map. In conjunction with these The Garcia River Soil Map (12/17/04), soil series information (USDA, NRCS), The Garcia River Vegetation Map (9/28/04), Garcia River Forest Permanent Timber Plots map (3/29/05) and Garcia River Forest Draft Reserve

Components map (2/25/05) all provided by The Nature Conservancy provided resources for the development of a survey strategy.
The study area was visited initially April 5-7, 2005 to gain on site familiarity with access, road conditions, vegetation types, and plant communities to determine an effective survey strategy. Because of weather related delays this first trip was combined with the beginning of surveys.

2017 Pre-Survey Investigations
Laying the groundwork of a successful and effective plant survey involves conducting preliminary investigations of the habitats and blooming times of special status plant species known to occur or with the potential to occur within a large buffer area surrounding a THP or other project survey area. The California Department of Fish and Wildlife (CDFW) and the California Native Plant Society (CNPS) recommend that the buffer be a minimum of 9 USGS quadrangles with the survey area located in the central quad.

First, an initial query is conducted from the most recent CNPS Inventory of Rare and Endangered Plants, the On-line 8th Edition, and the California Natural Diversity Database (CNDDB) for a large buffer surrounding the study site as described above. A list is then developed of all rare plants with California Rare Plant Ranks (previously known as CNPS Lists) of 1A, 1B, 2A, 2B, 3, and 4 with current threat rankings for each taxon across all natural communities (Appendix C).

Rare species, by their nature, often show patchy and sometimes disjunct patterns of rarity across relatively large ranges. This is partly due to large scale habitat fragmentation, along with narrow habitat specificity, and limited survey access. A list of potential rare plants helps investigators focus or concentrate their efforts on locations and site characteristics of a core of locally occurring rare species, however it is recognized that rare or even restricted species are commonly found outside their known ranges and habitat preferences and therefore surveys should not focus primarily on these species or the habitats they are found in, but instead be floristic in nature, accounting for all species across all habitats present on a THP or other project survey area.

The following are common sources of information regularly used throughout the entire botanical survey process. Potential habitat and vegetation types within a specific survey area are identified in: A Manual of California Vegetation (Sawyer et al, 2009). Sensitive species habitat information are investigated in the Inventory of Rare and Endangered Plants of California the CNPS on-line 8th edition of the Inventory (CNPS 2017), the Consortium of California Herbaria, and Species Taxa Lists (CNDDB and CDFW 2017). Current taxonomic status of all vascular species largely follows the 2nd edition Jepson Manual (Baldwin et al. 2012) and the Jepson Flora Project (eds.) [2017] *Jepson eFlora*, http://ucjeps.berkeley.edu/IJM.html [July 1, 2017].

Methodology
2005 Botanical Survey
Surveys in 2005 were conducted on the following dates:
April 5,6,7,28,29; May 12,13, 23,24; June 6,7,27,28; Aug 10,11.
The surveys were floristic in nature and took into account all vascular plant species encountered. Areas with relatively good access and high potential to support CRPR 1B and 2 species were prioritized. Because of the diverse suite of vegetation types and habitat indicated by the 2002 CALVEG map we concentrated our efforts particularly in the eastern portion of the property which included sites on and off of Inman Creek and Signal Creek roads. We employed various sampling strategies depending on the topography and extent of homogenous vegetation types.

April and May surveys concentrated on grasslands and associated meadows and seeps in addition to adjacent coniferous and hardwood forest because of the number of species with CRPR 1B and CRPR 2 status such as *Lasthenia burkei*, *Lasthenia conjugens*, *Layia septentrionalis*, *Limnanthes bakeri* and *Navarretia leucocephala ssp bakeri*. Many of the large grasslands had no passable road access and required cross-country travel by foot. We were rewarded for these efforts by finding a singular serpentine outcrop on a remote patch of grassland off Signal Cr. Road along with other areas of ridgetop mesic grasslands. By traversing across different vegetation types we were able to collect valuable habitat information on plant community structure and composition as well as phenology to assist us in follow-up surveys for later blooming plants.

Early surveys also concentrated on forested areas where 7 CRPR 1B and 2 status taxa have the potential to occur *(Kopsiopsis hookeri, Castilleja mendocinensis, Erythronium revolutum, Lilium maritimus*, *Mitellastra caulescens, Pleuropogon hooverianus*, and *Sidalcea malachroides*). Because of the extensive expanse of forested land on the Garcia River Property we referred to the February 2005 Garcia River Forest Draft Reserve Components map prepared for the Nature Conservancy to determine sampling points which would reflect a range of forest composition and canopy.

Permanent timber plot maps were provided by TNC in order to provide under-story composition information. Due to the similarity and limited number of species in several of the points sampled we found it more productive to seek sampling points that represented the diversity of vegetation types and plant communities found on the property. Many transects were along roads, especially Olson Gulch Road, where disturbance caused by road cuts often resulted in the greatest diversity of species in forested areas.

Surveys in June concentrated on the western portion of the Garcia River Property and included sites off of Olson Gulch and Graphite roads and a return trip creating an east-west transect via Signal Creek Road to the eastern edge of the property. Surveys focused on North Coast coniferous forest areas and meadows, seeps, marshes and riparian areas. While continuing to look for the aforementioned species in meadows and seeps, late season rare taxa became the focus of our surveys *(Campanula californica, Carex saliniformis, Carex californica, and Glygeria grandis*) where sampling included the most western portion of the property along the Garcia River. A search for broadleaved upland forest and North Coast coniferous forest species (especially CRPR 1B plant, *Astragalus agnicidus*) was conducted throughout the entire east-west transect.

The last survey in August included a return to east side grasslands and broadleaved upland forests as well as an extensive search of a remote portion of the Garcia River riparian corridor on the western side of the property. A search of grasslands for CRPR 4 tarweeds, *Hemizonia congesta* subsp. *calyculata* and *H. congesta* subsp. *tracyi*, was conducted on the way to a remote stock pond located during earlier surveys to inspect for the CRPR 2 *Potamogeton epihydrus ssp. nuttallii*. Seeps along Inman Road were revisited to survey for the CRPR 2: *Sanguisorba officinalis, Lycopodium clavatum* and aforementioned seep and marsh species. Forested areas were inspected for *Usnea longissima*. The Garcia River was surveyed along a 2mi. transect from below bridge #6 downstream to the west. This diverse habitat of hot, dry, steep, south facing slopes and cool, steep, north facing slopes had the potential to support riparian and ledge dwelling species, consequently our survey focused particularly on CRPR 3: *Erigeron bioletti*; CRPR 4: *Lilium rubescens*; CRPR 2: *Mitellastra caulescens*, *Glyceria grandis* and *Potamogeton epihydrus* subsp. *nuttallii*, and CRPR 1B: *Pleuropogon hooverianus*.

2006 -2017 Botanical Surveys on the GRF
Survey Methodology
All subsequent botanical surveys since 2005 have been floristic in nature and include all vascular and non-vascular plants encountered within a project survey area. Generally, plant phenology dates for potentially occurring rare species are used to determine the timing and frequency of surveys. Our site visits have been conducted from early spring through mid Fall, a period broad enough to include known blooming and fruiting times of potentially occurring rare species, but also encompassing the blooming period of early annuals, wetland plants, and late blooming herbaceous perennial species – roughly March through October. The level of effort required per given area and habitat was dependent upon the vegetation and its overall diversity and structural complexity. For example, densely forested areas with little understory require far less effort to survey than open herb or grass dominated areas.

Coordinates of rare species and communities are obtained with GPS, photo-documented, and described in detail regarding topography, landform, soil, vegetation alliance, associated species, and potential threats. Additionally, all information is obtained at the site sufficient to fill out a CNDDB Rare Plant Survey Form. Other notable or unusual habitat features, such as rocky outcrops, serpentine-influenced sites, springs, and waterfalls that are encountered are documented in the same manner.

All the following surveys have followed the pre-survey protocols described above. New taxa discovered during surveys are appended to the GRF master species list yearly.

2006: Jack's Opening THP (Heise and Hulse-Stephens 2006a); Lower North Fork THP (Heise and Hulse-Stephens 2006b).

2007: Graphite THP (Heise and Hulse-Stephens 2007a); Lower North Fork #2 THP (Heise and Hulse-Stephens 2007b); Lower North Fork #3 THP (Heise and Hulse-Stephens 2007c)

2008: Upper North Fork THP (Heise and Hulse-Stephens 2008a); Victoria Fork / Cal Watershed Unit, Blue Water Hole Creek (Heise and Hulse-Stephens 2008b); North Fork Garcia / Cal Watershed Unit (Heise and Hulse-Stephens 2008c)

2010: Hollow Tree East THP (Heise and Hulse-Stephens 2010a)

2012: Graphite THP, expanded (Heise and Hulse-Stephens 2012)

2013: Sneaky Prawn THP (Heise and Hulse-Stephens 2013); Hollow Tree Appurtenant Road Points (Heise, K. and G. Hulse-Stephens 2013b)

2014: Olsen Gulch THP botanical survey (Heise and Hulse-Stephens 2014)

2015: Olsen Gulch THP rare plant monitoring (Heise and Hulse-Stephens 2015)

2016: Inman watershed grasslands (Heise, K. 2016); Anderson Camp THP (Ringstad 2016)

2017: Section 11 THP (Heise and Hulse-Stephens 2017 *in progress*)

The Vegetation and Flora of the Garcia River Forest

Vegetation

The Garcia River Forest occurs primarily within the Outer North Coast subregion (NCoRO) of Northwestern California which is characterized by high rainfall and summer fog supporting redwood, mixed-evergreen, and mixed-hardwood forests. Several vegetation types are represented across the property and reflect a decreasing moisture gradient from west to east. The western section of the property is typical of the NCoRO subregion and is comprised largely of Douglas-fir (*Pseudotsuga menziesii*) and Redwood (*Sequoia sempervirens*), which either share or are the sole dominant in most stands and typically associated with both Tanoak (*Notholithocarpus densiflora*) and Madrone (*Arbutus menziesii*). Barbour and Major (1988) and Sawyer and Keeler-Wolf (1995) and Sawyer et al. (2009) describe these forest vegetation types and their associated species in detail.

At the far eastern end of the property patches of grassland, mixed-hardwood forest, and serpentine habitat, surrounded by redwood/Douglas-fir forest provide a mosaic of diverse vegetation types. The area is more typical of the Inner North Coast Ranges (NCoRI) subdivision which is characterized by lower rainfall, little or no summer fog and in general vegetation types adapted to dryer conditions.

The forks and tributaries of the Garcia River, North Fork Garcia River, Olsen Gulch Creek, Blue Waterhole Creek, Inman Creek, and Signal Creek, along with numerous seep meadows provide an abundance of riparian and wetland habitat.

The transition from a more summer fog influenced forest to the dyer interior forests and woodlands can first be detected traveling west to east along the Olsen Gulch Road at the edge of the summer fog belt where coastal understory species such as Forget-Me-Not (*Myosotis latifolia*), Velvet Grass (*Holcus lanatus*), common brome (*Bromus vulgaris*), Sweet Grass (*Anthoxanthum occidentale*), candy flower (*Claytonia siberica*), and Wax Myrtle *(Morella californica*) become less conspicuous. The understory loses its lush character and species richness is markedly less. Western Hemlock (*Tsuga heterophylla*) appears to gain importance in the transition region while Red Alder (*Alnus rubra*) becomes increasingly confined to canyon bottoms and eventually replaced by White Alder (*A. rhombifolia*).

Eight major vegetation/habitat types can be recognized across the Garcia River Forest. The most conspicuous are the redwood/Douglas-fir stands that dominate the western 2/3 of the property, transitioning into a mosaic of conifer/mixed hardwood/grassland landscape to the east. Wetland and serpentine habitat, outcrops and cliffs, and patches of shrubland represent a fraction of the area surveyed but contribute significantly to the overall plant diversity of the property, as well as providing habitat for two rare species.

Number of Taxa Associated with Vegetation Types (2005 data)

	Total	**Exotics**	**Rare Species**
Mixed Hardwood	232	58	0
Redwood/Douglas-fir	184	28	3
Grassland (mesic & xeric)	163	55	2
Riparian	121	25	0
Roadcuts, Cliffs, Outcrops	115	21	1
Wet Seep	93	23	1
Serpentine Habitat	65	12	0
Ceanothus Shrubland	49	11	0

Douglas-Fir/Redwood Forest

A closed coniferous forest comprised largely of Douglas-fir (*Pseudotsuga menziesii*) and Redwood (*Sequoia sempervirens*) covers much of the Garcia River Forest property. Common trees associated with this forest include Pacific Madrone (*Arbutus menziesii*), Tanoak (*Notholithocarpus densiflorus*), and Interior Live Oak (*Quercus chrysophylla*). Chinquapin (*Chrysolepis chrysophylla*) and Sugar Pine (*Pinus lambertiana*) become more important further to the east and on south and southwest facing slopes, whereas Western Hemlock (*Tsuga heterophylla*) is more prevalent at the western end of the property.

Forest management practices and various site characteristics have produced a variety of stands in many different stages of regrowth and as a result plant composition varies considerably from site to site. Forested slopes with some topographic and soil heterogeneity such as rocky knolls, terraces, or patches of thin fragmented shales support rich mixed coniferous forests with well-developed shrub and herbaceous canopies.

At the eastern end of the property conditions are generally dryer and *Quercus* spp. along with other hardwoods gain importance in the tree canopy. In addition to several conifer and hardwood species, Interior Live Oak (*Q. chrysolepis*) and California Nutmeg (*Torreya californica*) can be conspicuous at the mid tree canopy level. The herbaceous canopy of these diverse forests often contains a variety of native woodland grasses such as Elmer's Fescue (*Festuca elmeri*), Harford's Melic (*Melica harfordii*), Smooth Trisetum (*Trisetum canescens*), and Woodland Brome (*Bromus laevipes*) along with a rich compliment of native forbs.

Species poor sites appear to be associated with closed canopies and heavy accumulation of forest litter. In such sites Huckleberry (*Vaccinium ovatum*), sword fern (*Polystichum munitum*), and redwood sorrel (*Oxalis oregana*) may be the only conspicuous plant in the understory.

Common Species Associated with the Douglas-fir / Redwood Forest

Tree Canopy

Abies grandis	Grand Fir
Alnus rubra	Red Alder
Arbutus menziesii	Pacific Madrone
Chrysolepis chrysophylla	Chinquapin
Notholithocarpus densiflorus	Tanoak
Pinus lambertiana	Sugar Pine
Pseudotsuga menziesii	Douglas-Fir
Quercus agrifolia	Coast Live Oak
Quercus chrysolepis	Canyon Live Oak
Quercus garryana	Oregon Oak

Quercus kelloggii	Black Oak
Quercus parvula var. shrevei	Shreve Oak
Salix scouleriana	Scouler’s willow
Sequoia sempervirens	Redwood
Tsuga heterophylla	Western Hemlock
Umbellularia californica	California Bay

Shrub Canopy

Baccharis pilularis	Coyote Brush
Ceanothus incanus	Coast Whitethorn
Ceanothus thyrsiflorus	blue blossum
Corylus cornuta var. californica	Hazlenut
Lathyrus vestitus var. vestitus	Hillside Pea
Lonicera hispidula	Honeysuckle
Polystichum munitum	Western Sword Fern
Pteridium aquilinum var. pubescens	Bracken Fern
Rhododendron macrophyllum	California azalea
Rhododendron occidentale	Western azalea
Rosa gymnocarpa	Wood Rose
Rubus leucodermis	Western Rasberry
Rubus ursinus	California blackberry
Toxicodendron diversilobum	Poison Oak
Vaccinium ovatum	California honeysuckle
Woodwardia fimbriata	Giant Chain Fern

Herbaceous Canopy

Bromus vulgaris	Common Brome
Carex globosa	Round-fruited sedge
Elymus glaucus ssp. glaucus	Blue Wild Rye
Festuca occidentalis	Western Fescue
Galium californicum	California Bedstraw
Galium triflorum	Sweet-scented bedstraw
Hieracium albiflorum	Hawkweed
Anisocarpus madioides	Woodland Tarweed
Melica subulata	Alaska Oniongrass
Melica harfordii	Harford’s melic
Osmorhiza berteroi	Sweet Cicely
Oxalis oregana	redwood sorrel
Pentagramma triangularis	Goldenback Fern
Polygala californica	California Milkwort
Sanicula crassicaulis	Gamble Weed
Viola ocellata	Western Heart’s Ease
Whipplea modesta	Yerba de Selva

Grasslands

The upper Inman Creek watershed consists of a mosaic of mixed coniferous forest, hardwood forest and woodland, and grassland. Areas of grassland vary in size and the largest complex is well over a100 ha and occurs across varied terrain encompassing a ridgetop, south-facing slopes, spur ridges and gullies. The larger grassland areas (GR1 and GR2,) represent both natural clearings and converted forest land that have been used for pasturing livestock in the past. Grassland plots GR1 and GR2 are more coastal in species composition than the smaller grassland areas further east and support high densities of Annual and Sweet Vernal Grass (*Anthoxanthum aristatum, A. ordoratum*). Small, isolated grasslands (GR3) surrounded by hardwood forest and woodland show fewer sign of disturbance and are rich in native grass and forb species.

Grassland species composition changes with disturbance history, aspect, topographic relief, and soil moisture status, yet there is considerable species overlap between mesic and xeric grasslands. Dryer, south-facing slopes are typically dominated by exotic annual grasses such as Wild Oat (*Avena barbata*), European Silver Hairgrass (*Aira caryophyllea*), Large quacking grass (*Briza maxima*), Hedgehog Dogtail (*Cynosurus echinatus*), Nitgrass (*Gastridium ventricosum*), and Ripgut Grass (*Bromus diandrus*), but the native grasses, Blue Wild Rye (*Elymus glaucus*), California Brome (*Bromus carinatus var. carinatus*), and Purple Needle Grass (*Stipa pulchra*) are often common as well and patchy in occurrence.

Outcrops are generally hotspots for native species providing refuge in exotic dominated fields for species such as Idaho Fescue (*Festuca idahoensis*), One-sided Bluegrass (*Poa secunda*), Annual Fescue (*Vulpia microstachys),* Bird's Foot Fern (*Pellea mucronata var. mucronata*), and many other native forbs and grasses.

Native plant diversity is high on partially shaded, undisturbed west and east-facing slopes where communities consist almost entirely of native grass species such as *F. idahoensis*, California Oatgrass (*Danthonia californica*), *S. pulchra*, and Bent Grass (*Agrostis pallens*).

Mesic grasslands of northerly aspects are lush in comparison but not as species rich as east and west-facing slopes and are typically represented by Bracken Fern (*Pteridium aquilinum var. pubescens*), *A. pallens, F. idahoensis, S. pulchra*, and *D. californica*.

Dense stands of *D. californica* indicate seasonally wet grasslands and are often associated with seeps and springs. Plot name "Buckwest Meadow" in the upper Inman watershed is a typical *Danthonia* mesic grassland, where the rare Santa Cruz Clover (*Trifolium buckwestiorum*) was found along with more than 50 other native and exotic grass and forb species.

Wetlands

The major wetlands occurring on the Garcia River Forest are the riparian areas draining the upper Garcia River watershed. Other wetland types include seeps or meadows characterized by low but prolonged water discharge rates.

Riparian

The main branch of the Garcia River near the western end of the property is quite wide (10-15m) supporting dense Red Alder (*Alnus rubra*) and Sitka Willow (*Salix sitchensis*) with mature Redwood (*Sequoia sempervirens*) along the banks. The Torrent Sedge (*Carex nudata*) grows in large, conspicuous tussocks next to boulders in the main stream channel. In flatter areas along silty terraces and gravel bars several native and exotic species occur such as *Scirpus microcarpus, Cyperus eragrostis*, Mugwort (*Artemisia douglasiana)*, Durango Root (*Datisca glomerata*), *Equisetum* spp., Velvet Grass (*Holcus lanatus)*, Rabbit's Foot Grass *(Polypogon monspeliensis*), Cocklebur (*Xanthium strumarium*), and *Setaria viridis*. In shady recesses and alcoves along the rivers edge the vegetation is very lush and Streamside Orchid (*Epipactis gigantea*), Leopard Lily (*Lilium pardalinum*), Lady Fern (*Athyrium filix-femina*), and Five Finger Fern (*Adiantum aleuticum*) are common.

Further east and higher into the upper reaches of the main forks and tributaries of the watershed, stream channels narrow and become more rocky, gradients increase, and the character of the vegetation changes. White Alder (*Alnus rhombifolia*) along with Large-leaf Maple (*Acer macrophyllum*) dominate the riparian zone replacing Red Alder. Elk Clover (*Aralia californica*), Giant Chain Fern (*Woodwardia fimbriata*), and Western Azalea (*Rhododendron occidentalis*) are common species filling in the voids among mossy covered rocks.

Wet Seeps

Depressions or channels cut along the inboard side of roads intercept and hold water moving down slope creating wetland habitat. Roadside seeps are generally linear features common throughout the Garcia Forest Property and support largely cosmopolitan wetland taxa such as *Carex* spp., *Juncus* spp., *Typha* spp., *Equisetum* spp., and *Salix* spp. Common species include *Carex bolanderi, C. leptopoda, Cyperus eragrostis, Juncus bolanderi, J. effuses var. pacificus, J. balticus,* Hedge Nettle (*Stachys rigida*), Bolander's Water Starwort (*Callitriche heterophylla var. bolanderi*), and Loosestrife (*Lythrum hyssopifolium*).

Located above and west of the Garcia River Hot springs is a terrace/seep system with small depressions holding water. It is a large non-linear wetland with a well-developed herbaceous and shrub layer. Slough sedge (*Carex obnupta),* a plant of at least seasonal standing water, occurs here along with the rare Swamp Pea (*Lathyrus palustris*) which is treated in more detail in the rare plant section of this report.

Mixed Hardwood Forest and Woodland

The upper Inman Creek Watershed in the dryer, eastern portion of the property supports large stands of mixed hardwood forest and woodland surrounded by grassland and mixed coniferous forest. These forests contain a variety of hardwood species in addition to Douglas fir and have a well-developed herbaceous understory. They include species from adjacent grassland and Redwood/Douglas-fir forest and are the most species rich vegetation type on the Garcia River Forest.

This vegetation type generally shows little sign of disturbance from logging or grazing. Hardwood trees include Oregon Oak (*Quercus garryana*), Shreve Oak (*Q. parvula var. shrevei*), Canyon Live Oak (*Q. chrysolepis*), Valley Oak (*Q. lobata*), Pacific Madrone (*Arbutus menziesii*), and Buckeye (*Aesculus californica*). The shady understory supports many native bunchgrasses such as California Fescue (*Festuca californica*), Harford's melic (*Melica hardfordii),* Geyer's oniongrass (*M. geyeri),* woodland brome (*Bromus laevipes),* and smooth trisetum (*Trisetum canescens).*

Serpentine Habitat

The only substantial area of serpentine is located in the Inman Creek and consists of a reddish ultramafic outcrop approximately 2ha in size composed largely of serpentinite, derived from Franciscan Formation ophiolites of Mesozoic age. The outcrop itself is very sparse in plant cover but supports a rich suite of species found nowhere else on the property. A band of serpentine influenced grassland lies adjacent to the outcrop which in turn is surrounded by a mixed coniferous forest of Douglas-Fir, Redwood, and Pacific Madrone.

Species restricted to the outcrop include *Minuartia douglasii*, *Claytonia exigua ssp. exigua*, *Eriogonum luteolum*, Turpentine Weed (*Trichostema laxum),* *Microseris douglasii*, *Vulpia microstachys*, Dense lace fern (*Aspidotis densa*), and Blue-eyed Mary (*Collinsia parviflora*). Additional species are restricted to the adjacent serpentine grassland and include *Hordeum brachyantherum ssp. californicum* and *Trifolium dichotomum*.

In addition to these the site is rich in other native bunch grasses including California Fescue (*Festuca californica*), Western Fescue (*F. occidentalis*), and California Oat Grass (*Danthonia californica*). Many serpentine indicator taxa such as Cream Cups (*Platystemon californicum*), *Sidalcea diploscypha*, Gold Fields (*Lasthenia californica*), *Acmispon wrangelianus*, and *Lomatium utriculatum* are also present. Some roadcuts in the central portion of the property have serpentine rocks and support the CRPR 3 plant, *Erigeron biolettii*.

Ceanothus Shrubland

True areas of chaparral do not exist on the Garcia River Forest as evidenced by the absence of chamise and other chaparral shrublands typically dominated by *Quercus* spp., *Manzanita* spp., and fire-adapted species of *Ceanothus*. However, there are areas (Plot SC-1) of Blue Blossum

(*Ceanothus thyrsiflorus*) and Coast Whitethorn *(C. incanus*) shrubland on the property and their establishment is likely related to logging disturbance and thus transitional to Douglas-Fir / Redwood forest.

The largest area of shrubland occurs on a south-facing slope in the upper Signal Creek watershed and is characterized by dense thickets of Coast Whitethorn, Sticky Monkey Flower (*Mimulus aurantiacus*), and California Broom (*Acmispon glaber*). Grasses common in small clearings among the shrubs include *Melica harfordii*, Western Fescue (*Festuca occidentalis*), and Purple Needlegrass (*Stipa pulchra*).

The Flora, *updated 2017*

The vascular flora of the Garcia River Forest is represented by at least 618 species, in 325 genera and 91 families (app. A). Nomenclature adopted here and used throughout this report largely follows that of the Jepson Manual: Vascular plants of California (Baldwin et al. 2012), with more recent updates from taxonomic revisions and nomenclatural changes from the Jepson Flora Project (2017). Thirty families are monospecific containing only one taxon. 22% percent of the flora is comprised of exotic species and over half of these are included in the Poaceae, Asteraceae, and Fabaceae. The exotic monocots are represented entirely by the grass family (41).

Floristic Summary on the GRF between 2005 and 2017

Year	Families	Genera	Taxa	Exotics	Rare spp.
2005	78	277	504	110	5
2017	91	325	618	133	7

<u>The ten largest families and the number of exotic and native taxa in each (2017)</u>

Family	**Natives**	**Exotics**	**Total Taxa**
Poaceae	40	41	81
Asteraceae	47	26	73
Fabaceae	40	18	58
Boraginaceae	18	1	19
Lamiaceae	17	2	19
Rosaceae	12	6	18
Cyperaceae	17	0	17
Ericaceae	17	0	17
Apiaceae	11	3	14
Polemoniaceae	12	0	12

Rare Plant Occurrences on the Garcia River Forest – Updated 2017

Bolander's reed grass, *Calamagrostis bolanderi* Thurb **CRPR 4.2 S4 G4**

Bolander's reed grass is a perennial grass and a member of the Grass Family, *Poaceae*. It is a CRPR 4.2 California endemic.


Bolander's reed grass (*Calamagrostis bolanderi*) phopto: K. Heise

4 = Limited distribution (Watch List)
.2 = Fairly endangered in California
State Rank: S4, apparently secure in California
Global Rank: G3, apparently secure, considering populations outside California

Known Range:
The known range of the Bolander's reed grass is restricted to sites from sea level to 500 m, near the coast, in Humboldt, Mendocino and Sonoma counties. According to the CNPS on-line inventory (8th edition), it is "Possibly threatened by vehicles, logging, development, and grazing."

Plant Description: Bolander's reed grass is a perennial grass that grows from slender rhizomes.
Stems are erect reaching a height of 3 to 4.5 feet, generally with 4 nodes.
Leaves are flat and nearly smooth with blades 3-10 mm wide, evenly distributed along stems.
Inflorescence is a more or less open panicle, 10 to 25 cm long, with spreading branches, the lower ones as much as 8 cm long, all arranged in whorls.
Spikelets have smooth glumes, 3-4 mm long, with short stiff hairs on the keels. Lemmas are more or less equal to the glumes with short stiff hairs throughout. The anthers are 2/3s the size of the lemma. The awn is attached near the base of the lemma, abruptly bent and extends beyond the lemma about 2 mm. The hairs at the base of the floret are short (more or less 1 mm) and tufted.

Location: Bolander's reed grass occurs in sparse stands at the edge of seasonal and permanent roads across the GRF especially along the Olsen Gulch, North Fork, and Graphite Roads, primarily associated with redwood/Douglas fir forest. Sites documented: During 2007 survey 36 plants (38.93083, 123.5879), in 2016 app. 12 plants at south end of Section 11 THP (38.91161, 123.60411) along road margin (Heise and Hulse-Stephens 2007b; Heise 2017)

Site Quality and Associated Species:
Associate species include California wax myrtle (*Morella californica*) and Douglas iris (*Iris douglasiana*) as well as native grasses, California brome (*Bromus carinatus*), Common Brome (*B. vulgaris)*, and blue wildrye (*Elymus glaucus ssp glaucus*). Typical habitat is semi-shaded ground along road margins that receive regular grading.

Recommendations:
Bolander's reed grass (CRPR 4.2) in on a Watch List and not subject to CEQA regulations. New populations should be documented and CNDDB forms filed, however no protection measures beyond this are needed at this time.

Santa Cruz clover (*Trifolium buckwestiorum*) CRPR 1B.1 S2 G2

Rarity Status: CRPR 1B.1 S2 G2
1B = Rare, threatened or endangered in California and elsewhere
.1 = Seriously endangered in California

State Rank: S2 - Imperiled
Global Rank: G2 – Imperiled

Santa Cruz clover (*Trifolium buckwestiorum*) photo: K. Heise

Description
Santa Cruz clover is an annual in the Pea Family (*Fabaceae*) that displays several growth habit phases. In more impoverished soils where moisture is limited to brief accumulations following spring storms the plant grows to about 2cm and develops sessile non-involucred heads of 1 or 2 flowers, followed by seed set before desiccation. If moisture availability is extended by cool temperatures, spring rains, or available ground water the plant gradually produces a well-developed involucre with conspicuous tooted lobes that subtend a head of a few to many flowers. Stems range from 2cm to more than 20cm. and are decumbent to ascending.
Leaves occur along the stems and stipules have bristle-tipped teeth. Leaflets are .5 to 1.5 cm, round to elliptic and finely serrate.

Inflorescence can range from a singular flower without an involucre to a head of flowers, 5 to many, nested in a bowl-shaped involucre that is irregularly toothed and cut.

Flowers consist of a calyx tube 4-5mm, 10 veined with lobes smaller than the tube. Each lobe has 3 to 5 tiny lateral teeth ending in a 1-1.5 red bristle. The corolla is 6-7mm pale pink or white.
Seed: 1 (2)

Associated Species

Roadbed species associated with the Santa Cruz clover include native grasses: slender hairgrass (*Deschampsia elongata*) and Columbia brome (*Bromus vulgaris)*; non-native grasses: common velvet grass (*Holcus lanatus*), six weeks fescue (*Vulpia bromoides*) and silver European hairgrass (*Aira caryophyllea*); native herbs: deervetch (*Acmispon parviflorus*), Spanish lotus *(Acmispon americanus* var. *americanus*), variegated clover (*Trifolium variegatum),* tomcat clover *(T. willdenovii),* pinole clover (*T. bifidum),* and small-head clover (*T. microcephalum).* Non-native herbs include hairy cat's ears (*Hypochaeris radicata*) smooth cat's ear (*H. glabra*), little hop clover (*Trifolium dubium*), and *Soliva sessilis*.

Although it can dominate sites and become locally abundant, it's distribution and habitat specificity is very narrow. For these reasons the Santa Cruz clover is classified as a CRPR 1B plant and meets certain definitions (Native Plant Protection Act and the California Endangered Species Act) of the California Department of Fish and Wildlife Code making it eligible for state listing. Because of this it is mandatory that it be considered during preparation of environmental documents relating to CEQA.

Known Range and Distribution

The known range of the *T. buckwestiorum* is restricted to Mendocino, Monterey, Santa Cruz and Sonoma counties. Findings since the initial discovery in 2005 on the Garcia River Forest (GRF) indicate substantially larger occurrences in the northern part of its range in Mendocino County (Heise and Hulse-Stephens 2016). The Santa Cruz clover is widespread across the GRF with estimates well over 100,000 individuals comprising at least 100 populations within 32 occurrences (population clusters separated by .25 miles). It occurs primarily along the margins of the existing permanent roads including the Olsen Gulch, Graphite, North Fork Garcia, Blue Water Hole, Inman Creek, and Hollow Tree Roads (Figures 1, 2). It occurs less frequently on existing seasonal and decommissioned roads (Heise and Hulse-Stephens 2006a; 2006b; 2007b; 2008c; 2013b; 2014; Ringstad 2016)

Recommendations

Monitoring frequency data between 2009 – 2015 at 20 permanent sites indicate that *T. buckwestiorum* abundance is extremely variable from year to year regardless of the timing and frequency of grading (Heise and Hulse-Stephens 2010b; 2016). It is very tolerant of grading and vehicular traffic associated with logging activities. In addition, regular grading appears to help distribute seed while reducing competition. In light of these findings we suggest that good road maintenance is beneficial to the long term viability of *T. buckwestiorum* on TCF properties. The following recommendations are provided:

- No grading restrictions other than to follow best management practices designed to minimize soil erosion during road maintenance activities.
- New *T. buckwestiorum* occurrences should be documented as they are discovered and field forms sent to CNDDB as well as added to the TCF rare plant database.
- Schedules of grading activity should be maintained by TCF on a yearly basis so that more informed decisions can be made regarding rare plant management.

Figure 1: Locations of *Trifolium buckwestiorum* and *Piperia candida* along the the Hollow Tree Road

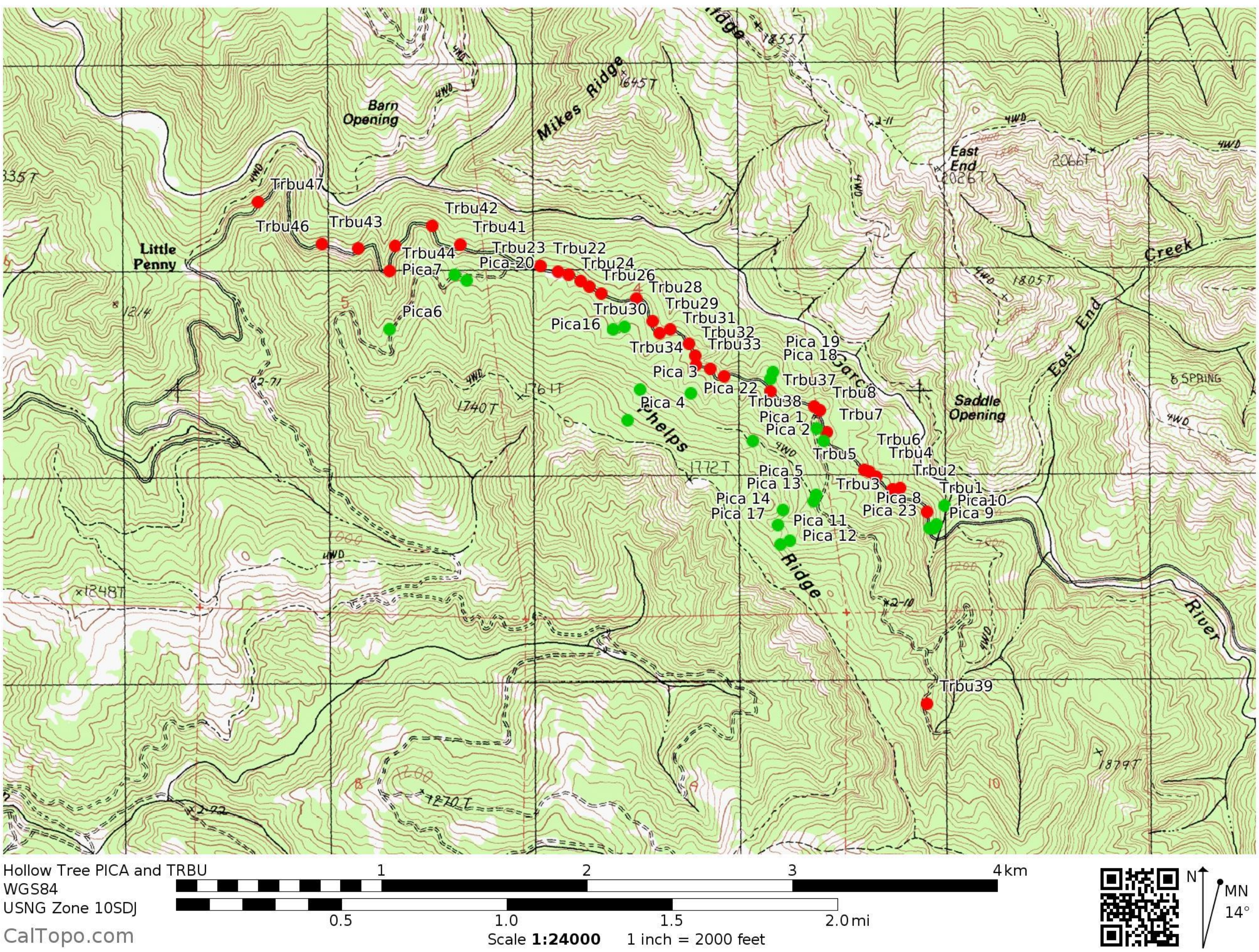
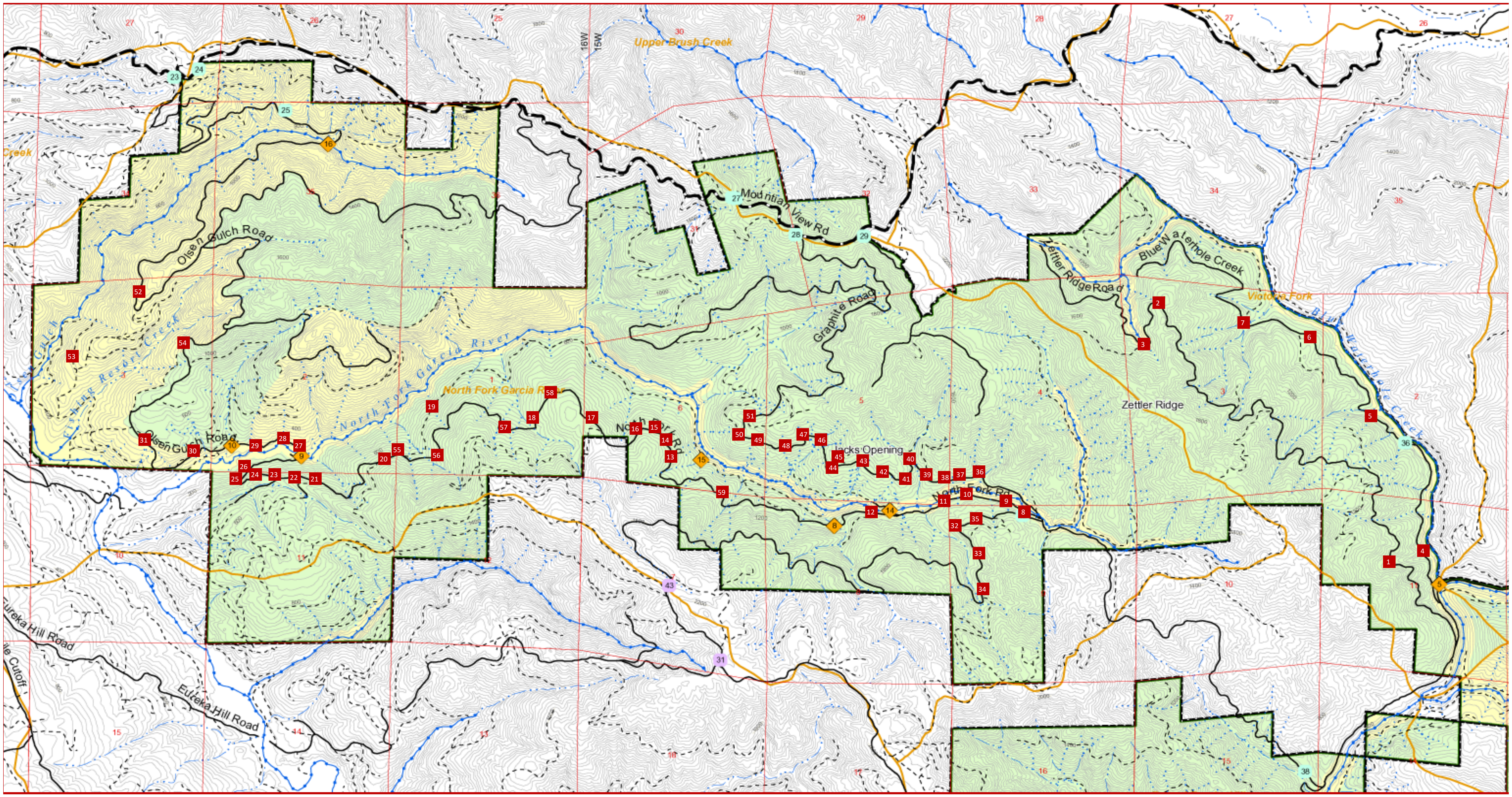


Figure 2: Santa Cruz clover (*Trifolium buckwestiorum*) locations on the western end of the Garcia River Forest.



■ *Trifolium buckwestiorum* occurrences

Marsh Pea (*Lathyrus palustris*) CRPR 2B.2 S2 G5

Marsh Pea, a member of the Legume Family (Fabaceae) has a California Rare Plant Rank of 2B.2

Lathyrus palustris Photo by K. Heise

CRPR 2B = Rare or endangered in California, common elsewhere.
.2 = Fairly endangered in California.
S2 = Imperiled in California
G5 = Secure considering populations outside California

Known Range: The known range for the Marsh Pea includes the coastal counties of NW California then fairly widespread across the country; north to Alaska, across the US to several states along the eastern shore board from Georgia to Maine, from Texas north through the Rocky Mtn. states.

Siting: The Marsh Pea was located April 24, 2005 in a forest bog in the North Coast coniferous forest on a relatively flat shelf on an otherwise steep south-facing slope above the Garcia River (N38.87587, W123.51535) approximately .3 miles west of the hot springs (Fig. 3). The bog is approximately 30m x 30m and the Marsh Pea was found in approximately 30% of the bog. The population covered an area of about 5m x 15m. The Marsh Pea is a long trailing plant that clambers up through surrounding vegetation. In all, 14 stems were found. Plants were approximately 5% in flower and 95% in bud.

Visible Disturbances or Possible Threats: The site is located in an area which serves as a corridor between a maintained road and the hot springs site. Though the property is secured with locked gates the historic popularity of the hot springs may still draw trespassers on foot or all-terrain vehicles. The area has been harvested for timber historically, but the wetland habitat remains vulnerable to traffic of any kind and most particularly to the resumption of logging activity.

Site Quality and Associated Species: The quality of the site is good. The wooded seasonal bog is in a Redwood/Douglas fir forest. Its partially open canopy creates areas of sunshine and shade over saturated and somewhat inundated soils. The dryer edges support shrubs and trees and under story plants, while the wetter areas are dominated by rushes and sedges. The marsh pea was found twinning up through shrubs in saturated soil. The general soil type in the area is 235-Yellowhound-Kibesillah complex with characteristic moderate permeability and low available water capacity however the soil and conditions present at the site give rise to a bog-like habitat.

Laythrus palustris Photo by K. Heise

Plants in the wetter part of the bog include: Pacific rush (*Juncus effusus)*, Common rush (*J. patens)*, Slough sedge (*Carex obnupta)*, Slender beaked sedge (*C. athrostachya)*, Harfords's sedge (*C. harfordii)*, Giant Horsetail (*Equisetum telmateia var. braunii)*, Musk Monkeyflower (*Mimulus moschatus)*, and Marsh Baccharis (*Baccharis glutinosa).*

Plants of the dryer shadier edges include California Blackberry (*Rubus ursinus)*, Creeping Snowberry (*Symphoricarpos mollis)*, Wood Strawberry (*Fragaria vesca)*, Sword Fern (*Polystichum munitum)*, Goosegrass (*Galium aparine)*, Bittercress (*Cardamine oligosperma)*, Lady Fern (*Anthyrium filix-femina)* and Fetid Adders's Tongue (*Scoliopus bigelovii)*, along with woody perennials: western azalea (*Rhododendron occidentalis)*, Coyote Bush (*Baccharis pilularis*), California Myrtle (*Morella californica)* and California Huckleberry (*Vaccinum ovatum).* Trees include Redwood and Douglas-fir.

Recommendations: A protection buffer of 50 feet all around the bog would prevent any accidental traffic in the area and provide protection from vehicular disturbance. Future logging plans will need to include protection and avoidance of this area. Site visit should be conducted every 3/5 years and the CNDDB record updated.

Streamside Daisy, *Erigeron biolettii* E. Greene   CRPR 3   S3? G3?

Streamside Daisy is a perennial and a member of the Sunflower Family (*Asteraceae*). It is a CRPR 3 plant: more information about this plant is needed (Review List).
Endangerment: unknown   **Distribution**: Endemic to California.

Known Range: The known range of Streamside Daisy is from Humboldt County south to Marin Co and eastward to include Solano and Napa counties. According to the CNPS on-line inventory (6^{th} edition) the majority of the known occurrences are in Sonoma and Napa counties. Most collections of this plant are very old and location, rarity and endangerment information are needed.

Visible Disturbances or Possible Threats: Talus deposits at the base of the road cut along the road reveal an unstable bank. Road widening or seismic activity could threaten this population. The #235 Yellowhound-Kibesillah Complex which makes up these soils is subject to severe erosion when the surface is left bare. The majority of this roadcut is bare.

Siting #1: A population of Streamside Daisy was located on June 28, 2005 on a steep, dry southeast facing road cut with serpentinite rocks on Hollow Tree Road south of the intersection with Graphite Road below a mixed broadleaf coniferous forest (38.89817, 123.50423). Note that this site is located north of the map area in Figure 3. The road cut supports approximately 50 plants perched on ledges and disintegrating slopes in an area approximately 15 x 100 m. Plants were 50% in flower.

Site Quality and Associated Species:
The quality of the site is fair with robust individual plants on ledges in steep relatively bare terrain. Above the road cut is a broadleaf mixed coniferous forest which includes Redwood, Douglas-fir, Tanoak (*Lithocarpus densiflorus)*, Canyon Live Oak (*Quercus chrysolepis), Ceonothus foliosus*, Madrone (*Arbutus menziesii)*, and Manzanita (*Arctostaphylos spp*.) The road cut consists of a few small trees and shrubs perched on rocky outcrops and these include Big-leaf Maple (*Acer macrophylla)*, Douglas-fir, Madrone, and Ocean Spray (*Holodiscus discolor)*. Herbs and ferns occupy small crevices in the varied terrain. These include a Stonecrop (*Sedum spathulifolium)*, Indian Pink (*Silene laciniate* subsp. *californica*), Goldback Fern (*Pentagramma triangularis)*, and narrow leaf sword fern (*Polystichum imbricans).*

Siting #2: Streamside Daisy was located on Aug 11, 2005 along the Garcia River south and west of bridge #6 approximately ½ mile and occurred occasionally along the river in the next half mile downstream (N38.87490° W123.51370°), see Figure 3. This part of the river is a deeply cut canyon and the forest above is a redwood/Douglas-fir/tanoak forest. The steep canyon walls support the Streamside Daisy on sandstone outcrops and bedrock crevices. The population was intermittent along the ½ mile stretch of river. Plants were approximately 80% in flower; 20% fruiting. Approximately 200 plants were observed.

Site Quality and Associate Species: The quality of the site is excellent. Streamside Daisy occurs on both sides of the river on the drier, more exposed south facing side and on the moister, shadier north facing side. Where these differing conditions give rise to different associations of species Streamside Daisy thrives in a range of conditions. On the south side of the river Streamside Daisy occurs in sandstone on dry exposed banks and associated species include Red Keckiella (*Keckiella corymbosa)*, Indian Pink (*Silene laciniata* subsp. *californica)*, Ocean Spray

(*Holodiscus discolor),* Zauschneria (*Epilobium canum ssp. latifolium*) and Toyon (*Heteromeles arbutifolia).*

On the north side of the river Streamside daisy grows on boulders lining the side of the river with Red Alder (*Alnus rubra*), Sitka Willow (*Salix sitchensis*), Alumroot (*Heuchera micrantha*) and *Boykinia occidentalis.* The soils along this part of the river are #135-Dehaven-Hotel Complex. The Dehaven soil is deep to bedrock and formed in a material derived from sandstone. The Hotel soil is also derived from sandstone.

Siting #3:
A population of approximately 15 streamside daisy plants was observed on an exposed rocky slope just above the Garcia River on August 7, 2013 (N38.87408 W123.52681) at an elevation of approximately 300 feet within the Sneaky Prawn THP (Heise and Hulse-Stephens 2013), see Figure 3.

Site Quality and Associate Species
The population is comprised of approximately 15 robust plants on a steep rocky substrate in an area of approximately 25 square feet. Associate species are comprised of poison oak (*Toxicodendron diversilobum*), ocean spray (*Holodiscus discolor*), creeping snowberry (*Symphoricarpos mollis*), goldback fern (*Pentagramma triangularis* subsp. *triangularis*) and western fescue (*Festuca occidentalis*).


Erigeron biolettii Photo: K. Heise

Recommendations:
Streamside daisy is a CRPR 3 species, a "review list" status which means more information needs to be gathered about the range and fitness of its populations and the nature of current threats. All occurrences are remote and away from areas where they would be affected by road building practices or timber harvest activities in the future. Because only a few occurrences are known from the GRF, a general assessment of occurrences should be conducted every 3/5 years and CNDDB records updated.

Figure 3: ***Trifolium buckwestiorum, Piperia candida, Erigeron bioletii,*** **and** ***Lathyrus palustris*** **locations on the Sneaky Prawn THP, Garcia River Forest**

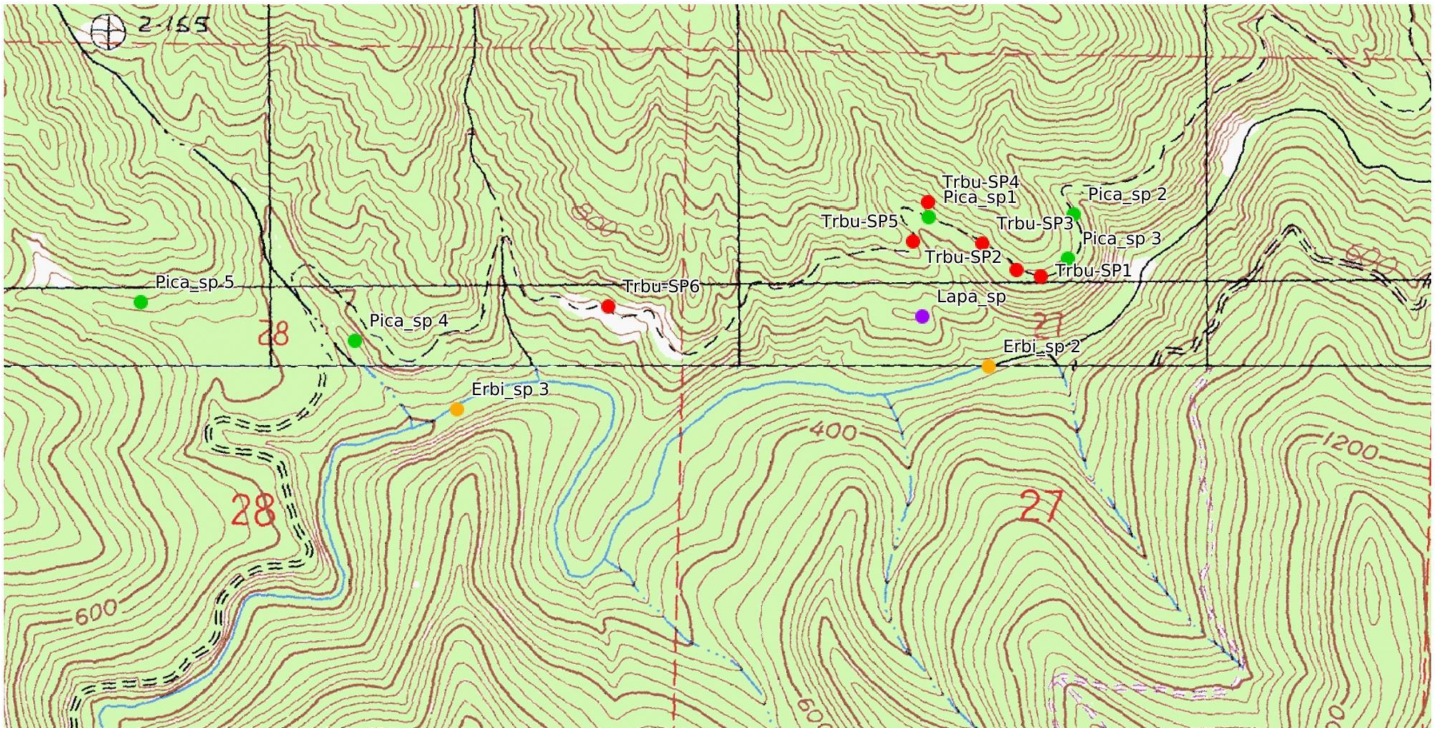
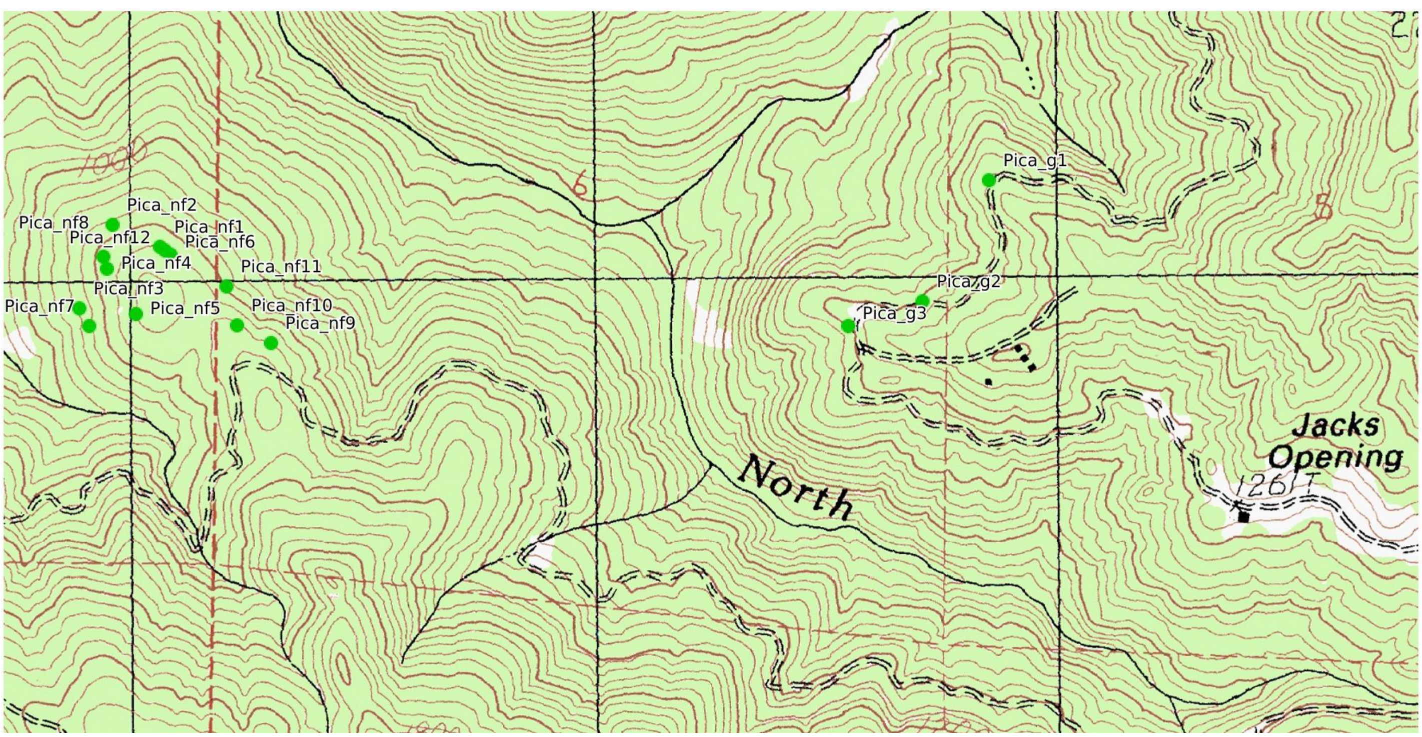


Figure 4: ***Piperia candida*** **locations on the North Fork and Grahite Roads, Garcia River Forest**



White-flowered Rein Orchid, *Piperia candida* R. Morgan & J. Ackerman

CRPR 1B.2 S3 G3

White-flowered Rein Orchid is a member of the Orchid Family (*Orchidaceae*) and has California

1B = Rare and endangered in California and elsewhere
Endangerment .2 = fairly endangered in California
White flowered rein orchid has no state or federal status.
State Rank S3 – vulnerable
Global Rank G3 = vulnerable

Ecology

Typical of other terrestrial orchids, germination is rare in *P. candida*, but when it does take place the seeds probably involve a symbiotic relationship with a fungus (Coleman 1995). Following germination, orchid seedlings typically grow below ground for 1 to several years before producing their first basal leaves. Plants may produce only vegetative growth for several years, before first producing flowers (Rasmussen 1995). The basal leaves of mature *P. candida* typically emerge early following winter rains and wither by July or August when the plant produces a single flowering stem. Monitoring *P. candida* since 2010 on the Garcia River Forest has shown that individuals that flower in one year may not flower the next, and a portion of the population may be completely dormant in any given year (Heise and Hulse-Stephens 2016).

Many of the white-flowering orchid species, including *P. candida*, are pollinated by nocturnal insects, such as geometrid moths in the case of *P. transversa*, and their fragrances are more intense in the evening. These orchids are capable of self-pollination but the rate of production of viable seeds is higher in plants pollinated by insects. Doak and Graff (2001) found that pollinators of *Piperia yadonii*, which is endemic to Monterey County, are predominantly nocturnal, short-tongued moths. In order to maintain adequate seed production to support long-term persistence of the species, they recommended that suitable habitat of sufficient size and connectivity for these pollinators also needs to be maintained.

Site Conditions

The distribution of *Piperia candida*, from observations on commercial timber lands in Mendocino County primarily along margins of skid trails and haul roads, suggests some level or pattern of disturbance is important in maintaining optimal habitat conditions. Local habitat conditions include partial to dense shade, thin soils with little to moderately deep leaf litter. Slash and other woody debris appear to limit establishment and success of *P. candida*.

Known Range: The known range of the white-flowered rein orchid in California extends from Santa Cruz and San Mateo counties northward into Sonoma, Mendocino, Humboldt, Trinity, Del Norte and Siskiyou counties. The range continues into Oregon and Washington.

2005 Siting: A small population of white-flowered Rein Orchid was located on June 7, 2005 on a North facing slope in a disturbed roadside area on Olsen Gulch Road (UTM 45260.915E, 4308066.993N; aspect:18; slope: 38; alt: 313m). After a thorough search only 4 stems were found, all flowering. Although habitat conditions at this site have remained unchanged

2008 – 2017 Sitings:
Numerous sitings have been documented since 2005 representing up to 75 occurrences mostly within the Upper North Fork THP (Heise and Hulse-Stephens 2008a), the Hollow Tree East THP (Heise and Hulse-Stephens 2010a), and Sneaky Prawn THP (Heise and Hulse-Stephens 2013). Baseline data was collected for 15 populations in 2010, followed by yearly monitoring (Heise and Hulse-Stephens 2016). See Figures 1, 3, 4.

Recommendations for *Piperia candida* occurrences

1) A buffer (no harvest area) of at least 50 feet from all confirmed *P. candida* off-road occurrences should be maintained. All trees must be felled away from the circumscribed buffer. Any tractor work above such occurrences should avoid soil destabilization of the slope, additionally actions that could alter upslope hydrology should be avoided.

2) No grading restrictions for occurrences along permanent haul roads and skid trails, however, such occurrences should remain free of slash, woody debris, and cut logs.

3) Because this species has a tendency to forgo flowering from year to year it is problematic to monitor on a yearly basis. Reduce monitoring frequency to every 3 years for permanent sites along Hollow Tree and North Fork roads.

Monterey clover (*Trifolium trichocalyx*) Heller CRPR 1B.1, FE, CE, S1 G1

1B= Rare, threatened or endangered in California and elsewhere.
.1= Seriously endangered in California
State Listing: (CE) Endangered, 11/79
Federal Listing: (FE) Endangered 8/12/98
State Rank: S1= Imperiled—Critically imperiled in the state because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
Global Rank: G1 = **Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

Description
Monterey clover is an herbaceous annual and a member of the Legume Family, *Fabaceae*, and is extremely variable in form (Baldwin et al. 2012). It was discovered and named by botanist Amos Arthur Heller who collected the plant in the sandy pinewoods near Pacific Grove in 1903. He described it in his publication (Heller 1904) as “an inconspicuous plant owing to its small size, depressed habit, and small, few-flowered heads as it occurs in its usual habitat along grass-grown roads and trails in the woods, but occasionally it is found in moist places, when the branches eventually become several decimeters in length. These large plants usually have short, few and small-flowered branches at the base”. This is an apt description of its growth form and habitat in Mendocino County.

Stems: Plants are prostrate and spreading, often compact and occasionally producing one or two long prostrate stems up to 50cm long that become decumbent when supported by adjacent plants.
Leaves: Plants have cauline leaves with 5-10 mm leaflets that are oblanceolate to obovate. Stipules are toothed or lobed.
Inflorescence: Flowers are arranged in head-like clusters of 1-20 flowers subtended by a small, deeply-cut, irregularly toothed involucre that can be smooth or hairy.


Monterey Clover (*Trifolium trichocalyx*) Photo: K. Heise

Flowers: Calyxes are hairy, 6-7 mm with lobes generally longer than the tubes. Calyx lobes are bristle-tipped and sometimes slightly forked. Flowers are contained within the calyx or sometimes extend just beyond the tips of the lobes. Corollas are pale pink to lavender.

Fruit: Fruits are cylindrical and 5-7 mm. long containing up to 6 seeds.

Discovery on the Garcia River Forest

On May 15, 2014 while conducting a botanical survey of the Olsen Gulch THP (THP 1-14-036 MEN) 9 small populations of *T. trichocalyx* were found, specifically along portions of the permanent Olsen Gulch and North Fork Roads and along seasonal Road #38000 which runs along the ridge between Olsen Gulch and Fishing Resort Creeks (Fig. 5) In 2016 an additional 13 *T. trichocalyx* populations were documented, 4 within the Olsen gulch THP (Table 7) and 9 within the Section 11 THP (Fig. 6). Similar to the Big River site 28 mi north discovered in 2011 (Heise et al. 2012), these new populations occur along road margins subject to occasional vehicle use and periodic disturbance from grading.

Along with the Big River occurrence, these are currently the only known populations beyond the Monterey Peninsula (USFWS 2009). Significant from both a biogeographic and conservation perspective, these new populations extend the range of the species approximately 200 mi (322 km) north of the Monterey Peninsula and occur in markedly different habitats with disparate geology, soils, and forest composition thus adding significantly to our knowledge of the ecology and distribution of this extremely rare species.

Because of the rarity of this species and the small population size at each site, baseline data was collected for future monitoring. By using a broad range of disturbance strategies from no action to heavy impact we hoped that the information gained from the 2015 and 2016 monitoring would help to develop the level and pattern of disturbance optimal in the long-term conservation of these and other populations (Heise and Hulse-Stephens 2016).

Overall, *T. trichocalyx* increased almost threefold over 2015 numbers, and due mostly to the sharp increases in 3 of the 4 sites that received severe grading. At these sites increases in *T. trichocalyx* were accompanied by large increases in the length of the occurrence along the roadbed. Unexpectedly, there was no trace of *T. trichocalyx* at one site, nor any species of *Trifolium*, even though the site had supported large numbers 2 years earlier and since then buffered from grading and vehicle use. In 2017 this site rebounded with 41 individuals (Heise 2017b).

Like the Santa Cruz clover, the Monterey clover is resilient to grading pressure and persists under regular disturbance. Similarly, it is an extremely variable species in regards to yearly patterns of presence and abundance. Permanent plots established in 2014 will continue to be monitored and all subsequent discoveries will be documented with CNDDB field forms and added to the TCF rare plant database.

Management Recommendations for Monterey clover (*Trifolium trichocalyx*)

- New *T. buckwestiorum* occurrences should be documented as they are discovered and field forms sent to CNDDB as well as added to the TCF rare plant database.

- Continue monitoring established *T. tricocalyx* sites on the GRF.

- No grading restrictions other than following best management practices designed to minimize soil erosion during road maintenance activities.

- Schedules of grading activity should be maintained by TCF on a yearly basis so that more informed decisions can be made regarding rare plant management.

Monitoring Goals for Monterey clover (*Trifolium trichocalyx*)

- To add to the existing knowledge of *Trifolium trichocalyx* habitat requirements and distribution.

- To track changes in species composition and abundance within *T. trichocalyx* habitat so that informed management decisions can be made.

- To better understand optimal site conditions and disturbance regimes necessary to maintain or increase current population and seed bank densities.

- To understand the effects of different road management practices.

- To gather sufficient information necessary to contribute to an informed evaluation of the status of *T. trichocalyx* in future USFW 5 Year Reviews.

Monitoring Protocols for Monterey clover (*Trifolium trichocalyx*)

- Selected *T. trichocalyx* sites on the Olsen Gulch and Section 11 THP will be monitored yearly through 2020, at which time further monitoring will be evaluated.

- Because of small population sizes all individual *T. trichocalyx* plants will be counted.

- During monitoring all associated species will be documented and a qualitative measure of abundance assigned.

- Habitat conditions will be described, for example, frequency and timing of grading, roadbed integrity, canopy over.

Figure 5: Locations of Monterey clover (*Trifolium trichocalyx*) on the Olsen Gulch THP, Garcia River Forest**.**

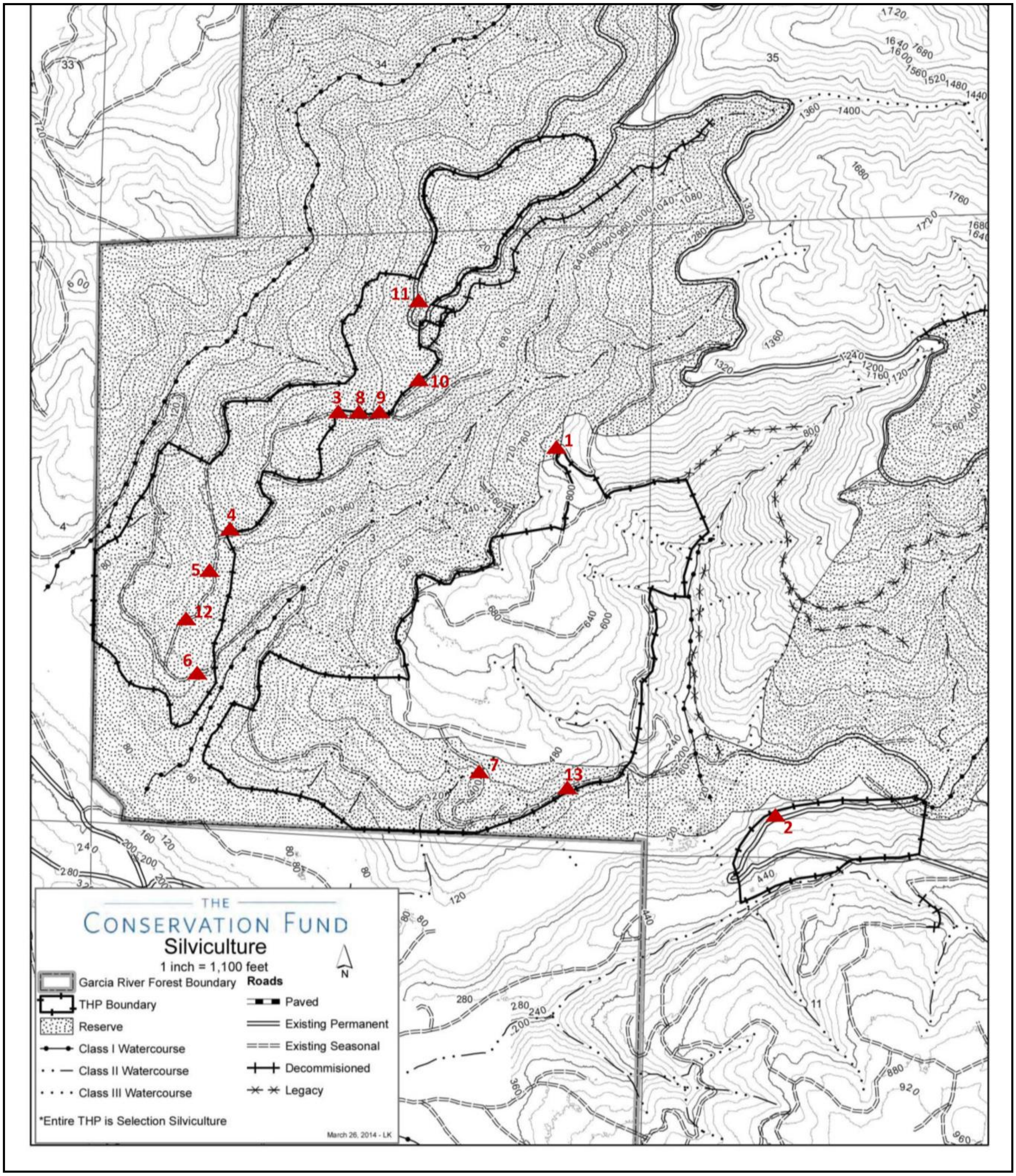
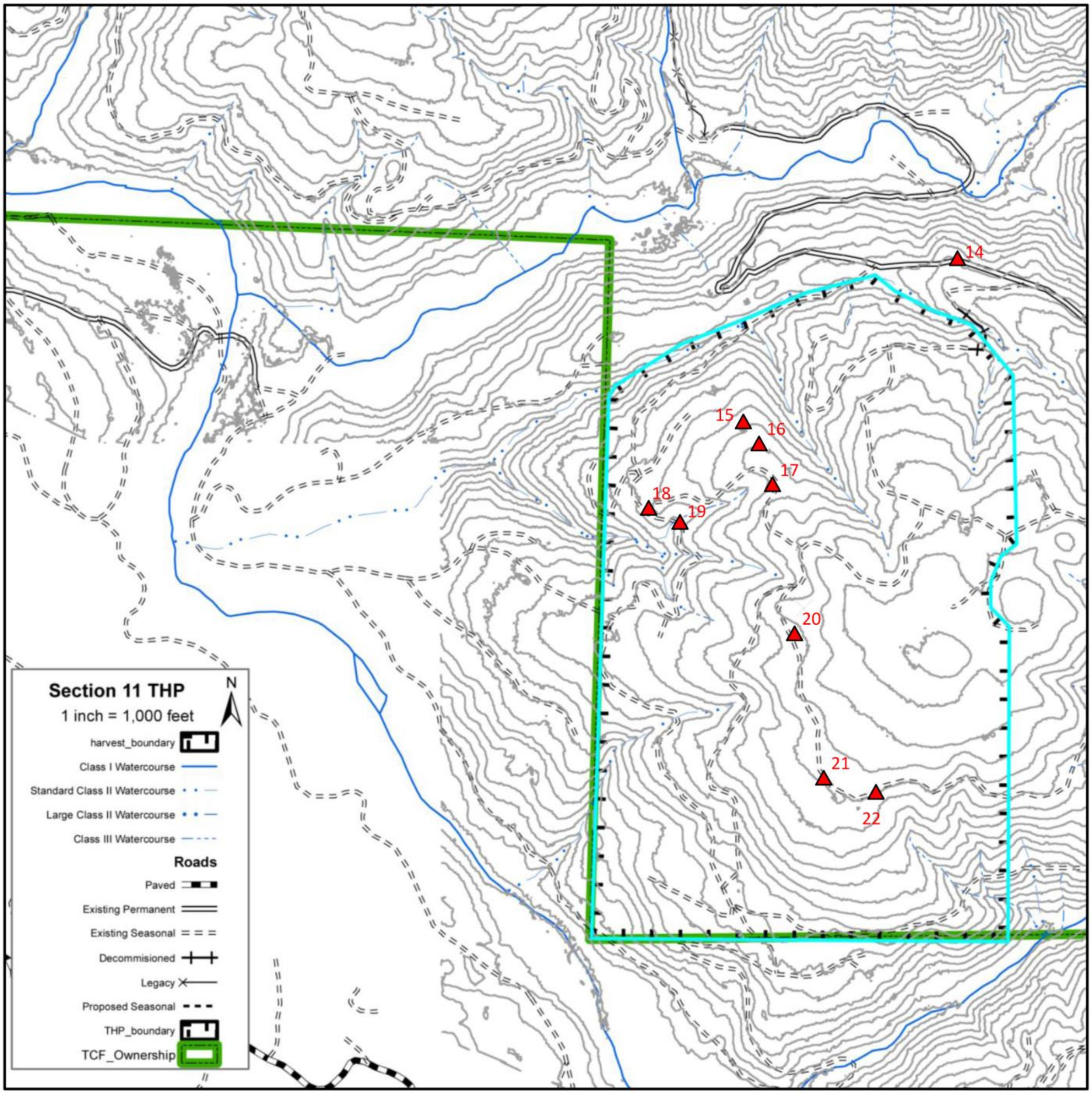


Figure 6: Locations of Monterey clover (*Trifolium trichocalyx*) on the Section 11 THP, Garcia River Forest



Methuselah beard lichen (*Usnea longissima*) CRPR 4.2

The CNPS Rare Plant Program began including Lichens of Conservation Concern in the CNPS *Inventory* in 2014.

CRPR 4 = Limited distribution in California; a watch list. **Endangerment .2** = fairly endangered in California.

Known Range: Alaska to California, W. Cascades

Siting: The Long-beard lichen was located on August 10, 2005 on Inman Road in a Redwood, Douglas Fir forest. It was growing in a single Douglas Fir tree on a northwest slope on the lower side of a road cut (UTM 461277.207E, 4304931.016N; aspect: 342; slope: 22; elv: 283m). No other occurrences were visible in the area.

Importance

According to Macrolichens of the Pacific Northwest, McCune and Geiser, 2000, "*U. longissima* is threatened or extirpated throughout most of its world range…Its highly local distributions suggest dispersal limitations that will impede its recovery from disturbances to its habitat."

"*U. longissima* is one of the most pollution-sensitive lichens. Its presence can be used as an indication of pure air, just as its disappearance indicates deteriorating air quality" (Lichens of North America, Brodo, Sharnoff and Sharnoff, 2000).

Site Quality and Associate Species: The quality of the site is poor with only a single Douglas-fir serving as host species. This tree was sparsely garlanded with the long pendulous lichen though Douglas-fir trees were within 10m of the host tree. The northwest facing slope above the deep Inman Creek drainage is exposed to cool, moist, onshore, up canyon air flows. The components of the forest include: Douglas-fir Redwood, Tanoak, Madrone, and California Huckleberry (*Vaccinium ovatum*).

Recommendation: If possible individual trees supporting Methuselah beard lichen should be protected. Additional discoveries should be documented and CNDDB records made.

Exotic Species on the Garcia River Forest

The exotic flora of the Garcia River Forest consists of 133 (up from 110 in 2005) species and is represented largely by the Poaceae, Asteraceae, and Fabaceae. Many of the more conspicuous exotics are associated with the roads that traverse the property and represent severely disturbed habitat. Three species, Jubatagrass (*Cortaderia jubata*), French Broom (*Genista monspessulana*), and yellow star thistle (*Centaurea solstitialis)* are on the California Invasive Plant Council (Cal-IPC) List A-1 (Most Invasive Wildland Pest Plants: Widespread) and were observed primarily along the roadways. These species, once established, have the potential to displace native species. Refer to the citations that follow for additional management information.

Jubatagrass (*Cortaderia jubata*)
Occurs in dense patches along the upper portion of the Olson Gulch Rd near Gate 23 where it is associated with disturbed areas such as landings and clearings along the road. Other occurrences were observed along Signal Creek Road. Since 2005 additional infestations have been documented at the Jack's Opening THP (Heise and Hulse-Stephens 2006a), Lower North Fork THP (Heise and Hulse-Stephens 2006b), and the Olsen Gulch THP (Heise and Hulse-Stephens 2014).

Control of jubata grass is similar to methods used to remove pampas grass. Because of the sensitivity of coastal sites occupied by jubata grass, few control strategies are available. Infestations sometimes can be averted by overseeding disturbed sites with desirable vegetation to prevent jubata grass seedling establishment. Manual methods such as pulling or hand grubbing jubata grass seedlings are highly effective. Seedling leaves are shiny, stiff, and erect. Other more desirable grasses are not as stiff. For larger plants, however, a pulaski, mattock, or shovel are the safest and most effective tools for removing established clumps. To prevent resprouting, it is important to remove the entire crown and top section of the roots. Detached plants left lying on the soil surface may take root and reestablish under moist soil conditions. A large chainsaw or weedeater can expose the base of the plant, allow better access for removal of the crown, and make disposal of the detached plant more manageable.

Cutting and removing or burning the inflorescence is important to prevent seed dispersal during the operation. This is best accomplished prior to seed maturation. To reduce labor, the top of the foliage can be removed and the remaining crown treated with diesel oil. Burning does not provide long-term control. The growing points of the grass are protected by surrounding leaves. This leads to rapid resprouting following a burn.

French Broom (*Genista monspessulana*)

In 2005 a large patch of French Broom was seen occurring along the Hollow Tree road between the intersections of Graphite Road and the Eureka Hill Road. This population is also associated with a portion of road that has been widened. Because of their invasive potential and close proximity to the road efforts should be made to control the spread of these plants.

French broom can be successfully managed by hand and mechanical removal especially when plants are young. Heavy equipment causes significant disturbance that will bring about re-sprouting from the seed bank. Prior to timber harvest operations, mature plants should be removed by weed wrench or excavator, soil shaken loose from the roots and plants stacked for burning. Used in conjunction with hand removal of year old plants an area can be left for one year after disturbance, before plants begin to flower, and returned to the following year for hand removal of all sprouts to reverse any infestation stimulated by soil disturbance.

Yellow star thistle (*Centaurea solstitialis)*

Small occurrences occur throughout the GRF, such as one descried here in the Jack's Opening THP (Heise and Hulse-Stephens 2006a), however now great infestations have been documented. Since human activity is the primary mechanism for the movement of this plant, disturbance of these populations by road maintenance equipment could provide a means for spreading the seed along the roads and within the areas where roads and skidtrails will be developed within the THP. Furthermore, these populations occur in close proximity to Santa Cruz Clover occurrences along Graphite Road and therefore extreme care is recommended in any treatment of yellow star thistle. Due to the small size of all populations of yellow star thistle direct methods are preferable over biological control which would promise to reduce the populations by 50 to 75 percent without eradicating it

Various methods of spot eradication are the least expensive and most effective method of preventing establishment of yellow star thistle (Bossard et al 2000). For information on control techniques the websites below should be consulted.

English Ivy (*Hedera helix*)

English ivy was observed as a single stout vine extending up a redwood tree on a northwest facing slope above Fishing Resort Creek, N38.93630° W123.62833° (Heise and Hulse-Stephens 2006b). This occurrence is represented on the accompanying map as well. Though no infestation was observed the presence of a single plant in the coastal forest represents the potential for future infestation and any individuals observed should be removed. It has the potential to completely cover forest stands in vigorous vines where nothing else seems able to compete. It inhibits regeneration of understory plants including herbaceous species, new trees and shrubs.

Another occurrence was observed on April 17, 2014, at N38 55.826, W123 37.496 in deep shade at an elevation 247 feet in the Olsen Gulch THP (Heise and Hulse-Stephens 2014). It was observed draping, spanning and surrounding two red alder trees standing 20 feet apart along the side of the road. Thirty-foot long bundles of vine were observed cascading down from upper branches.

English ivy can alter natural succession patterns in forests. It can form “ivy deserts” of vigorous vines in forests where nothing else seems able to compete. Vegetative reproduction is the key to the success of English ivy though it can also produce fruits that can be transported to other parts of the forest. English ivy seed is scarified, allowing it to germinate, and transported by passing through the digestive systems of birds. The best method for controlling English ivy may be hand removal. Removing and killing vines that spread up into trees is especially important because the fertile branches grow primarily on upright portions of the vine. If vines are cut at the base of the tree the upper portions will die quickly but may persist on the tree for some time. Vines on the ground should be removed to prevent regrowth up the tree (Bossard et al, 2000). Though no large scale infestation have been observed within the Garcia River Forest changing climatic conditions could favor this invasive in the future increasing its impact on the forest community. Consistent control now may prevent future problems.

Other Invasive Exotics

The western portion of the property has sizable infestations of Forget-me-Not (*Myosotis latifolia*) along the lower Olson Gulch and western North Fork roads just above the main fork of the Garcia River. This species along with foxglove (*Digitalis purpurea*) and sweet vernal grass (*Anthoxanthum odoratum*) are some of the most conspicuous exotics species associated with redwood forest. Grasslands on the eastern end of the GRF in the Inman watershed are compositionally complex with some areas largely dominated by a mix of non-native grasses such as wild oats (*Avena barbata*), big quaking grass (*Briza maxima*), hedgehog dogtail (*Cynosurus echinatus*), ripgut brome (*Bromus diandrus*), soft chess (*B. hordeaceus*), and medusa head (*Elymus caput-medusae*). Yet, even though exotic grasses can appear to dominate some areas, compositionally they only account for a quarter or less of all species present. There is also a high proportion of native forbs and grasses in these systems.

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Appendix A

Vascular Plants of the Garcia River Forest, The Conservation Fund, Mendocino County, California.

Plant surveys conducted by Kerry Heise and Geri Hulse-Stephens, Updated July 2017

Nomenclature and taxonomy follows the Jepson Manual, Higher Plants of California, 2nd edition, 2012.

Jepson Flora Project (2017); Jepson e-Flora http://ucjeps.berkeley.edu/eflora

Exotic species followed by an asterix have the potential to become invasive.

Rare plants in bold: California Rare Plant Rank 1B = Plants rare, threatened, or endangered in Calif. and elsewhere;

CRPR 2A = Presumed extirpated in Calif., but more common elsewere

CRPR 2B = Rare, threatened, or endangered in Calif. but more common elsewhere

CRPR 3 = A review list, plants needing more information; CRPR 4 = A watch list, plants of limited distribution.

Families = 91; Total species and infraspecific taxa = 618; Exotics = 133 (22%)

Family	**Scientific Name**	**Common Name**	**Exotic**
LYCOPHYTES			
Selaginellaceae - Spike-Moss family			
	Selaginella wallacei		
FERNS			
Athyriaceae - Lady Fern Family			
	Athyrium filix-femina var. cyclosorum	lady fern	
Blechnaceae -Deer Fern Family			
	Struthiopteris spicant (Blechnum s.)	deer fern	
	Woodwardia fimbriata	giant chain fern	
Dennstaedtiaceae - Bracken Fern Family			
	Pteridium aquilinum var. pubescens	bracken fern	
Dryopteridaceae -Wood Fern Family			
	Dryopteris arguta		
	Polystichum californicum	California sword fern	
	Polystichum imbricans ssp. imbricans	narrow-leaf sword fern	
	Polystichum munitum	western swordf fern	
Equisetaceae - Horsetail Family			
	Equisetum arvense	common horsetail	
	Equisetum hyemale ssp. affine	common scouring rush	
	Equisetum laevigatum	smooth scouring rush	
	Equisetum telmateia ssp. braunii	giant horsetail	
Polypodiaceae - Polypody Family			
	Polypodium californicum	California polypody	
	Polypodium calirhiza		
	Polypodium glycyrrhiza	licorice fern	
	Polypodium scouleri	leather leaf fern	
Pteridaceae - Brake Fern Family			
	Adiantum aleuticum	five-finger fern	

	Adiantum jordanii		
	Aspidotis californica		
	Aspidotis densa	dense lace fern	
	Myriopteris gracillima (Cheilanthes g.)	lace lip fern	
	Pellaea andromedifolia	coffee fern	
	Pellaea mucronata var. mucronata	bird's foot fern	
	Pentagramma triangularis ssp. *triangularis*	goldenback fern	
GYMNOSPERMS			
Cupressaceae - Cypress Family			
	Sequoia sempervirens	coast redwood	
Pinaceae - Pine Family			
	Abies grandis	grand fir	
	Pinus contorta ssp. contorta	shore pine	
	Pinus lambertiana	sugar pine	
	Pinus muricata	Bishop pine	
	Pinus ponderosa	ponderosa pine	
	Pseudotsuga menziesii	Douglas fir	
	Tsuga heterophylla	western hemlock	
Taxaceae - Yew Family			
	Taxus brevifolia	Pacific yew	
	Torreya californica	California nut-meg	
MAGNOLIIDS			
Lauraceae - Laurel Family			
	Umbellularia californica	California bay	
EUDICOTS			
Adoxaceae - Muskroot Family			
	Sambucus nigra subsp. *caerulea (S. mexicana)*	blue elderberry	
	Sambucus racemosa var. *racemosa*	red elderberry	
Anacardiaceae - Sumac Family			
	Toxicodendron diversilobum	poison oak	
Apiaceae - Carrot Family			
	Angelica tomentosa	woolly angelica	
	Anthriscus caucalis	bur-chervil	x
	Conium maculatum	poison hemlock	
	Daucus pusillus	rattlesnake weed	
	Lomatium dasycarpum		
	Lomatium utriculatum		
	Osmorhiza berteroi (O. chilensis)	sweet cicley	
	Perideridia kelloggii	yampah	
	Sanicula arctopoides	footsteps of spring	
	Sanicula bipinnatifida	purple sanicle	
	Sanicula crassicaulis	gamble weed	

	Sanicula laciniata		
	Torilis arvensis	japanese hedge parsley	x
	Torilis nodosa	knotted hedge parsley	x
Araliaceae - Ginsing Family			
	Aralia californica	elk clover	
	Hedera helix	english ivy	x*
Aristolochiaceae - Pipevine Family			
	Asarum caudatum	wild-ginger	
Asteraceae - Aster Family			
	Achillea millefolium	yarrow	
	Adenocaulon bicolor	trail plant, silver arrow	
	Agoseris grandiflora	grand mountain dandelion	
	Agoseris heterophylla		
	Anisocarpus madioides (Madia madioides)	woodland tarweed	
	Anaphalis margaritacea	pearly everlasting	
	Arnica discoidea		
	Artemisia douglasiana	mugwort	
	Baccharis glutinosa (B. douglasii)	marsh baccharis	
	Baccharis pilularis	coyote brush	
	Carduus pycnocephalus	italian thistle	x*
	Centaurea melitensis	napa thistle, tocalote	x*
	Centaurea solstitialis	yellow star-thistle	x*
	Chrysanthemum segetum	corn chrysanthemum	x
	Cirsium brevistylum		
	Cirsium cymosum		
	Cirsium occidentale var. *venustum*	venus thistle	
	Cirsium vulgare	bull thistle	x
	Crepis capillaris		
	Crepis vesicaria ssp. taraxacifolia		
	Ericameria arborescens	golden fleece	
	Erigeron biolettii	**streamside daisy CRPR 3**	
	Erigeron canadensis (Conyza c.)	horseweed	x
	Erigeron sumatrensis (Conyza floribunda)	tropical horseweed	x
	Eriophylum confertiflorum var confertiflorum	golden-yarrow	
	Eriophyllum lanatum var. *arachnoideum*	common wooly sunflower	
	Euchiton sphaericus (Gnaphalium japonicus)		x
	Eurybia radulina (Aster radulinus)	broad-leafed aster	
	Gamochaeta ustulata (Gnaphalium purpureum)	featherweed	
	Gnaphalium palustre	cudweed	
	Helenium puberulum		
	Heterotheca oregona var. *rudis*	rayless golden aster	
	Hieracium albiflorum	hawkweed	

	Hypochaeris glabra	smooth cat's ear	x
	Hypochaeris radicata	hairy cat's ear	x
	Lactuca saligna	willow lettuce	x
	Lactuca serriola	prickley lettuce	x
	Lagophyylla ramosissima ssp ramosissima		
	Lasthenia californica	goldfields	
	Leontodon saxatilis subsp. *longirostris*	hairy hawkbit	x
	Leucanthemum vulgare	ox-eye daisy	x
	Logfia californica (Filago filaginoides)	California cottonrose	x
	Logfia gallica (Filago gallica)		x
	Madia exigua	litter tarweed	
	Madia gracilis	slender tarweed	
	Madia sativa	coast tarweed	
	Malacothrix floccifera		
	Micropus californicus	slender cottonweed	
	Microseris douglasii ssp douglasii		
	Petasites frigidus var palmatus	coltsfoot	
	Pseudognaphalium beneolens	cudweed	
	Pseudognaphalium californicum	everlasting	
	Pseudognaphalium luteo-album	cudweed	x
	Pseudognaphalium ramosissimum	everlasting	
	Pseudognaphalium stramineum		
	Pseudognaphalium thermale		
	Psilocarphus brevissimus var. brevissimus	dwarf woolly-heads	
	Rafinesquia californica	California chicory	
	Senecio glomeratus (Erechtites glomerata)	cutleaf burnweed	x
	Senecio minimus (Erechtites minima)	coastal burnweed	x
	Senecio vulgaris		x
	Silybum marianum	milk vetch	x
	Solidago californica	California goldenrod	
	Soliva sessilis		x
	Sonchus asper	prickly sow thistle	x
	Sonchus oleraceus	common sow thistle	x
	Stephanomeria elata		
	Stephanomeria virgata subsp. *pleurocarpa*		
	Taraxacum officionalis	California dandelion	x
	Tolpis barbata		x
	Wyethia angustifolia	narrow-leaf mules ears	
	Wyethia glabra	coast range mule ears	
	Xanthium strumarium	cocklebur	
Berberidaceae - Barberry Family			
	Achlys californica	vanilla leaf	

	Berberis nervosa	barberry	
	Vancouveria planipetala	redwood ivy	
Betulaceae - Birch Family			
	Alnus rhombifolia	white alder	
	Alnus rubra	red alder	
	Corylus cornuta subsp. californica	hazelnut	
Boraginaceae - Borage Family			
	Amsinckia menziesii var. intermedia	rancher's fireweed	
	Cryptantha flaccida		
	Cryptantha torreyana	Torrey's cryptantha	
	Cynglossum grande	hound's tongue	
	Eriodictyon californicum	yerba santa	
	Myosotis discolor	blue scorpion grass	x
	Myosotis latifolia	forget-me-not	
	Nemophila heterophylla		
	Nemophila menziesii var. atomaria	baby white-eyes	
	Nemophila menziesii var. menziesii	baby blue-eyes	
	Nemophila parviflora		
	Nemophila pedunculata		
	Pectocarya pusilla	little pectocarya	
	Phacelia bolanderi		
	Phacelia mutabilis		
	Phacelia nemoralis subsp. oreganensis		
	Plagiobothrys bracteatus		
	Plagiobothrys nothofulvus	popcorn flower	
	Plagiobothrys tenellus	Pacific popcorn flower	
Brassicaceae- Mustard Family			
	Barbarea orthoceras	winter cress	
	Cardamine californica	milk maids	
	Cardamine oligosperma		
	Draba verna	whitlow-grass	
	Erysimum capitatum ssp. capitatum	western wallflower	
	Nasturtium officionale	water cress	
	Raphanus raphanistrum	jointed charlock	x
	Turritis glabra (Arabis g.)	tower mustard	
	Sisymbrium officinale	hedge mustard	x
	Streptanthus glandulosus ssp. secundus		
Campanulaceae - Bluebell Family			
	Asyneuma prenanthoides (Campanula p.)	California harebell	
	Campanula scouleri	Scouler's harebell	
	Githopsis specularioides		
	Heterocodon rariflorum		

Caprifoliaceae - Honeysuckle Family			
	Lonicera hispidula	honeysuckle	
	Lonicera interrupta	chaparral honeysuckle	
	Symphoricarpos albus var. *laevigatus*	snowberry	
	Symphoricarpos mollis	creeping snowberry	
Caryophyllaceae - Pink Family			
	Cerastium glomeratum	mouse-ear chickweed	x
	Minuartia douglasii		
	Petrorhagia dubia		x
	Sagina decumbens subsp. occidentalis	pearlwort	
	Silene gallica	windmill pink	x
	Silene laciniata subsp. californica	indian pink	
	Spergularia rubra	sand-spurrey	x
	Stellaria crispa		
	Stellaria media	common chickweed	x
	Stellaria nitens	shining chick-weed	
Celastraceae - Staff Tree Family			
	Euonymus occidentalis	western burning bush	
Chenopodiaceae - Goosefoot Family			
	Dysphania bothrys	jerusalem oak	x
Convolvulaceae - Morning-Glory Family			
	Calystegia purpurata ssp purpurata		
	Calystegia subacaulis subsp. *subacaulis*		
Cornaceae - Dogwood Family			
	Cornus nuttallii	mountain dogwood	
Crassulaceae - Stonecrop Family			
	Crassula tillaea	sand pygmy weed	
	Sedum spathulifolium		
Cucurbitaceae - Gourd Family			
	Marah oreganus	coast manroot	
Cuscutaceae - Dodder Family			
	Cuscuta sp.	dodder	
Datiscaceae - Datisca Family			
	Datisca glomerata	durango root	
Dipsacaceae - Teasel Family			
	Dipsacus fullonum	wild teasel	x
Elatinaceae - Waterwort Family			
	Elatine rubella		
Ericaceae - Heath Family			
	Allotropa virgata	sugar stick	
	Arbutus menziesii	madrone	
	Arctostaphylos canescens subsp. *canescens*	hoary manzanita	

	Arctostaphylos canescens subsp. *sonomensis*	sonoma manzanita	
	Arctostaphylos columbiana	Columbia manzanita	
	Arctostaphylos glandulosa subsp. *glandulosa*		
	Arctostaphylos manzanita subsp. *glaucescens*	common manzanita	
	Arctostaphylos manzanita subsp. *manzanita*	common manzanita	
	Chimaphila menziesii	little prince's pine	
	Gaultheria shallon	salal	
	Hemitomes congestum	gnome plant	
	Monotropa hypopitys	pinesap	
	Pyrola picta	white-veined wintergreen	
	Rhododendron macrophyllum	California rhododendron	
	Rhododendron occidentale	western azalea	
	Vaccinium ovatum	California huckleberry	
	Vaccinium parvifolium	red huckleberry	
Euphorbiaceae - Spurge Family			
	Chamaesyce serpyllifolia	thyme-leafed spurge	
	Croton setigerus (Eremocarpus s.)	turkey mullein	
	Euphorbia lathyris	gopher plant	x
Fabaceae - Pea Family			
	Acmispon americanus var. americanus (Lotus purshianus)	spanish lotus	
	Acmispon brachycarpus (Lotus humistratus)	deervetch	
	Acmispon glaber (Lotus scoparius)	California broom	
	Acmispon parviflorus (Lotus micranthus)	deervetch	
	Acmispon wrangelianus (Lotus w.)		
	Astragalus gambelianus	gambel's dwarf locoweed	
	Cytisus scoparius	scotch broom	x
	Genista monspessulana	french broom	x*
	Hosackia stipularis (Lotus s.)	lotus	
	Lathyrus angulatus		x
	Lathyrus hirsutus	Caley pea	x
	Lathyrus jepsonii var californicus		
	Lathyrus palustris	**marsh pea - CRPR 2B.2**	
	Lathyrus polyphyllus		
	Lathyrus torreyi		
	Lathyrus vestitus var. ochropetalus		
	Lathyrus vestitus var. vestitus	hillside pea	
	Lotus corniculatus	birdfoot trefoil	x
	Lupinus arboreus	yellow bush lupine	
	Lupinus bicolor	miniature lupine	
	Lupinus latifolius	broadleaf lupine	
	Lupinus rivularis		

	Medicago lupulina	black medick	x
	Medicago polymorpha	California burclover	x
	Melilotus alba	white sweetclover	x
	Melilotus officinalis	yellow sweet clover	x
	Pickeringia montana var montana	chaparral pea	
	Trifoliium depauperatum	baloon clover	
	Thermopsis gracilis (T. macrophylla var. venosus)	false-lupine	
	Trifolium albopurpureum		
	Trifolium barbigerum	bearded clover	
	Trifolium bifidum var bifidum	pinole clover	
	Trifolium bifidum var decipiens	pinole clover	
	Trifolium buckwestiorum	**Santa Cruz clover - CRPR 1B.2**	
	Trifolium cernuum	nodding clover	
	Trifolium ciliolatum	foothill clover	
	Trifolium depauperatum	balloon clover	
	Trifolium dichotomum (T. albopurpureum var. d.)		
	Trifolium dubium	little hop clover	x
	Trifolium fucatum	bull clover	
	Trifolium glomeratum	clustered clover	x
	Trifolium gracilentum	pinpoint clover	
	Trifolium incarnatum	crimson clover	x
	Trifolium microcephalum	maiden clover	
	Trifolium microdon	thimble clover	
	Trifolium obtusiflorum	clammy clover	
	Trifolium oliganthum	few-flowered clover	
	Trifolium striatum	knotted clover	x
	Trifolium subterraneum	subterranean clover	x
	Trifolium trichocalyx	**Monterey clover - CRPR 1B.1**	
	Trifolium varigatum	white-topped clover	
	Trifolium willdenovii	tomcat clover	
	Vicia americana	american vetch	
	Vicia gigantea	giant vetch	
	Vicia hirsuta		x
	Vicia sativa subsp. *nigra*	narrow-leaved vetch	x
	Vicia sativa subsp. *sativa*	spring vetch	x
	Vicia tetrasperma		x
Fagaceae - Beech Family			
	Chrysolepis chrysophylla var. *chrysophylla*	chinquapin	
	Notholithocarpus densiflorus var. *densiflorus*	tan oak	
	Notholithocarpus densiflorus var *echinoides*	dwarf tanbark	
	Quercus agrifolia	coast live oak	
	Quercus chrysolepis	canyon live oak	

	Quercus garryana var. garryana	oregon oak, garry oak	
	Quercus kelloggii	black oak	
	Quercus lobata	valley oak	
	Quercus parvula var. shrevei	shreve oak	
	Quercus wislizeni var frutescens	dwarf interior live oak	
	Quercus wislizeni var. wislizeni	interior live oak	
Garryaceae- Silk Tassel Family			
	Garrya elliptica	silk tassel bush	
Gentianaceae - Gentian Family			
	Cicendia quadrangularis		
	Zeltnera davyi (Centaurium d.)	davy's centaury	
	Zeltnera muehlenbergii (Centarium m.)	montery centaury	
Geraniaceae - Geranium Family			
	Erodium botrys	broadleaf filaree	x
	Erodium cicutarium	red-stemmed filaree	x
	Geranium dissectum	cut-leaf geranium	x
	Geranium molle	dove-foot geranium	x
	Pelargonium grossularioides		x
Grossulariaceae - Gooseberry Family			
	Ribes californicum ssp. californicum	hillside gooseberry	
	Ribes menzisii	canyon gooseberry	
	Ribes roezlii var. cruentum	sierra gooseberry	
	Ribes sanguineum var. glutinosum	red-flowering currant	
Hypericaceae - St. John's Wort Family			
	Hypericum anagalloides	tinker's penny	
	Hypericum concinnum	gold-wire	
	Hypericum perforatum	klamath weed	x*
Lamiaceae - Mint Family			
	Clinopodium douglasii (Satureja d.)	yerba buena	
	Glechoma hederacea	ground ivy	x
	Lepechinia calycina	pitcher sage	
	Melissa officinalis	bee balm	
	Mentha arvensis	field mint	
	Mentha pulegium	penny royal	x*
	Monardella villosa ssp. villosa	coyote mint	
	Pogogyne zizyphoroides		
	Prunella vulgaris var. lanceolata	self-heal	
	Scutellaria antirrhinoides	skullcap	
	Scutellaria californica	California skullcap	
	Scutellaria tuberosa		
	Stachys ajugoides	hedge nettle	
	Stachys rigida var. *quercetorum*	hedge nettle	

	Stachys chamissonis	coast hedge nettle	
	Trichostema lanceolatum	vinegar weed	
	Trichostema laxum	turpentine weed	
Limnanthaceae - Meadowfoam Family			
	Limnanthes douglasii ssp. nivea	snowy meadowfoam	
Linaceae - Flax Family			
	Linum bienne	common flax	x
Lythraceae - Loosestrife Family	Loosestrife Family		
	Lythrum hyssopifolium	loosestrife	x
Malvaceae - Mallow Family			
	Sidalcea diploscypha		
Montiaceae - Montia Family			
	Calandrinia menziesii (C. ciliata)	redmaids	
	Claytonia exigua		
	Claytonia parviflora	streamside spring beauty	
	Claytonia perfoliata	miner's lettuce	
	Claytonia sibirica	candy flower	
	Montia siberica		
	Montia fontana	water chickweed, blinks	
	Montia parvifolia	samll-leaved montia	
Moraceae- Mulberry Family			
	Ficus carica	edible fig	x
Myricaceae- Wax Mytrle Family			
	Morella californica (Myrica California)	California wax myrtle	
Myrsinaceae - Myrsine Family			
	Lysimachia arvensis (Anagallis a.)	scarlet pimpernel	x
	Lysimachia latifolia (Trientalis l.)	star flower	
	Lysimachia minimus (Centunculus minimus)	chaffweed	
Oleaceae - Olive Family			
	Fraxinus latifolia	oregon ash	
	Fraxinus dipetala	California ash	
	Olea europea	olive	x
Onagraceae - Evening Primrose Family			
	Clarkia concinna	red ribbons	
	Clarkia purpurea ssp. quadrivulnera		
	Epilobium brachycarpum		
	Epilobium canum subsp. *latifolium*	zauschneria	
	Epilobium ciliatum subsp. *ciliatum*	northern willow herb	
	Epilobium ciliatum subsp. *glandulosum*		
	Epilobium densiflorum		

	Epilobium minutum		
Orobanchaceae - Broomrape Family			
	Castilleja attenuata	valley tassels	
	Castilleja densiflora	owl's clover	
	Castilleja wightii		
	Kopsiopsis strobilacea (Boschniakia s.)	California groundcone	
	Orobanche fasiculata	clustered broom-rape	
	Orobanche uniflora	naked broom rape	
	Pedicularis densiflora	indian warrior	
	Triphysaria eriantha ssp. eriantha	butter and eggs	
	Triphysaria pusilla		
	Triphysaria versicolor ssp. versicolor		
Oxalidaceae- Oxalis Family			
	Oxalis pilosa		
	Oxalis corniculata		x
	Oxalis laxa		x
	Oxalis oregana	redwood sorrel	
Papaveraceae - Poppy Family			
	Dicentra formosa	bleeding heart	
	Eschscholzia californica	California poppy	
	Platystemon californicus	cream cups	
Philadelphaceae - Mock Orange Family			
	Whipplea modesta	yerba de selva, modesty	
Phrymaceae - Lopseed Family			
	Mimulus aurantiacus	sticky monkey-flower	
	Mimulus cardinalis	scarlet monkey flower	
	Mimulus congdonii		
	Mimulus douglasii		
	Mimulus guttatus	common monkeyflower	
	Mimulus moschatus	musk monkeyflower	
Plantaginaceae - Plantain Family			
	Callitriche heterophylla var. bolanderi	Bolander's water-starwort	
	Callitriche marginata		
	Collinsia parviflora	blue-eyed mary	
	Digitalis purpurea	foxglove	x
	Keckiella corymbosa	red keckiella	
	Plantago erecta		
	Plantago coronopus	cut-leaf plantain	x
	Plantago lanceolata	English plantain	x
	Synthyris reniformis	snow queen	
	Tonella tenella		
	Veronica americana	American brooklime	

Polemoniaceae - Phlox Family			
	Collomia heterophylla	varied-leaf collomia	
	Gilia capitata ssp. capitata	blue field gilia	
	Gilia tricolor ssp. tricolor	bird's eye	
	Leptosiphon acicularis (Linanthus a.)	**bristly linanthus CRPR 4.2**	
	Leptosiphon bicolor (Linanthus b.)	bicolored linanthus	
	Leptosiphon ciliatus (Linanthus ciliatus)	whisker brush	
	Leptosiphon minimus		
	Leptosiphon parviflorus (Linanthus p.)		
	Navarretia intertexta ssp intertexta	needle-leaved navarretia	
	Navarretia squarrosa	skunkweed	
	Navarretia tagetina	marigold navarretia	
	Phlox gracilis	slender phlox	
Polygalaceae - Milkwort Family			
	Polygala californica	California milkwort	
Polygonaceae - Buckwheat Family			
	Eriogonum luteolum		
	Eriogonum nudum var. nudum	naked wild buckwheat	
	Persicaria punctata (Polygonum punctatum)	water smartweed	
	Polygonum avivulare subsp. depressum	knotweed	x
	Pterostegia drymarioides	threadstem	
	Rumex acetosella	sheep sorrel	x
	Rumex crispus	curly dock	x
	Rumex dentatus		x
	Rumex salicifolius	willow dock	
Ranunculaceae - Buttercup Family			
	Anemone deltoidea	windflower	
	Anemone grayii		
	Aquilegia formosa	columbine	
	Clematis ligusticifolia	virgin's bower	
	Delphinium hesperium ssp. hesperium	western larkspur	
	Delphinium nudicaule	red larkspur	
	Ranunculus californicus	California buttercup	
	Ranunculus hebecarpus		
	Ranunculus occidentalis	western buttercup	
	Ranunculus repens	creeping buttercup	
	Ranunculus uncinatus		
Rhamnaceae - Buckthorn Family			
	Ceanothus cuneatus ssp. cuneatus	buck brush	
	Ceanothus foliosus var. foliosus	wavy-leaf ceanothus	
	Ceanothus incanus	coast whitethorn	
	Ceanothus integerrimus	deer brush	

	Ceanothus thyrsiflorus	blue blossum	
	Ceanothus velutinus	tobacco brush	
	Frangula californica (Rhamnus californica)	California coffeeberry	
	Frangula purshiana (Rhamnus purshiana)	cascara	
Rosaceae - Rose Family			
	Adenostemma fasciculatum	chamise	
	Amelanchier utahensis	service berry	
	Aphanes occidentalis	lady's mantle	
	Cercocarpus betuloides	birch-leaf mt mahogany	
	Cotoneaster pannosa		x
	Drymocallis glandulosa (Potentilla g.)	sticky cinquefoil	
	Fragaria vesca	wood strawberry	
	Heteromeles arbutifolia	toyon	
	Holodiscus discolor	ocean spray	
	Malus pumila	apple	x
	Prunus domesticum	plum	x
	Pyrus communis	common pear	x
	Rosa eglantaria	sweet briar	x
	Rosa gymnocarpa	wood rose	
	Rubus armeniacus (R. discolor)	himalayan blackberry	x
	Rubus leucodermis	western raspberry	
	Rubus parviflorus	thimbleberry	
	Rubus ursinus	California blackberry	
Rubiaceae - Madder Family			
	Galium aparine	goose grass	x
	Galium californicum ssp. californicum	California bedstraw	
	Galium muricatum	humboldt bedstraw	
	Galium parisiense	wall bedstraw	x
	Galium porrigens var. porrigens	climbing bedstraw	
	Galium triflorum	sweet-scented bedstraw	
	Sherardia arvensis	field madder	x
Salicaceae - Willow Family			
	Salix laevigata	red willow	
	Salix lasiandra	Pacific willow	
	Salix scouleriana	Scouler's willow	
	Salix sitchensis	Sitka willow	
Sapindaceae - Soapberry Family			
	Acer circinatum	vine maple	
	Acer macrophyllum	big leaf maple	
	Aesculus californica	California buckeye	
Saxifragaceae - Saxifrage Family			
	Boykinia occidentalis		

	Heuchera micrantha	alum root	
	Lithophragma affine	woodland star	
	Lithophragma heterophyllum	woodland star	
	Pectiantia ovalis (Mitella ovalis)		
	Saxifraga mertensiana	merten's saxifrage	
	Tellima grandiflora	fringe cups	
	Tiarella trifoliata var. unifoliata	lace flower	
Scrophulariaceae - Figwort Family			
	Scrophularia californica	California figwort	
	Verbascum blattaria	moth mullein	x
	Verbascum thapsus	woolly mullein	x
Solanaceae - Nightshade Family			
	Solanum americanum	nightshade	
	Solanum xanti	nightshade	
Urticaceae - Nettle Family			
	Urtica dioica subsp. *gracilis*	american stinging nettle	
	Urtica dioica subsp. *holosericea*	stinging nettle	
Valerianaceae - Valerian Family			
	Plectritis congesta subsp. *brachystemon*		
Verbenaceae - Vervain Family			
	Verbena lasiostachys var. lasiostachys		
Violaceae - Violet Family			
	Viola ocellata	western heart's ease	
	Viola sempervirens	evergreen violet	
Viscaceae - Mistletoe Family			
	Phoradendron serotinum subsp. *macrophyllum*	American mistletoe	
MONOCOTS			
Agavaceae - Century Plant Family			
	Chlorogalum pomeridianum	soaproot	
Araceae - Arum Family			
	Lemna minuscula		
	Lemna minor	duckweed	
Cyperaceae - Sedge Family			
	Carex amplifolia	big-leaf sedge	
	Carex athrostachya	slender-beaked sedge	
	Carex bolanderi	Bolander's sedge	
	Carex feta	green-sheathed sedge	
	Carex globosa	round-fruited sedge	
	Carex gynodynama	wonder-woman sedge	
	Carex harfordii	harford's sedg	
	Carex hendersonii	timber sedge	
	Carex leptopoda	slender-foot sedge	

	Carex multicaulis	stick sedge	
	Carex nudata	torrent sedge	
	Carex obnupta	slough sedge	
	Carex tumulicola	foothill sedge	
	Cyperus eragrostis	nutsedge	
	Eleocharis macrostachya	spikerush	
	Isolepis carinata (Scirpus koilolepis)		
	Scirpus microcarpus		
Iridaceae - Iris Family			
	Iris douglasiana	douglas iris	
	Iris macrosiphon		
	Iris purdyi	purdy's iris	
	Sisyrinchium bellum	blue-eyed grass	
Juncaceae - Rush Family			
	Juncus articulatus		
	Juncus bolanderi	bolander's rush	
	Juncus bufonius var. *bufonius*	toad rush	
	Juncus bufonius var. occidentalis	western toad rush	
	Juncus covillei	coville's rush	
	Juncus effusus var. pacificus		
	Juncus exiguus	weak rush	
	Juncus occidentalis		
	Juncus patens	common rush	
	Juncus tenuis		
	Juncus xiphioides		
	Luzula comosa var. *laxa*	wood rush	
	Luzula parviflora subsp. *parviflora*		
Liliaceae - Lily Family			
	Calochortus tolmei	pussy ears	
	Clintonia andrewsiana	clintonia	
	Fritillaria affinis	checker lily	
	Lilium pardalinum	leopard lily	
	Prosartes hookeri (Disporum hookeri)	hooker's fairybell	
	Prosartes smithii (Disporum smithii)		
	Scoliopus bigelovii	fetid adders tongue	
Melanthiaceae - False-Hellebore Family			
	Toxicoscordion fremontii (Zigadenus fremontii)	death camus	
	Toxicoscordion micranthum (Zigadenus micranthus)	death camus	
	Trillium ovatum	western trillium	
	Xerophyllum tenax	bear-grass	
Orchidaceae - Orchid family			
	Calypso bulbosa	calypso orchid	

	Cephalanthera austiniae	phantom orchid	
	Corallorhiza maculata	spotted coralroot	
	Corallorhiza mertensiana	western coralroot	
	Epipactis gigantea	streamside orchid	
	Goodyera oblongifolia	rattlesnake-plantain	
	Piperia candida	**white-flowered rein orchid CRPR 1B.2**	
	Piperia elongata		
	Piperia transversa		
Poaceae - Grass Family			
	Agrostis capillaris	colonial bentgrass	x
	Agrostis exarata		
	Agrostis gigantea		x
	Agrostis hallii		
	Agrostis pallens		
	Agrostis stolonifera	redtop	x*
	Aira caryophyllea	silver european hairgrass	x
	Aira praecox		x
	Anthoxanthum aristatum	annual vernal grass	x
	Anthoxanthum occidentale (Hierochloe occidentalis)	sweet grass	
	Anthoxanthum ordoratum	sweet vernal grass	x
	Aristida oligantha	prairie three-awn	
	Avena barbata	slender wild oat	x
	Brachypodium distachyon	false brome	x*
	Briza maxima	big quaking grass	x
	Briza minor	little quaking grass	x
	Bromus maritimus	maritime brome	
	Bromus carinatus var. carinatus	California brome	
	Bromus diandrus	ripgut brome	x
	Bromus hordeaceus	soft chess	x
	Bromus japonicus		x
	Bromus laevipes	woodland brome	
	Bromus madritensis var. *madritensis*	foxtail chess	x
	Bromus madritensis subsp. *rubens (B. rubens)*	red brome	x
	Bromus sitchensis		
	Bromus sterilis	poverty brome	x
	Bromus tectorum	cheatgrass brome	x
	Bromus vulgaris		
	Calamagrostis bolanderi	**Bolander's reedgrass CRPR 4.2**	
	Calamagrostis rubescens	pine grass	
	Cortaderia jubata	jubata grass	x*
	Cynosurus cristatus	crested dogtail	x

	Cynosurus echinatus	hedgehog dogtail	x
	Dactylis glomerata	orchard grass	x
	Danthonia californica	California oatgrass	
	Deschampsia elongata	slender hairgrass	
	Elymus glaucus subsp. *glaucus*	blue wildrye	
	Elymus multisetus	big squirrel-tail grass	
	Festuca arundinacea	tall fescue	x
	Festuca bromoides	brome fescue	x
	Festuca californica	California fescue	
	Festuca elmeri		
	Festuca idahoensis	idahoe fescue	
	Festuca microstachys		
	Festuca myuros	rattail fescue	x
	Festuca occidentalis	western fescue	
	Festuca perennis (Lolium multiflorum)	italian ryegrass	x
	Festuca rubra	red fescue	
	Festuca subulata		
	Festuca subuliflora		
	Gastridium phleoides (G. ventricosum)	nit grass	x
	Glyceria elata	fowl mannagrass	
	Glyceria leptostachya	mannagrass	
	Holcus lanatus	common velvet grass	x
	Hordeum brachyantherum ssp. californicum		
	Hordeum marinum ssp. gussoneanum	mediterranean barley	x
	Hordeum murinum ssp. leporinum	hare barley	x
	Koeleria macrantha		
	Melica geyeri	Geyer's melic	
	Melica hardfordii	Hardford's melic	
	Melica imperfecta		
	Melica subulata	alaskan oniongrass	
	Melica torreyana	torrey's melic	
	Paspalum dilatatum	dallis grass	x
	Phalaris aquatica	harding grass	x
	Poa annua	annual bluegrass	x
	Poa howellii		
	Poa pratensis	kentucky bluegrass	
	Poa secunda ssp. secunda	one-sided bluegrass	
	Poa trivialis	rough bluegrass	x
	Polypogon australis	Chilean beardgrass	x
	Polypogon interruptus	ditch beard grass	x
	Polypogon monspeliensis	annual beard grass	x
	Rytidosperma penicillatum (Danthonia pilosa)	hairy oatgrass	x

	Setaria viridis	setaria	x
	Stipa lemmonii var. lemmonii (Achnatherum lemmonii)	lemmon's needle grass	
	Stipa lepida (Nassella lepida)		
	Stipa pulchra (Nassella pulchra)	purple needlegrasss	
	Stipa miliacea (Piptatherum miliaceum)	smilo grass	x
	Elymus caput-medusae (Taeniatherum caput-medusae)	medusahead	x
	Trisetum canescens	smooth trisetum	
Potamogetonaceae - Pondweed Family			
	Potamogeton natans	floating-leaved pond weed	
Ruscaceae - Buthcher's-Broom Family			
	Maianthemum racemosum (Smilacina racemosa)	branched false solomon's seal	
	Maianthemum stellatum (Smilacina stellata)	star false solomon's seal	
Themidaceae - Brodiaea Family			
	Brodiaea elegans subsp. elegans	harvest brodiaea	
	Dichelostemma capitatum subsp.*capitatum*	blue dicks	
	Dichelostemma congestum	ookow	
	Triteleia hyacinthina	white brodiaea	
	Triteleia laxa	ithuriel's spear	
Typhaceae - Cattail Family			
	Typha sp.		

Appendix B

Bryophytes and Lichens, Garcia River Forest, The Conservation Fund, Mendocino County, Calif.

Surveys by Kerry Heise, Geri Hulse-Stephens, and David Toren 2006-2017

Nomenclature largely follows:

For Mosses: Norris D.H. and J.R. Shevock. 2004. Contrb. toward a bryoflora of CA: I. A Specimen-Based Catalogue of Mosses. Madrono 51(1): 1-131. II. A Key to the Mosses. Madrono 51 (2) 133-269

Syntrichia adopted from Bryophte Flora of NA, Vol 27, 2007.

P. Wilson (ed.) [2017] California Moss eFlora, http://ucjeps.berkeley.edu/CA_moss_eflora/index.htmlL [accessed on July 2017

For Liverworts: Doyle W.T. and R.E. Stotler. 2006. Contributions toward a bryoflora of California III. Keys and. Annotated Species Catalogue for Liverworts and Hornworts. Madrono 53: 89-197.

For Lichens: Brodo I.M., S.D. Sharnoff, and S. Sharnoff. 2001. Lichens of North America. Yale Univ. Press. and S. Sharnoff. 2014. A Field Guide to California Lichens. Yale Univ. Press.

S.C. Tucker & B.D. Ryan. Constancea 84: Revised Catalog of Lichens, Lichenicoles, and Allied Fungi in California (http://ucjeps.berkeley.edu/constancea/84/). Accessed on December 19, 2011

MOSSES	**Habitat**
AULACOMNIACEAE	On rotten logs and old stumps
Aulacomnium androgynum	
BARTRAMIACEAE	On rock face
Anacolia menziesii	moist soil of old road bed
Philonotis capillaries	
Philonotis fontana	
BRACHYTHECIACEAE	
Brachythecium frigidum	On moist banks next to creek
Homalothecium arenarium	
Homalothecium nuttallii	On hardwood bark and rock
Homalothecium pinnatifidum	
Isothecium cristatum	On old fallen logs
Isothecium stoloniferum	On shaded logs and boulders
Kindbergia oregana	On shaded duff and tree bases and logs, old roadbeds
Kindbergia praelonga	On moist to wet logs, rock along streams
Scleropodium obtusifolium	On boulder inundated with water
Scleropodium touretii	On moist to dry soil and over humus
BRYACEAE	
Imbribryum gemmiparum	On wet rock in streambed
Ptychostomum pseudotriquetrum (Bryum p.)	
Rosulabryum capillare	suny soil over rock
Rosulabryum torquescens	
BUXBAUMIACEAE	
Buxbaumia piperi	On damp soil and rotten logs
CRYPHAEACEAE	
Dendroalsia abietina	On Red Alder, oak bark

DICRANACEAE	
Dichodontium pellucidum	On wet rock along stream
Dicranella howei	On moist mineral soil banks
Dicranum fuscescens	On shaded rotten log
Dicranum howellii	On shaded rotten log
Orthodicranum tauricum	On shaded logs and tree bases
DITRICHACEAE	
Ceratodon purpureus	On bare soil in sunny sites
Ditrichum ambiguum	On shaded soil of roadbanks
Ditrichum schimperi	Bare soil and roadbeds
FISSIDENTACEAE	
Fissidens bryoides	Semiaquatic along small stream
Fissidens crispus	On damp soil banks
Fissidens grandifrons	Aquatic, on rock in running water
FUNARIACEAE	
Funaria hygrometrica	On sunny soil on road edge
GRIMMIACEAE	
Bucklandiella heterosticha	Boulders and rock walls in sun or filtered light
Codriophorus varius	On rock, moist or dry
Grimmia laevigata	
Grimmia lisae	On rocks at high water line
Grimma trichophylla	
Racomitrium aciculare	On water splashed rock
HEDWIGIACEAE	
Pseudobraunia californica	On sunny rock
HYPNACEAE	
Hypnum circinale	On shaded conifer bases
Hypnum subimponens	On shaded rock and logs
Pseudotaxiphyllum elegans	On damp soil and duff in shade
LEPTODONTACEAE	
Alsia californica	On shaded branch of Cal. Nutmeg
LESKEACEAE	
Claopodium whippleanum	On bare soil in sun or shade
LEUCODONTACEAE	
Antitrichia californica	On oak bark

Pterogonium gracile	Rock and hardwood trunks
MNIACEAE	
Epipterygium tozeri	On moist bare soil with mosses
Leucolepis acanthoneuron	On moist soil along stream
Rhizomnium glabrescens	moist to wet soil along stream
Plagiomnium insigne	wet, sandy floodplain bottoms
Plagiothecium laetum	deeply shaded moist organic soil
Plagiomnium venustum	On decaying humus, and roadbed
Pohlia wahlenbergii	On shaded wet soil
NECKERACEAE	
Neckera douglasii	Epiphytic on California Nutmeg
Porotrichum bigelovii	On wet shaded rock along streams
ORTHODONTIACEAE	
Orthodontium gracile	
ORTHOTRICHACEAE	
Orthotrichum lyelii	On bark of Tanoak, Quercus
Orthotrichum tenellum	Bark of oak
PLAGIOTHECIACEAE	
Plagiothecium laetum	On damp rotten wood and soil
POLYTRICHACEAE	
Atrichum selwynii	On bare mineral soil, roadcuts
Polytrichastrum alpinum	On shady rock face
Polytrichum juniperinum	On bare or humusy soil
Polytrichum piliferum	
POTTIACEAE	
Didymodon nicholsonii	On rock along stream
Didymodon tophaceus	On e-facing calcareous boulder
Didymodon vinealis	On soil or rock, sun or shade
Timmiella crassinervis	On bare soil in sun or shade
RHABDOWEISIACEAE	
Amphidium californicum	In shaded underhangs of outcrops
SELIGERIACEAE	
Dicranoweisia cirrata	On dead log
LIVERWORTS	

ANEURACEAE	
Aneura pinguis	Water splashed rock along stream, & shaded seeps
AYTONIACEAE	
Asterella bolanderi	On moist mossy bank
CALYPOGEIACEAE	
Calypogeia sp.	On damp shaded soil
CEPHALOZIACEAE	
Cephalozia bicuspidata	On shaded soil and humus
CEPHALOZIELLACEAE	
Cephaloziella divaricata	On soil over rock
Cephaloziella turneri	On moist, bare, acidic soil
FRULLANIACEAE	
Frullania nisquallensis	Epiphytic on Red Alder
Frullania bolanderi	
Jungermannia rubra	On moist bare soil banks
GEOCALYCACEAE	
Chiloscyphus polyanthos	
GYMNOMITRIACEAE	
Marsupella bolanderi	On soil over rock mixed with mosses
JUNGERMANNIACEAE	
Jungermannia rubra	On moist shaded soil
LEPIDOZIACEAE	
Lepidozia reptans	On shaded base of Redwood
PORELLACEAE	
Porella navicularis	On shaded hardwood bark
PSEUDOLEPIDOZIACEAE	
Blepharostoma trichophyllum	On shaded soil bank
RADULACEAE	
Radula bolanderi	Epiphytic on Red Alder, and tanoak
SCAPANIACEAE	
Scapania bolanderi	on soil
Scapania sp.	on shaded boulder

TARGIONIACEAE	
Targionia hypophylla	on soil bank
HORNWORTS	
ANTHOCEROTACEAE	
Anthoceros sp	On moist to wet bare soil
LICHENS	
Alectoria sarmentosa	
Bryoria fremontia	fallen Douglas Fir branches
Cladonia coniocraea	On shaded soil banks
Cladonia fimbriata	
Cladonia furcata	On shaded soil and old wood
Cladonia macilenta	On old rotten logs
Cladonia pyxidata	
Cladonia verruculosa	
Evernia prunastri	
Fuscopannaria leucostictoides	on shaded scaly bark of madrone
Hypogymnia enteromorpha	On conifer branches
Hypogymnia imshaugii	
Hypogymnia tubulosa	
Leptogium corniculatum	On shaded soil banks
Leptogium platynum	Moist soil of old roadbed
Lobaria sp.	
Nephroma sp.	On bark of Red Alder
Ochrolechia sp.	On shaded conifer trunks
Parmelia sulcata	on red alder
Parmotrema chinense	upper trunck of fallen tanoak
Peltigera membranacea	
Peltigera neopolydactyla	
Peltigera venosa	On shaded soil over rock
Peltigera sp.	On shaded soil banks
Pilophorus acicularis On rock of roadcuts	On shaded soil banks
Sphaerophorus globosus	Epiphytic on conifer brances
Pannaria sp.	On shaded rock on roadcuts
Platismatia stenophylla	
Pseudocyphellaria anthraspis	Epiphytic on hardwoods
Tuckermannopsis orbata	On conifer branches
Usnea filipendula	Epiphytic on conifers
Usnea longissima	

Appendix C

17 quad area rare plant query surrounding the Garcia River Forest, The Conservation Fund, Mendocino County, CA.

California Native Plant Society, Rare Plant Program. 2017. Inventory of Rare and Endangered Plants of California (online edition, v8-03 0.39). Website http://www.rareplants.cnps.org [accessed 06 July 2017].

Taxa in bold occur on the GRF

Scientific Name	Common Name	Family	CRPR	CESA	FESA
Abronia umbellata var. breviflora	pink sand-verbena	Nyctaginaceae	1B.1	None	None
Agrostis blasdalei	Blasdale's bent grass	Poaceae	1B.2	None	None
Arctostaphylos bakeri ssp. sublaevis	The Cedars manzanita	Ericaceae	1B.2	CR	None
Arctostaphylos hispidula	Howell's manzanita	Ericaceae	4.2	None	None
Arctostaphylos stanfordiana ssp. raichei	Raiche's manzanita	Ericaceae	1B.1	None	None
Astragalus agnicidus	Humboldt County milk-vetch	Fabaceae	1B.1	CE	None
Astragalus breweri	Brewer's milk-vetch	Fabaceae	4.2	None	None
Astragalus rattanii var. rattanii	Rattan's milk-vetch	Fabaceae	4.3	None	None
Bryoria pseudocapillaris	false gray horsehair lichen	Parmeliaceae	3.2	None	None
Bryoria spiralifera	twisted horsehair lichen	Parmeliaceae	1B.1	None	None
Calamagrostis bolanderi	**Bolander's reed grass**	**Poaceae**	**4.2**	**None**	**None**
Calochortus raichei	The Cedars fairy-lantern	Liliaceae	1B.2	None	None
Calystegia purpurata ssp. saxicola	coastal bluff morning-glory	Convolvulaceae	1B.2	None	None
Campanula californica	swamp harebell	Campanulaceae	1B.2	None	None
Carex californica	California sedge	Cyperaceae	2B.3	None	None
Carex lyngbyei	Lyngbye's sedge	Cyperaceae	2B.2	None	None
Carex saliniformis	deceiving sedge	Cyperaceae	1B.2	None	None
Castilleja ambigua var. ambigua	johnny-nip	Orobanchaceae	4.2	None	None
Castilleja ambigua var. humboldtiensis	Humboldt Bay owl's-clover	Orobanchaceae	1B.2	None	None
Castilleja mendocinensis	Mendocino Coast paintbrush	Orobanchaceae	1B.2	None	None
Ceanothus confusus	Rincon Ridge ceanothus	Rhamnaceae	1B.1	None	None
Ceanothus gloriosus var. exaltatus	glory brush	Rhamnaceae	4.3	None	None
Ceanothus gloriosus var. gloriosus	Point Reyes ceanothus	Rhamnaceae	4.3	None	None
Coptis laciniata	Oregon goldthread	Ranunculaceae	4.2	None	None
Cuscuta pacifica var. papillata	Mendocino dodder	Convolvulaceae	1B.2	None	None
Cypripedium californicum	California lady's-slipper	Orchidaceae	4.2	None	None
Cypripedium montanum	mountain lady's-slipper	Orchidaceae	4.2	None	None
Erigeron biolettii	**streamside daisy**	**Asteraceae**	**3**	**None**	**None**

Erigeron supplex	supple daisy	Asteraceae	1B.2	None	None
Eriogonum cedrorum	The Cedars buckwheat	Polygonaceae	1B.3	None	None
Eriogonum ternatum	ternate buckwheat	Polygonaceae	4.3	None	None
Erysimum concinnum	bluff wallflower	Brassicaceae	1B.2	None	None
Erythronium revolutum	coast fawn lily	Liliaceae	2B.2	None	None
Fritillaria roderickii	Roderick's fritillary	Liliaceae	1B.1	CE	None
Gilia capitata ssp. pacifica	Pacific gilia	Polemoniaceae	1B.2	None	None
Gilia capitata ssp. tomentosa	woolly-headed gilia	Polemoniaceae	1B.1	None	None
Glehnia littoralis ssp. leiocarpa	American glehnia	Apiaceae	4.2	None	None
Glyceria grandis	American manna grass	Poaceae	2B.3	None	None
Grimmia torenii	Toren's grimmia	Grimmiaceae	1B.3	None	None
Harmonia guggolziorum	Guggolz' harmonia	Asteraceae	1B.1	None	None
Hesperevax sparsiflora var. brevifolia	short-leaved evax	Asteraceae	1B.2	None	None
Hesperocyparis pygmaea	pygmy cypress	Cupressaceae	1B.2	None	None
Horkelia marinensis	Point Reyes horkelia	Rosaceae	1B.2	None	None
Horkelia tenuiloba	thin-lobed horkelia	Rosaceae	1B.2	None	None
Hosackia gracilis	harlequin lotus	Fabaceae	4.2	None	None
Kopsiopsis hookeri	small groundcone	Orobanchaceae	2B.3	None	None
Lasthenia californica ssp. bakeri	Baker's goldfields	Asteraceae	1B.2	None	None
Lasthenia californica ssp. macrantha	perennial goldfields	Asteraceae	1B.2	None	None
Lasthenia conjugens	Contra Costa goldfields	Asteraceae	1B.1	None	FE
Lathyrus palustris	**marsh pea**	**Fabaceae**	**2B.2**	**None**	**None**
Lilium maritimum	coast lily	Liliaceae	1B.1	None	None
Lupinus sericatus	Cobb Mountain lupine	Fabaceae	1B.2	None	None
Lycopodium clavatum	running-pine	Lycopodiaceae	4.1	None	None
Malacothamnus mendocinensis	Mendocino bush-mallow	Malvaceae	1A	None	None
Microseris paludosa	marsh microseris	Asteraceae	1B.2	None	None
Mitellastra caulescens	leafy-stemmed mitrewort	Saxifragaceae	4.2	None	None
Oenothera wolfii	Wolf's evening-primrose	Onagraceae	1B.1	None	None
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	Apiaceae	4.2	None	None
Piperia candida	**white-flowered rein orchid**	**Orchidaceae**	**1B.2**	**None**	**None**
Pleuropogon hooverianus	North Coast semaphore grass	Poaceae	1B.1	CT	None
Pleuropogon refractus	nodding semaphore grass	Poaceae	4.2	None	None

Potamogeton epihydrus	Nuttall's ribbon-leaved pondweed	Potamogetonaceae	2B.2	None	None
Sidalcea calycosa ssp. rhizomata	Point Reyes checkerbloom	Malvaceae	1B.2	None	None
Sidalcea malachroides	maple-leaved checkerbloom	Malvaceae	4.2	None	None
Sidalcea malviflora ssp. purpurea	purple-stemmed checkerbloom	Malvaceae	1B.2	None	None
Streptanthus glandulosus ssp. hoffmanii	Hoffman's bristly jewelflower	Brassicaceae	1B.3	None	None
Streptanthus morrisonii ssp. morrisonii	Morrison's jewelflower	Brassicaceae	1B.2	None	None
Tracyina rostrata	beaked tracyina	Asteraceae	1B.2	None	None
Trifolium buckwestiorum	**Santa Cruz clover**	**Fabaceae**	**1B.1**	**None**	**None**
Trifolium trichocalyx	**Monterey clover**	**Fabaceae**	**1B.1**	**CE**	**FE**
Usnea longissima	**Methuselah's beard lichen**	**Parmeliaceae**	**4.2**	**None**	**None**
Veratrum fimbriatum	fringed false-hellebore	Melanthiaceae	4.3	None	None

APPENDIX D

NORTHERN SPOTTED OWL LIFE HISTORY AND HABITAT INFORMATION

The spotted owl is a medium sized owl, about 20 inches long with an average wingspan of 40 inches. Spotted owls have large dark eyes, lack ear tufts and the legs and feet are fully feathered. Spotted owl's diet generally consist of rodents and small birds and with a smaller component of other various animals such as insects, bats and lizards (Forsman 1984). Spotted owls hunt for food, or forage, by perching and swooping on prey items. The spotted owl's range occurs from southern British Columbia to the southern part of the Sierra Madre Occidental and Oriental mountains. The spotted owl is comprised of 3 subspecies within this range. The Mexican spotted owl's range is the largest occurring from the southern Rocky Mountains in Colorado; the Colorado Plateau in southern Utah; southward through Arizona, New Mexico, and far western Texas; in Mexico through the Sierra Madre Occidental and Oriental mountains and the southern end of the Mexican Plateaus range. The California spotted owl occurs throughout the Sierra Nevada mountain range in addition to the coastal mountain ranges of southern California north to the San Francisco peninsula. The Northern spotted owl range is north of the San Francisco peninsula throughout the coastal and inland ranges of California and throughout the coastal and Cascade mountain ranges of Oregon and Washington to southern British Columbia. The redwood region accounts for only about 9% of the northern spotted owl's range. The northern spotted owl (hereafter referred to as NSO) was listed as a threatened species under the Endangered Species Act (ESA) in 1990 as concern mounted over the continuing loss of habitat that NSO's appeared to require for survival and reproductive success (Federal register 1990). Subsequently, in August 2016 the NSO was listed as threatened under the California Endangered Species Act. As part of the ESA listing it was required by landowners within the range of the NSO to survey for their presence if any kind of habitat altering activities were proposed. The United States Fish and Wildlife Service (USFWS) is in charge of administering and consulting with species protected under the ESA. The USFWS developed a protocol for surveying for NSOs in 1991 and revised it in 1992. Subsequently, in 2011 the USFWS developed an updated protocol that was primarily intended to address the presence of barred owls. Additional minor revisions to the protocol were made in 2012.

Northern Spotted Owl Survey Procedures

Northern spotted owl surveys are currently required to be conducted in conformance with the 2012 revision of the 2011 USFWS NSO survey protocol. The USFWS NSO survey protocol requires landowners within the range of the northern spotted owl to survey areas for NSO presence if any "habitat altering, or significant disturbance" project is proposed. The method of surveying for presence requires covering the project area with survey stations that are spaced approximately ¼ - ½ mile apart. Each survey station is "called" for 10 minutes using a digital calling device that plays recorded NSO vocalizations. Survey stations are called between sunset and sunrise and the permitted survey season is March 1-August 31. The protocol requires 6 survey visits per year to the project area for two years prior to commencing project operations. If NSO are detected during nighttime surveys, daytime follow-up surveys are conducted to determine if there is a NSO territory in the area of the detection. If NSO are found during daytime surveys, they are offered mice and the fate of these mice is recorded to determine reproductive status (whether a NSO territory is nesting or not).

Habitat Requirements and Regulations

When the NSO was listed under the ESA in 1990 it was generally believed that they required large tracts of old growth or late seral stage forests for survival and reproductive success (Thomas et al 1990). This was primarily a result of interpreting habitat conditions that existed around nest sites, at the time little was known about the habitat that was used or needed for foraging (LaHaye et al, 1999). Recent studies have shown that NSOs require a mixture of forest conditions for reproductive success and long-term survival (Franklin, 2000 and Irwin et al, 2000). Generally, NSOs require nesting habitat that consists of well stocked, mixed-conifer dominated, dense canopy stands often close distances to year-round water and riparian habitat (Irwin et al. 2007) These stands can be of varying ages but what is important is retained structure from older stands (Forsman et al. 1984, Solis and Guitierrez 1990, Ripple et al. 1991, Lehmkuhl and Raphael 1993, Hunter et al. 1995, Meyer et al. 1998). Features including branch deformities, cavities, mistletoe clumps, broken tops, debris platforms, old squirrel, vole and raptor nests provide nesting possibilities within such stands (Blakesley et al. 1992 and Thome et al. 1998). Also, factors such as north facing slopes, providing cooler temperatures during the breeding season and areas on the lower 1/3 of slopes also seem to provide refuge from adverse environmental conditions (Irwin et al. 2007). NSOs can utilize a wide range of prey species across their range however, in the redwood region the main prey item is the dusky-footed woodrat (Ambrose, 1991 and Mendocino Redwood Company, 1989, 2001 unpublished). In the redwood region dusky-footed woodrats occur in high densities in early successional stages “brushy-stage” clearcuts and in the ecotones between late and early successional forests (Franklin et al. 2000). The distance relationship between stand conditions used by NSO’s for nesting and foraging may well determine whether NSOs will occupy a site and/or have reproductive success. It is presumed that if NSOs have to travel great distances between nest sites and foraging locations it may result in poor reproductive success or exclusion of NSOs from an area altogether (Franklin et al. 2000 and Irwin et al. 2007).

The USFWS defines NSO habitat as the following:
Nesting/roosting habitat: ≥60% canopy cover of trees ≥11” DBH (diameter at breast height) and ≥ 100 square feet of basal area of trees ≥11” DBH
Foraging habitat: ≥40% canopy cover of trees ≥11” DBH and ≥ 75 square feet of basal area of trees ≥11” DBH
Non-suitable Habitat: ≤40% canopy cover of trees ≥11” DBH and ≤75 square feet of basal area of trees ≥11” DBH

The Garcia River Forest is composed of a relatively continuous landscape of closed canopy 50-60 year old timber. The dominant tree species are sugar pine, Douglas-fir, and redwood. There is a substantial component of mixed hardwood species, primarily tanoak. No late seral stage stands are present on the property but a few scattered individual residual old growth trees remain. Using the USFWS habitat definitions, the majority of the property is most likely foraging habitat, with scattered patches of nesting/roosting habitat focused primarily along riparian areas.

NSO take avoidance for Timber Harvest Plans on the Garcia River Forest will most likely be demonstrated through 14 CCR 919.9(e) of the California Forest Practice rules which requires the plan submitter to consult with the USFWS. The Arcata, California office of the USFWS has prepared a set of guidelines that landowners within the coast redwood region must follow to assure that the take of NSO through timber operations does not occur. The March 15, 2011 version of the Northern Spotted Owl Take Avoidance Analysis and Guidance for the California Coast Forest District ("Attachment A") outlines habitat protection measures and operational restrictions that are applied to known NSO sites. Revisions to the "Attachment A" guidelines are commonly made every few years. Protection measures are focused around each NSO territory's activity center. Each territory's activity center is generally that territory's most recent nest site or the most recent roost location if no nest site is known. Under the "Attachment A" guidelines, a 100 acre core area polygon composed of the best available suitable habitat (preferably nesting/roosting) is delineated contiguous with each territory's activity center. Generally speaking, timber harvest is prohibited within each NSO territory's core area. Additionally, within 0.7 mi of each NSO activity center at least 500 acres of suitable NSO habitat (nesting/roosting or foraging) and at least 200 acres of this habitat must be nesting/roosting habitat.

Silvicultural Objectives and Habitat Development

TCF's principal silvicultural objectives are to grow large high-quality trees, increase structural complexity and natural diversity and establish a high level of sustainable timber production through selective (individual tree and group selection) harvests. These measures should maximize [volume and] value growth [within the constraints of an unevenage management philosophy] and develop and maintain important late-seral habitat characteristics for wildlife and non-timber forest vegetation. "Crop tree" target diameters are 30 to 36 inches for redwood and 22 to 28 inches for Douglas-fir. Forest management will seek to ensure that late-seral ecological functions and processes are present within a managed forest. Ultimately, these measures are intended to develop stands that have high canopy closure, some large mature trees, and a high degree of structural diversity, which should ensure that NSO nesting/roosting habitat is maintained and developed through time. Additionally, active timber management that creates some canopy gaps and stimulates understory vegetation growth will ensure that high quality foraging habitat is present.

Gualala River Forest NSO Survey Summary

Historically, NSO surveys on the Garcia River Forest have been somewhat inconsistent. Throughout the 1990's-mid 2000's surveys were conducted on a timber harvest plan specific basis and little effort was made to monitor known NSO territories for occupancy and reproductive status. Since acquiring the property, TCF has implemented a more intensive survey design. A network of 140+ survey stations was installed across the

Garcia River Forest ownership and the entire ownership was surveyed annually from 2009-2014. Surveys from 2015-2016 were pared back to a project specific scale with approximately 50% of the ownership surveyed during each of these years. Site visits to all recently occupied NSO activity centers were also conducted from 2009-2016 to determine reproductive status and assess occupancy trends.

The California Natural Diversity Database (CNDDB) currently lists 14 NSO activity centers located on the Garcia River Forest. Several of these sites are no longer occupied by NSO and recent years' surveys generally find 8-10 occupied NSO activity centers across the ownership. Additionally, there are several NSO activity centers located immediately outside TCF ownership that are routinely detected during surveys.

Additional Threats to NSO's

Aside from the habitat issues associated with NSO reproduction and survival, there is a more ominous threat to NSOs emerging, which is the invasion of the barred owl into the range of the NSO. Barred owls are in the same genus as NSOs and occupy a similar niche, competing for many of the same prey resources and nesting sites. Antagonistic behavior between barred owls and NSO is well documented throughout the Pacific northwest (Courtney et al. 2004, Olson et al. 2005). Barred owls are displacing NSOs (Kelly et al. 2003) as well as suppressing the calling behavior of NSOs, which can make NSO survey efforts increasingly difficult and possibly ineffective (Crozier et al. 2006). In the last decade, the number of barred owls in Mendocino county has steadily increased. Barred owls are routinely detected during spotted owl surveys on the Garcia River Forest and the range across the property where barred owls are detected appears to have expanded since ownership wide surveys were initiated in 2009. Barred owls appear likely to be impacting NSO detection probabilities and occupancy trends at several sites throughout the Garcia River Forest. At this point, barred owl specific surveys have yet to conducted on the Garcia River Forest, though they may be considered at a future time. In other portions of the redwood region, experimental barred owl removal trials have been partially successful at allowing NSO to re-occupy sites where they were previously displaced (Diller et al. 2012). Recent studies also suggest that management activities, such as the creation of 15-25 acre patches of early seral hardwoods in close proximity to known barred owl nests and preferential removal of redwood during thinning in young stands, may provide habitat conditions that NSO are better adapted to exploit than barred owls (Irwin et al. 2013). Barred owl management activities may be considered if NSO displacement continues to become problematic and if permitting opportunities exist.

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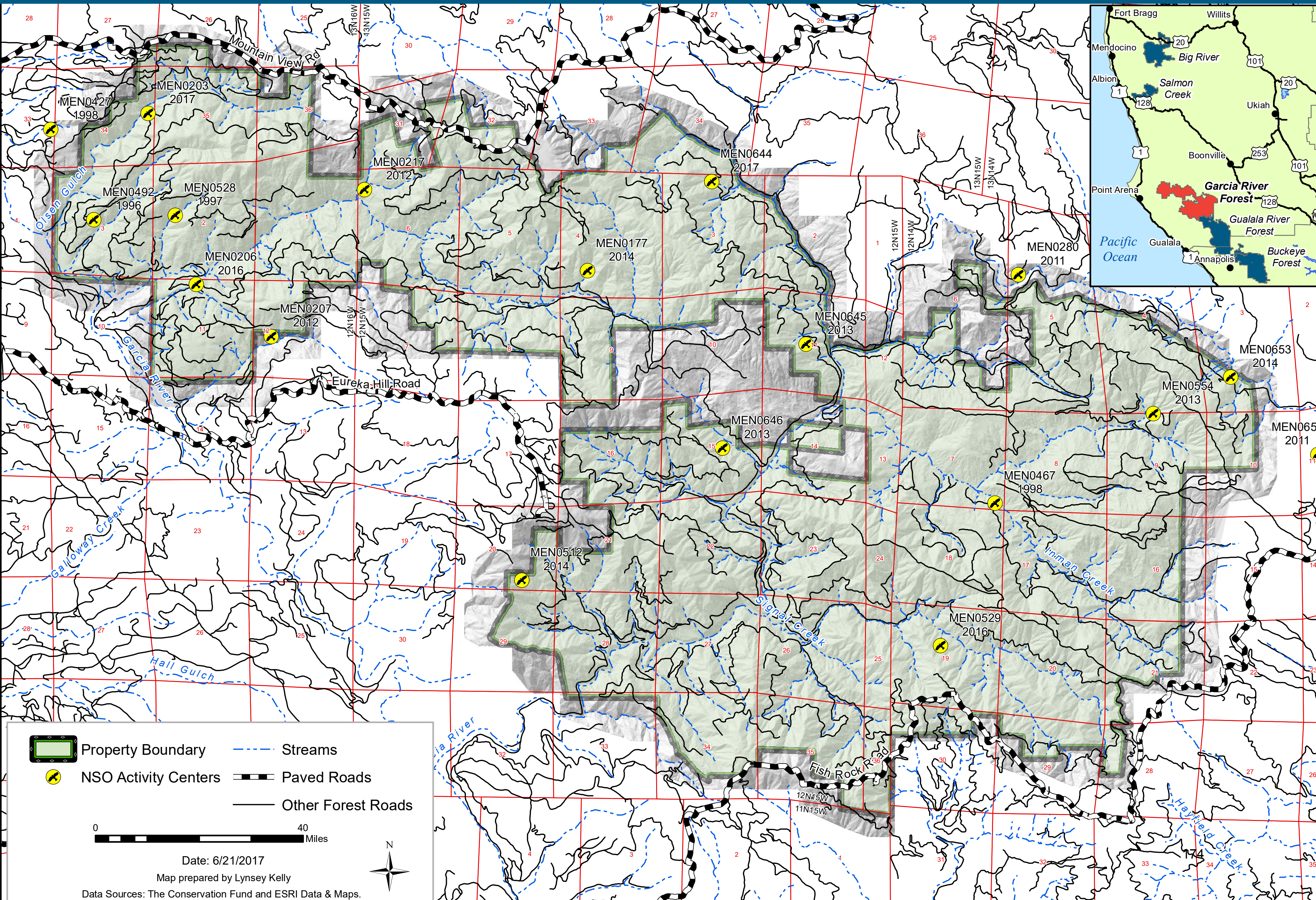
Garcia River Forest - NSO Activity Centers

THE CONSERVATION FUND



APPENDIX E

			Site Treatments			Site Types				
Project	Year Completed	Total Sites	Road Drainage Improvement	New Culvert	Decomm	Landslides	Stream Crossings	Other	Culverts	Total Sediment
Jacks Opening THP	2007	36	24	10	2	2	26	8	20	10210
Lower North Fork THP	2007	43	31	9	3	6	32	5	29	6418
Inman Creek - Phase I	2008	138	43	60	35	2	123	13	81	23934
Jack Fire	2008	9			9	1	6	2		1580
Lower North Fork THP	2008	8	8				8		7	113
Pulte Homes	2009	7	1	6		1	6		6	1681
Pulte Homes	2010	104	45	49	10	9	78	17	70	23835
Signal Creek - Phase I	2010	33	18	11	4		32	1	26	5832
Bluewater Hole 2011	2011	17	5	9	3		17		11	3164
GRF 2011	2011	22	9	10	3	2	14	6	15	4849
NOAA Decom	2011	36	8		28	3	28	5	1	3824
Signal Creek - Phase I	2011	39	6	4	29	3	24	12	7	10495
Bluewater Hole 2012	2012	53	26	25	2	3	41	9	29	10344
GRF 2012	2012	1	1			1				576
Inman Creek - Phase II	2012	61	4	5	52	6	48	7	5	10792
Lower North Fork #2 THP	2012	24	22		1	4	17	3	1	670
Upper North Fork THP	2012	8	8				5	3		181
Inman Creek - Phase II	2013	37		2	35	7	29	1	2	7838
Olsen Gulch Rd	2013	13	11	2		4	8	1	3	3205
Raccoon Creek Rd	2013	27	16	8	3	4	16	7	10	6854
Graphite THP	2014	2	2				2			175
Hollow Tree THP	2014	70	36	34		1	67	2	54	19635
Mainstem Garcia	2014	19	14	5		3	16		8	3868
Mainstem Garcia	2015	23	12	10	1	3	19	1	10	4382
Olsen Gulch THP	2015	22	18	4		12	6	4	4	1885
Graphite Creek	2016	10	5	3	2	1	8	1	4	1656
Mainstem Garcia	2016	2		2			2		2	1008
TOTALS		**864**	**373**	**268**	**222**	**78**	**678**	**108**	**405**	**169004**

APPENDIX F

BRIDGE CONDITIONS TABLE

Source: NCRM, February 2005. Updated by TCF, July 2017.

Bridge #	Location	Length	Abutment Type	Running Surface	Maintenance Requirements	Repair or Replacement Cost
1	Hollow Tree Rd Mailliard Property Unnamed tributary	50’	Log and earth fill	Wood	Check wood deck before hauling logs.	
2	Hollow Tree Rd Mailliard Property Unnamed tributary	30’	Log and earth fill w/ Monschke blocks	Steel Plate	None	
3	Hollow Tree Rd Mailliard Property Garcia River Crossing	89’	Steel reinforced concrete blocks	2 89’ flat cars side by side	Bridge repaired 2014.	$350,000

Bridge #	Location	Length	Abutment Type	Running Surface	Maintenance Requirements	Repair or Replacement Cost
4	Hollow Tree Rd Garcia River Crossing	100’	Concrete w/ earth backfill	Wood	Wood running boards and cross members replaced 2009. Bridge support structure to be evaluated by civil engineer.	$20,000
5	Hollow Tree Rd Blue waterhole Creek Crossing	89’	Steel Reinforced concrete blocks	2 89’flatcars side by side	Bridge repaired 2012.	$150,000
6	Hollow Tree Rd. South Fork Garcia River Crossing	130’	Sheet pile retaining wall with earth backfill	2-89’ flatcars side by side	Repaired 2010.	$350,000

Bridge #	Location	Length	Abutment Type	Running Surface	Maintenance Requirements	Repair or Replacement Cost
7	Hot Springs Rd. Signal Creek Crossing	53’	Log and earth fill	Steel Plate	None	
8	Olson Gulch Rd Class II Tributary	40’	Log and earth fill	Wood	Wood running boards replaced 2009.	$15,000
9	Olson Gulch Rd Garcia River Crossing	89’	Steel Plate	89’ single flat car, steel plate	Inspect railroad undercarriage prior to hauling. Have civil engineer inspect if doubtful of strength.	
10	Olson Gulch Rd. Fishing Resort Creek	53’	Log and earth fill		Deck replaced with steel plate 2010.	$20,500

Bridge #	Location	Length	Abutment Type	Running Surface	Maintenance Requirements	Repair or Replacement Cost
11	Upper Signal Creek	53' flatcar	None	None	Bridge removed during Signal Creek Road abandonment. Salvage and reuse bridge.	
12	Big Cheese Road Unnamed tributary to Signal Creek	40' boxcar	Boulders	Good metal deck covered with rock mounted sideways	None at this time.	
13	Graphite Creek	53' flatcar	Redwood sill logs	Steel	Steel deck installed 2015 but needs to be wider to accommodate log trucks.	$10,000
14	Upper North fork Garcia	53' flatcar	Laced log abutment	Wood	Bridge needs to be removed and salvaged. Log abutments and fill should be removed and stabilized. Bridge not safe for pickup trucks.	

Bridge #	Location	Length	Abutment Type	Running Surface	Maintenance Requirements	Repair or Replacement Cost
15	Tributary to North Fork	40’ boxcar with steel deck	earth	Frame needs straitening and welding	Remove and salvage if accessible.	
16	Olsen Gulch	53’ flatcar.	logs	wood	None at this time. Inspect prior to log hauling.	
17	Unnamed tributary to main stem Garcia	53’ flatcar.	logs	wood	Replace deck prior to log hauling.	

APPENDIX G

ROCK PITS

Source: NCRM, September 2004

Garcia River Forest Rock Pits - 09/21/04 NCRM				
Pit Number	**Location**	**Size**	**Type of rock**	**Comments**
1	Hollow Tree Road	1/4 acre	shale	Within 100 feet of a watercourse, requires permit to comply with SMARA
2	Inman Creek Road	1/5 acre	shale	Within 100 feet of a watercourse, requires permit to comply with SMARA
3	Big Cheese Road	1/5 acre	shale	Good rock source, pit to be developed
4	West Hollow Tree Road	1/3 acre	shale	Large raveling cut bank
5	Graphite Road	1/4 acre	shale	Raveling cut bank near watercourse. Emergency rock only
6	Olsen Gulch Road	1/5 acre	Boulder Pit	Boulders showing on surface and excavated from road cut. Dig test holes before developing.
7	Mountian View Road and Graphit Road	1/3 acre	Shale	Good rock source
8	Mountian View Road 200 feet west of pit 7	1/5 acre	Shale	Undeveloped pit, rock shows on surface
9	Hollow Tree Road	1/4 acre	Shale	Good rock source, pit to be developed

The pits listed have been mapped; however, this list is not complete and many more pits exist on unexplored roads and ridges. There are also dozens of small unmapped oportunistic rock pits along road cut banks that yield small quantities of rock. For large road rocking jobs pits will need to be terraced for safety reasons and to facilitate extraction. Currently most pits are not terraced and extraction is restricted to pulling rock off of the bottom and letting the top cave in. There is a shortage of large rock (2'+) available for rip rap. Locating a source of rip rap will be a priority as road upgrades progress.

APPENDIX H

THE CONSERVATION FUND

North Coast Forest Conservation Program Policy Digest
Original version August 2010; this version July 2017

TABLE OF CONTENTS

North Coast Forest Conservation Program Policy Digest Overview
The Conservation Fund's North Coast Forest Conservation Program
Primary authors: Jenny Griffin, Evan Smith
August 2010, updated September 2012, 2014, 2017

Introduction

The following summary of The Conservation Fund's North Coast California forest management policies was prepared to facilitate review and provide links for more information in a single source document.

Program Background

The Conservation Fund's California forest properties were acquired as part of the Fund's North Coast Forest Conservation Initiative, which is dedicated to the permanent protection and restoration of coastal forests in the Redwood Region of northern California. The strategic foundation for the Initiative is described in "Conservation Prospects for the North Coast"[1] prepared in 2005 by The Conservation Fund for the California Coastal Conservancy. This study noted the extraordinary biological diversity and economic productivity of the coastal forests of the Redwood Region and recommended that conservationists "move quickly to establish 'working landscape' conservation management on large, strategically located forest …. properties in Humboldt, Mendocino and Del Norte counties."

The Conservation Fund acquired the 23,785-acre Garcia River Forest in February, 2004. In October 2006, The Conservation Fund acquired an additional 16,100 acres in two tracts – the 11,707-acre Big River Forest and the 4,204-acre Salmon Creek Forest. In December 2011, The Fund acquired the 13,537 acre Gualala River Forest. The Fund acquired the 177 acre Hardell property, adjacent to Salmon Creek, in September of 2012. The Hardell property will be managed as part of the Salmon Creek tract. In 2013, the Fund acquired the 18,120 acre Buckeye Forest in Sonoma County. The Conservation Fund and its partners developed an Integrated Resource Management Plan (IRMP) for each acquisition[2] to guide the management and restoration plan for these properties. Partners include the State Coastal Conservancy, Wildlife Conservation Board, State Water Board, North Coast Regional Water Quality Control Board, David and Lucile Packard Foundation, Nature Conservancy, and National Fish and Wildlife Foundation and Sonoma County Agricultural Preservation and Open Space District. These properties represent a collective capital investment of approximately $120 million.

By acquiring these properties, the Fund and its partners hope to demonstrate that these large tracts of intensively managed coastal forest can gradually be returned to sustainable timber production and ecological vitality through the use of innovative financing and patient management by a nonprofit organization in partnership with private and public agencies and community stakeholders.

Property-specific Background

The Conservation Fund owns five forests in California as part of its North Coast Forest Conservation Program: Salmon Creek, Big River, Garcia River Gualala River and Buckeye Forest. While there is one overall program, each property has some unique management requirements that are outlined in each individual IRMP.All reference documents are available at http://www.conservationfund.org/our-conservation-strategy/focus-areas/forestry/north-

[1] Available at: http://www.conservationfund.org/north_coast_forests
[2] ibid

coast-conservation-initiative/north-coast-forest-reference-documents/ and at the Fund's North Coast Office.

There are a number of planning differences between the various forests (these are described in more detail in the Forest Management Policies):

1. Because of the different funding sources and loan agreements, each program has its own accounting records and revenue-sharing requirements. Some expenses such as staff time are shared between the accounts but are tracked and reported separately.
2. The Garcia River Watershed has an approved Total Maximum Daily Load (TMDL) Action Plan developed by the EPA and adopted by the North Coast Regional Water Quality Control Board. In compliance with the action plan TCF has developed an ownership-wide program to meet the TMDL requirements through implementation of an approved Site-Specific Management Plan and Erosion Control Plan. Water quality protection is an objective across all of the properties, but because of the TMDL status, the reporting, monitoring and specific policies for the Garcia River Forest are slightly different. [A very small portion of the Gualala Forest is also within the Garcia watershed and subject to the TMDL requirements—these will be addressed in site-specific project prescriptions.]
3. While a key objective on all properties is to increase the volume and quality of the timber inventory, the Annual Allowable Cut levels are different between the forests, primarily because of the different initial inventory conditions and partially because of the loan repayment obligations for BR/SC.
4. The Nature Conservancy holds perpetual conservation easements on the Garcia River and Gualala River Forests which, among other things, protects the land from future development. There is an established Ecological Reserve Network that comprises 35% of the Garcia River Forest where management is limited to techniques that advance the desired ecological goals, namely late-seral forest development and protection.
5. BR/SC also have permanent conservation restrictions, but in a slightly different form. Use of the BR/SC property is limited to conservation purposes (including forest management) and the State Coastal Conservancy and the Wildlife Conservation Board are responsible for ensuring the conservation objectives are met.
6. Sonoma County Agricultural Preservation and Open Space District holds a conservation easement on the Buckeye Forest. The Buckeye has a unique profit-sharing agreement with the State Coastal Conservancy.

Program Goals

The North Coast Forest Conservation Program shall be guided by the following objectives:

- Acquire forestland with high conservation values that is under threat of loss or degradation because of human development and protect those properties for continued forest management and restoration.
- Manage the forests sustainably [and profitably], increasing the economic productivity and ecological health, while providing meaningful local employment and recreation opportunities.
- Respect the local community by operating honestly, transparently and efficiently; soliciting and responding to feedback; hiring local services and purchasing local goods; and holding ourselves to the highest standards for professional, safe and courteous conduct.

- Work collaboratively with local businesses, civic institutions, and other organizations and landowners to increase the understanding, appreciation, and value of the region's forest systems.

Unified Management

All properties that are acquired as part of the North Coast Forest Conservation Program are to be managed consistent with the TCF Forest Management Policies, the property-specific management plan, and the North Coast Forest Conservation Program Goals. In addition, TCF is committed to the Principles and Criteria of the Forest Stewardship Council (FSC) and Sustainable Forestry Initiative (SFI) and to maintaining our annual independent certification under those systems. The Management Policies and Program Goals and their implementation will be reviewed every year as part of the Annual Program Review and updated as necessary; the management plans will be reviewed and updated on a ten-year cycle. This document and all management plans and policies are intended to be publicly available.

Policies

Existing stand alone policy documents (attached):
TCF Forest Management Policies
Road Management Policies
Commitment to Safety and Health
HCVF RSA Program Memo
Social Benefit/Impact Assessment
Certified Product Chain-of-Custody Program
Herbicide Application and Hardwood Management Policy

Policies on the following topics are detailed within the respective IRMPs:
Ecological Reserve Network (GRF IRMP, pgs. 17, 25-27)
Aquatic habitat restoration (GRF pgs. 44; BR/SC pgs. 63-64, 108-192; GuRF pgs. 61-63; BF pgs. 71-74)
Invasive species management (GRF pgs. 64; BR/SC pg. 67; GuRF pgs. 64; BF pgs 75-76.; see also July 15, 2010 Draft "Invasive Plant Management Plan for the Salmon Creek Forest")
Water Quality (GRF pgs. 16-21; 254-257; 259-274; BR/SC pgs. 29-37; 58-64; 108-192; GuRF pgs. 26-41; BF pgs. 26-51)
Community Use and Involvement (GRF pgs. 67-68; BR/SC pgs. 80-84; GuRF pgs. 3,67-68; BF pgs.78-79)
Monitoring (GRF pgs. 50, 55, 61, 64, 68; BR/SC pgs. 77-79; 258-265, 274; GuRF pgs. 50, 55, 61, 64, 68; BF pgs. 60, 65, 71, 76, 79)

FSC/SFI Standards:
TCF is committed to forest management certification under Forest Stewardship Council (FSC-US Forest Management Standard version 1.0) and Sustainable Forestry Initiative (2015-2019 Standard). Available at https://ic.fsc.org/united-states.298.htm and http://www.sfiprogram.org/sfi-standard/forest-management-standard/

FOREST MANAGEMENT POLICIES
For The Conservation Fund's North Coast Forest Conservation Program
Principal authors: Evan Smith, Scott Kelly, Jenny Griffin
August 2010; expanded annually

Contents

I. Program Overview

These forest management policies have been developed to guide management of The Conservation Fund's California forest properties. These properties were acquired as part of the Fund's North Coast Forest Conservation Initiative, which is dedicated to the permanent protection and restoration of coastal forests in the Redwood Region.

The strategic foundation for the Initiative is described in "Conservation Prospects for the North Coast" prepared in 2005 by The Conservation Fund for the California Coastal Conservancy. This study noted the extraordinary biological diversity and economic productivity of the coastal forests of the Redwood Region and recommended that conservationists "move quickly to establish 'working landscape' conservation management on large, strategically located forest…properties in Humboldt, Mendocino and Del Norte counties."[1]

This recommendation is based on two key findings:

1. Population growth, increasing land values, depletion of timber inventories and global competition in the commodities markets are putting increasing pressure on traditional resource-based land uses, making land use conversion increasingly likely as landowners look for more profitable uses of their land.[2]
2. The traditional approach of public acquisition and preservation of forest and range lands is not sufficient to meet this challenge: there is not nearly enough public money to purchase or manage such large properties and local communities are concerned about the fiscal and economic impacts of taking working lands out of production.

1 The Conservation Fund, 2005, *Conservation Prospects for the North Coast, A Review and Analysis of Existing Conservation Plans, Land Use Trends and Strategies for Conservation on the North Coast of California* at page 134.
[2] Id. at page 131.

In furtherance of this strategy, The Conservation Fund acquired the 24,000-acre Garcia River Forest in February, 2004, thereby establishing the first non-profit owned "working forest" in California. An Integrated Resource Management Plan (IRMP) for the property was collaboratively developed over a two-year planning period to meet the following general objectives:

- Restore and protect a productive and relatively natural coastal California forest ecosystem.
- Protect fish and wildlife habitat associated with this ecosystem, in particular the oak woodlands, serpentine grasslands, redwood/-Douglas-fir forests, and spawning habitat for coho salmon and steelhead trout.
- Protect significant water resources, springs and the water quality thereof.
- Maintain the capacity of the Property for productive forest management, including the long-term sustainable harvest of high quality forest products, contributing to the economic vitality of the state and region.
- Provide outdoor recreational opportunities, as appropriate.

In October 2006, The Conservation Fund acquired an additional 16,100 acres in two tracts – the 11,700-acre Big River Forest and the 4,400-acre Salmon Creek Forest. A similar management and restoration plan for these new properties was completed in August 2009 (Big River and Salmon Creek Integrated Resource Management Plan). This plan identifies and describes in detail the following specific management goals:

- Improve ecological conditions by protecting and enhancing water quality.
- Improve ecological conditions by protecting and enhancing terrestrial and aquatic habitat on the Forests.
- Generate sufficient revenue to cover SRF loan and the Packard loan payments (the latter from non-timber revenue, such as the sale of carbon offsets, and only after the accrued SRF obligations are fulfilled), property taxes, on-site maintenance, management, and restoration projects.
- Develop and implement conservation-based forest management greenhouse gas reduction projects under the California Climate Action Registry's Forest Project Protocol version 2.1.
- Practice continual improvement through adaptive management based on monitoring of water quality and forest health against specific objectives described in the Plan.
- Support the local business community by utilizing local contractors and suppliers.
- Involve the local community by seeking input on management of the Forests, including review of this Plan and timber harvest plans implemented under the Plan, and providing compatible public access, educational, and recreational opportunities.

In 2011, The Conservation Fund acquired the 13,900 acre Gualala River Forest and in 2013 the Fund acquired the 18,120 acre Buckeye Forest in Sonoma County. Integrated Resource Management Plans have been completed for these properties. All activities on the property shall be in conformance with these Forest Management Policies and all other organizational policies and commitments.

These combined acquisitions (74,000 acres) represent a collective capital investment of approximately $120 million. By acquiring them, the Fund and its partners hope to demonstrate that these large tracts of intensively managed coastal forest can gradually be returned to sustainable timber production and ecological vitality through the use of innovative financing and patient management by a nonprofit organization in partnership with private and public agencies and community stakeholders.

Guiding these properties from their current forest conditions (which reflect a legacy of clear cutting or excessive harvesting resulting in young and in some cases understocked timber stands) to the desired future condition of economic stability and ecological integrity will take decades. Along the way we will need to overcome many challenges, including relatively low current timber volumes, the unnatural predominance of hardwoods in places, the burden of maintaining and improving extensive road systems, and the uncertain economic, regulatory and political environment affecting the timber economy as a whole.

At the same time, there is broad awareness that North Coast forests are at an historic crossroad, with one road leading to fragmentation and loss of forest productivity and ecological integrity, the other leading to intact watersheds, recovering fish and wildlife, and a sustainable timber economy for the region. With the cooperation and goodwill of the community and public and private stakeholders, we are optimistic that we are setting off down the latter, more hopeful road.

II. Policy Introduction

These guidelines and policies apply to management and operations on the Garcia River, Gualala River, Buckeye, Big River, and Salmon Creek properties. This document is a "work-in-progress" and will be revised and refined based on the experience and perspective of our project foresters, program partners, and agency staff as we all develop increasing familiarity with the properties and the forests' response to the silvicultural and other management measures described here, and in the IRMPs for each Forest (all plans are available at http://www.conservationfund.org/our-conservation-strategy/focus-areas/forestry/north-coast-conservation-initiative/north-coast-forest-reference-documents/).

III. Forest Management General Strategy

[Taken, without editing, from the Garcia River Forest IRMP and also detailed in each additional IRMP]

- Our silviculture will be primarily uneven-aged, to develop and maintain a range of tree sizes and ages within a stand, with the goal of producing valuable sawtimber and utilizing natural regeneration.
- We have a responsibility to manage the properties to generate reasonable revenue for loan payments, re-investment in the property (e.g. restoration projects, road upgrades) and, potentially, for conservation projects elsewhere in the region.
- Our harvest levels will be significantly less than growth rates over the next few decades so as to increase the timber inventory.
- We are providing for increased riparian buffers on our Class I streams so as to improve riparian habitat conditions and provide late-seral connectivity across the landscape.
- Special attention will be given to critical wildlife habitat features, such as snags, down wood, and trees of significant size.
- We recognize that because of past practices the forest contains smaller trees and more hardwoods than would have occurred naturally and we will work to more closely approximate natural conditions.
- There are no old growth stands on the properties; there are individual trees that may be residual old growth—these and other very large trees and true oaks will be maintained.
- We anticipate no need to clearcut; we may use even-aged variable retention harvests (that retain large trees and habitat features) to rehabilitate conifer sites now dominated by hardwood or in future salvage situations; group selection will likely be used on Douglas-fir sites; and all regeneration harvests will encourage natural regeneration.

- We have committed to certification of our forest management under the Forest Stewardship Council and Sustainable Forestry Initiative standards and to reporting our carbon sequestration through the California Climate Action Registry.

IV. Critical Landscape Features

Most of these policies are intended to guide the management of those areas of the property which will support commercial timber harvesting operations. However, one of the most important steps in determining how to manage a forest is recognizing which areas have unique ecological values that outweigh their potential contribution from a commercial harvest perspective. For example, oak woodlands are fairly geographically limited and support a very different set of birds and small mammals than dense coniferous forest. Likewise, springs, seeps, and small wetlands occupy only a very small portion of the property but probably support more amphibians than the rest of the forest. The protection of these features is critical to achieving the program objectives of restoring habitat for species of concern and increasing the ecological health of these forests. Specific policies to address these areas include the following:

- All pygmy forest and true oak (Quercus spp.) woodlands and native grasslands are to be preserved.
- Springs, seeps, and small wetlands shall receive protection measures at least equivalent to Class 3 WLPZ. [There are no large wetlands on the properties.]
- Riparian forests, particularly along Class 1 streams, will be managed to provide for closed canopy mature forest with a high component of down logs and other late-seral features. [Some removal of timber can be consistent with this objective - see WLPZ Protection Measures for more detail in Section XIV, below.]
- Other features that are fairly rare on the landscape and may have unique habitat value include cliff faces, alder thickets, and recently-burned areas. These will be mapped and receive site-specific protection measures when they are within or adjoining a potential timber harvest area.

V. Harvest Levels

Careful determination of appropriate harvest levels is critical to ensuring sustainability and achieving the conservation and economic objectives for the properties we manage. As described below, each project has slightly different harvest levels because of the differing starting inventories and financial responsibilities.

In the **GRF** IRMP, we committed to harvesting not more than 35% of growth on the working forest (non-reserve) portion of the Garcia River Forest (GRF) for each of the first two decades (measured on a rolling ten-year basis). The net harvest levels shown here are based on the forest growth and yield stream developed in 2013 for TCF's Long Term Sustained Yield Plan as required by the California Forest Practice Rules. The Conservation Fund used the FORSEE growth and yield model to simulate harvests. The model was programmed to incorporate the various management constraints of the forest. The model shows an annual allowable harvest of 2.26 mmbf (million board feet) for the first 5 year planning period (2014-2018). Over the next decade this should result in an increase in standing timber volume on the non-reserve portion of the property from 11.4 mbf (thousand board feet) per acre to 15.0 mbf per acre (reaching 20 mbf per acre around 2038).

In the **BR/SC** IRMP we committed to an annual net harvest level for each of the first two decades of 4.65 million board feet (the MOU restriction is for not greater than 5.1 million board feet and the appraisal estimated that the FPR would allow harvest of 8.5 million board feet). The allowable harvest levels shown here are based on the forest growth and yield stream developed in 2013 for

TCF's Long Term Sustained Yield Plan as required by the California Forest Practice Rules. The Conservation Fund used the FORSEE growth and yield model to simulate harvests. The model was programmed to incorporate the various management constraints of the forest. The model shows an annual allowable harvest of 7.3 and 7.7 mmbf for BR and SC respectively for the first 5 year planning period (2014-2018). Where the growth and yield model exceeds the restrictions of the MOU the MOU will be adhered to. Over the next decade this should result in an increase in standing timber volume on the non-reserve portion of the property from 22.8 mbf (thousand board feet) per acre to 28.9 mbf per acre for Big River and should result in an increase in standing timber volume on the non-reserve portion of the property from 26.4 mbf (thousand board feet) per acre to 31.5 mbf per acre for Salmon Creek.

For the Gualala Forest The Conservation Fund used the FORSEE growth and yield model to simulate growth and harvest, the model was programmed to incorporate the various management constraints of the forest. The harvest levels shown here are based on the forest growth and yield stream developed in 2013 for TCF's Long Term Sustained Yield Plan as required by the California Forest Practice Rules. The model shows an annual allowable harvest of 1.7 mmbf (million board feet) for the first 5 year planning period (2014-2018). Over the next decade this should result in an increase in standing timber volume on the non-reserve portion of the property from 9.4 mbf (thousand board feet) per acre to 11.6 mbf per acre (reaching 20 mbf per acre around 2039).

For the Buckeye Forest, growth forecasting and harvest scheduling is underway as part of our overall management of the property. In the interim, annual harvest is not to exceed 1.5mmbf for the first 5 year planning period, which is based on being comparable in size and composition to the Garcia River Forest (non-reserve). This should be no more than 35% of expected growth and allow the forest to significantly increase in stocking.

VI. Silvicultural Objectives

Our goal is to grow large high-quality trees and be able to perpetuate that through selective harvests. We want to maximize value growth and develop and maintain important late-seral habitat characteristics for wildlife and non-timber forest vegetation. Our "crop tree" target diameters are 30-36" for redwood and 26-28" for Douglas-fir (most high-quality trees below this diameter range will be retained while most non-wildlife trees above this diameter range will be removed). Generally, we are not trying to mimic old-growth or late-seral stand conditions, we are trying to ensure that late-seral ecological functions and processes are present within a managed forest. For example we will be seeking to develop stands that have high canopy closure, some large mature trees, and a high degree of structural diversity. In time we may elect to allow certain stands to return to old growth, once they are on an appropriate trajectory.

The success of our initiative and these acquisitions depends on our ability to generate revenue to support ongoing management and restoration projects and repay loans for the acquisition of the properties in a manner that over time achieves our stated silvicultural and ecological objectives. In consultation with project foresters and biologists, we will continually strive to balance our harvest levels and methods to carefully meet our financial and management obligations while improving ecological health and vitality. We will not fixate on the silvicultural semantics of "uneven-aged," "all-aged" or "multi-aged" or the coefficient of the "reverse J-shaped curve," but on the question of whether we are growing high-quality trees and maintaining desired habitat conditions. More detailed performance monitoring metrics are available in the BR/SC IRMP (Section 4.4.9.2, Long-term Forest Monitoring) and in the GRF IRMP (Section IV, Adaptive Management and Information Systems). In addition we have the broader objectives of engaging the local community and businesses in what we do, which relates back to how we conduct harvesting operations.

This silvicultural strategy is also aligned with what we understand about historical disturbance patterns and evolutionary forces in the redwood region. To generalize from many years of complementary academic research, including the Proceedings from the past two Redwood Forest Science Symposiums, it is safe to say the pre-European settlement conditions were very different than the processes of today. Most forests were quite old, in the 500-2000 years in the canopy, with a modest amount of tanoak (10-15% of basal area), with occasional small (under 1000 acre) patches of younger and brushier forest, and relatively limited bareground or early seral stage conditions (caused by flooding, landslides or extreme fires). Fires were frequent (10-20 year recurrence) and low intensity, likely driven by Native American burning as much as lightning strikes. Individual tree mortality was limited, mostly due to self-thinning (competition-induced) and occasional windstorm damage. In general, the redwood forest was fairly stable at large temporal and spatial scales. Our silvicultural practices follow these patterns, emphasizing low-intensity but extensive single-tree selection harvests, similar to what would occur under self-thinning stages of stand development. Our group selection harvests (2.5 acre max) are similar in size to openings created by landslides, flood scouring or higher intensity fires. Variable retention harvests, especially because we utilize this approach on dryer sites, are probably similar to conditions after a more intense fire. In short, our silviculture should restore and maintain more natural forest conditions and simulate natural disturbance patterns, with the exception that development of true late seral stage characteristics will only occur in the Ecological Reserve, riparian buffers and NSO habitat core areas-- and not across the managed forest.

VII. Silvicultural Decisions

To the extent that it is possible to generalize types of stands and approaches, we have attempted to describe likely decision pathways below. Forests are highly variable so it is impossible and unwise to prescribe "one-size fits all." Further, each of the forests reflects a management legacy that limits our silvicultural options. For example, prior management of the Garcia River Forest, Gualala Forest and Buckeye Forest has left very young stands with limited commercial volumes. For the most part, these stands are growing well—they just have limited silvicultural options in the short-term. On Big River and Salmon Creek, a history of clear-cuts forces difficult choices between the remaining well-stocked stands and stand classes that are several years away from supporting our preferred silvicultural methods. Additionally many of the partial harvests of the past did not always leave the high-quality trees we desire. Finally, we are learning more every day about how to manage forests for both economic and environmental objectives and our approaches will change with future scientific research and operational realizations.

Our preferred silviculture is high retention (150 sf/acre basal area) single tree selection with re-entries every 10-20 years to remove most trees that exceed the target crop-tree size and thin the smaller size classes. Stands that have reached this condition (referred to as stand condition A) will be maintained indefinitely through thinning, individual tree selection, and small group selection harvests. Most stands are not anywhere near the desired stand condition A. Some stands may consist of smaller diameter classes or be less dense but generally have good form and growth (referred to as stand condition B). These stands might be dense even-aged stands of 40-60 years or they may be more open stands of indeterminate age that have had past selection harvests; regardless, the key silvicultural criteria is that they have good material to work with. (The Garcia LNF THP, the BR Riverbends THP, and the selection units of LSC THP are good examples of B conditions.) B stands are in an excellent position because they can support commercially-viable selection harvests and with a few decades of growth and just one or two intermediate harvests that maintain high-quality trees and increasing stocking, they will reach A condition. The silviculture to go from B to A is similar to the selection silviculture to maintain A (although in B we are not particularly concerned with creating a new age class). These are "easy" decisions, because the stands have good stocking and growth and the pathway to the desired conditions is evident and readily achievable.

However because of past harvesting practices, very few stands are currently in A or B condition (because of lower stocking, smaller diameters and/or poorer-quality trees). Most stands will take several decades to reach this steady-state condition with multiple intermediate harvest entries to guide this development. Until we reach the ideal steady-state condition, the silviculture focus will be on creating and/or building stands of higher quality and better growth potential. Many stands (especially on Big River) are young and even-aged, from clearcuts or aggressive selection harvests in the last thirty years (referred to as stand condition C). C stands are, for the most part, growing quickly and with good-quality stems—but they are small in diameter (average 12" or less) and lack structure from a habitat perspective. C stands will receive thinnings to accelerate stand development and concentrate growth on high-quality stems. These selective harvests will occur every 10-20 years with the long-term objective of moving the C stands into B and then A condition. These thinnings will yield low harvest volumes and small average piece sizes so they will need to be carefully-designed to be economically-viable. These low-value harvests will be a good source of employment in the local community and will also allow us to shape the stand at an early age to better achieve our long-term growth and habitat objectives. (The better-stocked parts of the Jack's Opening THP fit this generalization.) In some cases pre-commercial thinning will be considered.

A different category of stands (condition D) has resulted from the merchantable trees having been excessively "picked over;" most of the dominant trees were removed leaving uneven regeneration, a low-quality overstory and often a high degree of tanoak competition. The overstory may be of average to large diameter but the entire stand is usually less than 100 square feet of basal area per acre and not comprised of the high-quality stems we desire (and therefore not growing in value). In most of these cases the younger "regeneration" age classes exhibit good growth, height, form and stocking. Harvests in D stands need to balance the removal of the poor-quality overstory (to accelerate the development of the higher-quality regeneration and pole-sized trees) with the need to maintain habitat structure and late-seral elements. (The "seed tree removal" units in the LSC THP and the variable retention units in the Jarvis Camp THP fall into this category.) This is not "easy" silviculture as it will feel like an aggressive harvest. The residual stand will be open-looking and often we will need to reduce hardwood competition and/or plant additional conifers. A good indication for this type of harvest is that given twenty years without harvest the stand would not be appreciably improved (hence the need for an intervention). In the short-term it is easy to think, "maybe it would be better to not harvest here," but it should be obvious that in the long-term the stand and the program will benefit from this harvest. These D harvests result in a good-quality young stand that is growing well and has some late-seral elements. Given two to three decades to develop without commercial harvest they will become C and B stands.

Of course not all stands fit these generalizations. In some stands, especially on the east side of the Garcia, it is more appropriate to manage primarily for Douglas-fir than redwood and since Douglas-fir lacks redwood's remarkable abilities to release and sprout, these will likely have long-term management through group selection, although the first couple of entries will look more like B thinnings. And some stands, again on the east side of Garcia, are completely dominated by tanoak. While it might be better ecologically and financially to be growing more conifers on these sites the short-term cost of such a rehabilitation will likely preclude much action.

VIII. THP Operational Realities

The complexity of forest regulations and the high cost of harvesting operations impose additional constraints on our operations, beyond simply what silviculture we want to apply. For example, almost all of our harvests are some type of thinning (a selective harvest not designed to introduce another age class) but under the Forest Practice Rules (FPR) they may need to be called Selection, Group Selection, Commercial Thinning, Transition, Variable Retention, Rehabilitation, or Alternative Prescription because of the differing requirements for initial and post-harvest stocking and tree diameter requirements defined in the FPR for each specific silvicultural treatment listed above. And in the Timber Harvest Plan (THP) document we will commit to meeting only the FPR stocking requirements (rather than a voluntary higher standard) to avoid risk of violation in areas where initial stocking is low prior to harvest. Regardless of what the prescription is called, we will only implement the silviculture that enables us to meet our long-term project goals and follows the retention requirements and tree marking guidelines below.

Another operational reality relates to the distribution of THPs across the landscape. Our THPs will need to be fairly large (200-500 acres) and geographically-concentrated because of the high costs of THP development and maintenance. The goal is to increase operational efficiency by concentrating planning and road costs. We will try to treat all the eligible stands within a selected area (rather than cherry-picking across the property). Thus THPs will often include several types of FPR silviculture but almost all of them will meet stocking requirements immediately following the harvest. In the future we will not use amendments to increase THP area (unless there is a significant market or regulatory shift) but in 2007 as part of adapting the approved LSC THP to our preferred approach we used an amendment as an expedient means. Another important economic constraint is that currently we have limited ability to cable-thin young Douglas-fir stands because of high logging costs and low Douglas-fir prices.

IX. THP Development and Review Process

Our goal is to develop clear and consistent THPs that incorporate the concerns of the public and conservation partners before they are submitted to the state agencies. THPs are, by requirement, cumbersome documents and long-term legal obligations; we do not expect to revolutionize THP writing. We have adopted the following procedures for the development and review of THPs:

1. General harvest locations will be informed by harvest scheduling plans and reviewed by Scott Kelly (TCF's Forest Manager).
2. Field foresters will review past materials and field conditions, decide on likely unit layout, silvicultural prescriptions, access needs, road improvements, etc., and consult with project consultants and partners on habitat and restoration implications and opportunities.
3. Evan and Scott will field review harvest unit selections and general operation strategies.
4. Field foresters will coordinate necessary surveys and access (geologist, botanist, NSO).
5. Field foresters will begin unit layout and stand marking.
6. "Field Consultation"-- staff, contract foresters and advisors will discuss, in the field, the proposed operation.
7. Garcia only—notice to TNC will be provided and field review scheduled if desired.
8. Stakeholder tour. Tours will be offered just prior to CAL FIRE submittal (when all the potential THP issues are well-identified and resolved). Holly Newberger, Program Coordinator, will coordinate.
9. Field foresters will complete drafting of the THP.
10. THPs will be submitted to Scott for review.
11. Field foresters will prepare final version and submit to CAL FIRE, with copy for TCF office.

12. Field foresters will prepare a THP summary that contains forest stand descriptions at a level of detail feasible for review of operations pursuant to the GRF CE, including site classes, stand volumes, and maps.

Field Consultations are a very important step in our review process because they leverages the combined experience of our foresters and biologists to ensure that only sound and well-planned THPs that reflect TCF goals and objectives go forward and because it offers an opportunity for everyone to learn from each other, thus helping our program grow efficiently.

X. Retention Requirements

[Quoted from the Big River and Salmon Creek IRMP - with edits italicized and in brackets - and equally applicable to all properties]

Within a harvest area, the Fund will permanently retain or recruit downed wood, snags, and trees with high wildlife value given their recognized ecological role and ability to enrich the surrounding stand. The following policies for downed wood, snags, and wildlife trees are meant to implement this strategy by providing clear rules and numerical targets for certain types of features. [The FPR do not categorically address general wildlife habitat retention trees (although there are some requirements for protection of active raptor nests), but additional guidance is available from DFG.] Retention trees will be painted ("W") or tagged by the field foresters as they are marking the timber harvest to communicate the value of these features not just to the loggers but also the public and future foresters. Because a harvest can include over a thousand retention trees, they are not mapped or recorded unless they are suspected NSO nest trees. And while maintaining trees with high wildlife value is important, it is also critical to recognize the wildlife value of the surrounding stand and the conserved landscape, and not expect the harvest stand to mimic or contain all features which may be better represented in other areas of the property.

Downed Wood

Target: two pieces per acre (at least one conifer, 18 inch minimum diameter and ten feet minimum length).

Actions:

- Retain existing downed wood except in situations of recent windfall or fire outside of WLPZ. (In most stands this should be sufficient to meet the target.)
- Retain snags and mark trees for recruitment snags to eventually become downed wood.
- Redistribute cull logs from the landing (unless used for firewood or instream restoration).

Snags and Wildlife Trees

Target: four per acre on average across stand. [*While every effort shall be made by the Licensed Timber Operator (LTO) to retain all snags, it is understood that some snags may be cut for safety considerations by the LTO with the project foresters approval (e.g. snags near active landings which may fall into the landing if bumped by logging equipment or snags used to anchor yarder guy lines or tail holds).*]

Criteria for mandatory retention:

- Snags (all should be retained but only those greater than 18-inch DBH and 20 foot height shall count towards the retention targets);
- Conifers greater than 48-inch DBH;
- Old-growth trees (use MRC definition if in question – see Appendix K [*of Big River/Salmon Creek IRMP*]);
- Raptor nest trees (active or likely to be re-used);

- Any hardwood [*tanoak, true oak, madrone, chinquapin, and alder*] over 20 inches;
- Murrelet habitat trees (use MRC definition if in question – see Appendix K [*of Big River/Salmon Creek IRMP*]);
- Den trees (cavity greater than three inch diameter and greater than ten feet above ground);
- Trees with basal hollows or other significant features (cavities, acorn granaries, significant burn scars, significant or unusual lichen accumulation, signs of deformity, decadence, unusual bark patterns, or other unique structure or features).

Actions:

- Retain all mandatory [*retention*] trees and snags except where necessary to fall for operator safety, and protect with screen trees if appropriate.
- If below the target number, mark and retain additional recruitment trees. [*Additional wildlife trees will likely be marked in the future from the surrounding stand as it develops.*]
- [*At the discretion of the project forester live trees may be designated for girdling to accelerate snag recruitment within a THP area.*]

XI. Retention General Guidelines

- Marked wildlife trees…are not intended for future harvest and are allowed to grow beyond the crop tree target size.
- In the absence of mandatory retention trees, on average at least one conifer per acre should be retained from the largest ten percent of the diameter distribution of the stand.
- Marking of the wildlife trees (with paint or tags) is intended to communicate the recognition of the importance of that stem to future foresters, agency reviewers, and the public.
- For the next 20 years some preference for snag and downed log creation and wildlife tree recruitment will be given to cull trees and whitewoods (because of their low financial value) even though they may have a shorter lifespan.
- All retention is subject to operational considerations; the felling of any tree is permitted when necessary for operator safety, road right of way, or yarding corridors. Field foresters will attempt to avoid locating yarder corridors where they would conflict with mandatory retention wildlife trees.
- Targets shall be assessed across the entire harvest stand, not on an individual acre basis.
- Preference is for spatial grouping (clumps of downed wood, snags, and/or wildlife trees).
- The above criteria shall apply to selection harvests. When marking variable retention harvests extra screen trees may be appropriate.

All of the foregoing requirements and guidelines are subject to further review and amendment as the science and practice of forest management evolves and new research is developed and applied. Because of past practices, some portions of the Forests do not have sufficient wildlife features and the initial targets set forth above are intended to guide the long-term retention and recruitment of these features.

Two or three of anything per acre is an admittedly arbitrary number chosen to put our forestlands on the right trajectory for the development and maintenance of late-seral habitat characteristics within a managed forest; achieving some of these targets will likely take more than one entry. These distribution and size targets are not expected to be the ultimate value but merely what is appropriate to select and recruit in the next twenty years; the development of late-seral habitat elements is a long-term process and will be shaped over several harvest entries. In addition, it is unclear how the establishment of Sudden Oak Death (documented on GRF) will affect the Forests.

XI.I. Habitat Retention

When encountered, rare plants, animals and their associated habitat will be protected per the guidelines established by CalFire, USFWS or CDF&G. Established general habitat retention guidelines for the Northern Spotted Owl, Marbled Murrelet and California Red Legged Frog are followed. In the absence of pre-established guidelines, protection measures developed in consultation with CalFire, CDF&G and/or USFWS will be implemented. Habitat protection measures for coho salmon and steelhead trout are embedded in the forest practice rules and included in the "Specific Watercourse and Lake Protection Zones (WLPZ)" described below. Other rare species are generally protected on a case by case basis during the timber harvest planning and review process.

XII. Hardwoods

Hardwood species, including tanoak, true oaks, madrone, chinquapin, and alder, are an important ecological component of North Coast forests. Past management practices have resulted in an unnaturally high abundance of tanoak in many areas that historically were dominated by conifers. Mixed hardwoods account for 13.8 percent of the basal area on the Salmon Creek Forest, 16.8 percent on the Big River Forest, 34.1 percent on the Garcia River Forest, 39.6 percent on the Gualala River Forest and 34.7 percent on the Buckeye Forest; in some stand types in Salmon Creek and Big River it is as high as 46 percent, and on the Garcia up to 83 percent. For comparison, old growth conifer stands in the area often have ten percent or less of the basal area in hardwood species. On Salmon Creek and Big River, stands with greater than 25 percent of the basal area in hardwood species account for 23 percent of the forested acres. On the Garcia, stands with greater than 25 percent of the basal area in hardwood species account for 91 percent of the forested acres, and stand with greater than 50 percent of the basal area in hardwood species account for 45 percent of the forested acres.

In addition to the ecological imbalance, the high concentration of tanoak significantly reduces conifer growth and stocking and therefore the future financial value of the properties, since tanoaks have effectively no commercial value (it costs more to log and deliver than they are worth as firewood). The long-term goal is to maintain an appropriate level of tanoak and other hardwoods (probably around ten percent on average). It is important to not try to eliminate tanoak—merely to increase conifer site occupancy over time. To achieve these objectives, the following management measures will be implemented:

- All true oak (*Quercus* spp.) woodlands are to be preserved [*these occur primarily on GRFand Gualala*].
- All hardwood wildlife trees are to be retained (which includes all hardwoods 20 inches or greater), except where removal is required for safety concerns or necessary for yarding or road corridors.
- Where the post-harvest hardwood basal area would exceed 30 square feet of basal area per acre (averaged across the stand), tanoak shall be controlled through manual falling or girdling or herbicide treatment through direct basal injection ("hack-and-squirt") or stump treatment to provide a post-harvest hardwood basal area of 15 to 30 square feet per acre. This may take more than one entry to achieve.
- Most tanoak reduction will be achieved within a selection or thinning harvest by selective falling (of tanoaks) to release existing conifers. While the tanoak stumps will likely re-sprout, the conifers should have established dominance and will eventually shade-out most of the sprouts. In this type of incremental treatment (selective falling), clumps of hardwoods and individual hardwoods which do not compete with desirable conifers will be left alone. [*This*

treatment occurred to varying degrees in almost all of THPs prepared to date, the best example of which might be the Jack's Opening THP on GRF.]

- There are many stands where selective tanoak felling would not be sufficient to meet the desired level of conifer site occupancy. In these situations, a more aggressive treatment will be utilized through an herbicide treatment that kills a majority of the tanoak to release either existing conifers or seedlings planted shortly before or after the tanoak treatment. Even within these prescriptions, smaller areas of intact hardwoods would be intentionally retained (for biodiversity reasons). Preference for hardwood retention will be given to large trees (greater than 20 inches), true oaks, chinquapins and madrones, and groups of hardwoods. Rehabilitation treatments (including the use of herbicides) are intended to be one-time interventions and should not need to be repeated because of the decreased openings and ground disturbance associated with subsequent harvests. [*An example of this treatment occurred within the Variable Retention units of the Jarvis Camp THP on Big River.*]
- The only herbicide to be used in tanoak control treatments currently is imazapyr (tradename Arsenal). Only licensed and insured contractors with a good track record for safety and compliance may apply herbicides. All herbicide application must be in conformance with label guidelines and applicable laws. Additional herbicides may be considered in the future as they are developed and tested and reviewed with respect to Forest Stewardship Council and Sustainable Forestry Initiative standards.
- Any planned use of herbicide will be clearly identified in the THP and THP summary.
- Reduction in the use of herbicides is an important objective; alternatives to herbicide treatment have been and will continue to be evaluated on a periodic basis. A comparison of herbicide treatment and logging of tanoaks for commercial firewood was evaluated as part of the Jarvis Camp THP. Monumented plots will allow for long-term evaluation of effectiveness but the initial impressions are that the logging method resulted in increased cost and site disturbance (exposed soil and damage to the residual stand). That said, a commercial market for tanoak would be pursued if it develops. Areas with well-established and good quality hardwoods will likely be managed for mature hardwoods instead of attempting to re-establish conifer.
- There will be no tanoak control with herbicides in WLPZs; manual falling or girdling of small tanoak may be used, but only as part of a riparian shade enhancement project (likely with conifer underplanting).
- Priority for rehabilitation treatments will be given to high site, tractor-operable ground, with existing desirable redwood growing stock. Herbicide treatments will be less than 100 acres annually (on a rolling average basis) on Big River. No acreage limitations for herbicide have been adopted for Garcia, Gualala and Buckeye.
- Tanoak control measures will be reviewed periodically and revised as appropriate based on knowledge and experience gained in the field over the next several years. Herbicides will likely also be used to control certain exotic invasive plants, primarily jubata grass and broom. No other uses of herbicides or pesticides are anticipated.
- See also in this Policy Digest "HERBICIDE APPLICATION AND HARDWOOD MANAGEMENT POLICY"

XIII. Pre Commercial Thinning

Pre commercial thinning involves the selective cutting of small trees and brush that are not subsequently processed into forest products. PCT is generally done in stands of young, 10-15 year old plantations with the purpose of accelerating stand development and promoting conifer dominance. Vigorous growth of small trees and brush in the early stages of stand development following clear cutting often leads to intense competition for a site's resources including water, soil nutrients and sunlight. By selectively cutting brush and small trees we can focus more of a site's resources on fewer tree stems. This increases individual tree growth and promotes sustained vigorous growth across the stand and into the future. Trees selected for retention are generally in the upper 25% of stem diameters within the stand and have full crowns and straight stems without crooks, forks, dead, or broken tops. The ideal spacing between conifer stems is generally 15 feet, though additional trees may be left around the edges of small openings as they are encountered. When thinning redwood stump sprouts, 2-3 sprouts are left around each stump, trees sprouting from the root collar are favored over trees spouting from the top of the stump. Tanoak and other miscellaneous brush species are cut wherever they are competing with conifer regeneration. Thinning is also used for "species control" in which desirable commercial species are favored to remain on site. Wherever possible redwood is favored as a leave tree, Douglas-fir and Grand-fir are retained where no redwood trees exists or where hotter, dryer site conditions dictate that Douglas-fir be left in favor of redwood. To retain structural and compositional diversity, clumps of brush and hardwood species that are not competing with conifers are left uncut.

Pre commercial thinning is implemented in young stands with chainsaws and no heavy equipment is used therefore, impacts to non timber resources including wildlife habitat, rare plants and water quality are assumed to be negligible. Conifer and Hardwood trees identified for retention with an orange stripe by the previous owner(s) are retained for wildlife habitat. TCF does not remove or burn slash generated from PCT, slash is lopped such that it is contact with the ground to promote decomposition and return nutrients to the soil. Habitat values for some species of birds and rodents can be improved by the slash accumulation associated with PCT which provides ground cover necessary for those species. It is felt that forage values for deer and bear are generally unaffected by thinning slash accumulations.

If PCT is to be implemented between February 1st and July 10th of any year the most recent NSO call records are reviewed to ensure that our operations are more than ¼ mile from an active NSO nest. One quarter mile is the recommended distance to avoid auditory harassment of NSO during the breeding season. The stands targeted for PCT are too young (to small) to be considered nesting habitat for NSO or other raptors. It has been shown that NSO do forage in clear cuts for wood rats which prefer heavy slash accumulations for nesting. It is assumed that PCT does not negatively impact forage for NSO and it may improve wood rat habitat by replenishing the available downed material.

XIV. Timber Marking Guidelines

Timber marking (designating individual trees for harvest) is the art of shaping future forest stand conditions by extracting merchantable forest volume while protecting and enhancing wildlife habitat such that the end result is a well-stocked, rapidly-growing, and healthy forest with abundant and diverse wildlife habitat features. Approaches to timber marking vary by stand condition and silvicultural objective and it is difficult to identify a universal prescription.

Because of the thousands of individual judgment calls that are made while marking a stand, even individual foresters with the same objective would inevitably make slightly different decisions. The general goal of timber marking by the Fund is relatively simple: current (pre-harvest) conditions should be improved by the time of re-entry (typically ten to twenty years) while also increasing net growth. "Improved" is a subjective term but for our purposes it means increased values for conifer basal area, merchantable volume, snags and downed logs per acre. These are also some of the values that will be used to monitor forest trends across the properties.

Below is a summary of The Fund's timber marking criteria incorporating recommendations from two experienced local foresters (Jim Able and Craig Blencowe). These guidelines strive to capture some of the art of achieving the desired balance between habitat recruitment and retention while removing sufficient conifer volume to satisfy the economic needs of the project. Timber marking will be conducted with these criteria in mind. One of the purposes of the Field Consultations (both pre- and post- harvest) is for the forestry team to discuss the timber marking, particularly in riparian stands, understocked areas, and near NSO activity centers.

Timber marking criteria

Marking can vary according to two criteria: the type of stand and the management objectives. These two factors permit flexibility to the extent that the marking adheres to the overall management goal of maintaining a productive sustainable forest.

To this end, what we leave is more important than what we cut. Following a harvest, a stand should have a higher proportion of high-quality trees with well-developed crowns (high potential for increased growth). The key question we must answer before marking a tree is, "What is the potential for the tree to grow in the future?" Trees with little or no potential to grow (i.e. put on recoverable volume) should be removed [unless they are retained for wildlife trees]. The difficult questions arise when a tree's potential is not readily apparent (often in the case of co-dominants). For this reason, beginning timber markers (and even experienced ones) benefit from boring trees and comparing recent growth with crown size, color, and form.

There are factors other than maximum growth which determine which trees we mark. We place as much emphasis upon high quality and high future value as we do upon maximizing growth rate. For that reason, trade-offs exist and while our stands may be maximizing annual value growth, they may not necessarily be growing at the maximum rate.

In addition to the wildlife tree retention requirements, our "normal" marking scheme for selection harvests involves the following:

- Retained trees should be thrifty and of good quality (e.g. minimum 30% crown ratio). Leave best formed trees regardless of diameter and spacing.
- Focus on attaining "target sizes" of 30-36" in redwood and 26-28" in Douglas-fir. This means that you must be very cautious about marking in the 24-28" dbh classes (redwood) and the 22-24" dbh classes (fir), since these will be your "crop trees" at the next entry.
- Assume that 20% of the trees are doing 80% of the growing so it's not which trees to cut, it's which trees should be left to grow. Figure out which of the trees are in this 20% grower category, and leave them. (Percentages will vary from stand to stand.)
- Green culls, conk-infected fir, and large rough wolf trees are usually retained for wildlife.
- Trees that have reached 'crop tree" size should be harvested, along with other suppressed and intermediate trees to capture mortality and improve the growth of the residual stand. Perpetuate the development of a new age class or the growth of existing advance regeneration

at each entry by introducing sunlight to the forest floor. Without the new age classes sustainable selection silviculture will not work!

- You can always opt to allow trees to grow larger than crop size; however, when leaving trees 40" dbh +, you must carefully weigh your decision. Are they to be a legacy tree? Remember trees greater than 48" are to be permanently retained and many large trees with large crowns may reduce the growth of seedlings and future crop trees. Suggest no more than 4 large legacy trees per acre in addition to other trees retained for wildlife and snag recruitment.
- Removal of suppressed and intermediate trees with little or no growth potential. Severely suppressed trees (even redwood) do not release significantly (volume wise) or at least should not be counted on to add significant growth. Cutting suppressed trees does not generally benefit growth and timber recovery, but it will significantly increase logging costs. Cut a few with each entry.
- Removal of grand-fir overstory trees to specifically release viable redwood and Douglas-fir understory is appropriate. We will be managing for mixed-species stands but we do need to guard against encouraging grand-fir in the understory - it is shade tolerant and can dominate a redwood forest in the absence of periodic wildfires. Alternatively, grand-fir can be designated for girdling for accelerated snag recruitment (especially in poor market conditions). These treatments are designed to mimic the high natural mortality rate of grand-fir in an unmanaged forest.
- Removal of 25-35% of the stand volume with a re-entry of 10-15 years. In the field, this usually works out to marking perhaps 30-50% of the volume in a redwood clump, and leaving the well-formed trees growing in the open..
- In windy areas, we try to remove less volume and leave some kind of a wind buffer on the windward side of the stand (usually these trees are wind-beat anyway).
- Where only one large tree (e.g. 26"dbh+) occurs in a clump of smaller (12-14" trees), we mark it, especially if it is on the south side of the clump. Cutting one large high-quality tree is preferable to generating the same value by cutting three or four small high-quality trees.
- Spacing improvement becomes more important when we are returning for the 2nd or 3rd time to a stand because the trees are larger and the crowns need room to expand to maintain high growth rates.
- Do not "give up" WLPZ areas and mark them to the extent it is appropriate and consistent with WLPZ Measures in Section XIV, below.
- Mark hardwoods for removal where small redwood or Douglass- fir trees or a sprouting redwood stump will receive more light.
- It is sometimes necessary to have logistics trump silviculture (e.g. we may have to mark the tree that can be physically felled or yarded, even though it may not be the one we really want to cut). This is especially true in WLPZs
- Group selections work in places where there are few if any good trees to leave or where you need to cut volume across a low-to-medium volume stand. Per 14 CCR 913.2(a)(2)(A): groups shall be limited in size to 2.5 acres and groups cannot comprise more than 20% of the harvest area.
- Likewise, aesthetics may also trump silviculture in given locations (e.g. along county roads).

- Do not become "hung up" on whether you are doing "all age" or "even age" management. If you are truly selecting the best trees to retain for the future and perpetuating the development of the next age class you are probably doing both.

XV. Watercourse and Lake Protection Zone (WLPZ) Measures

TCF places a very high priority on protecting and improving water quality and aquatic and riparian habitat. On the Garcia River Forest, a detailed Site Specific Management Plan (SSMP) required under TMDL regulations was submitted to and approved by the North Coast Regional Water Quality Control Board (NCRWQCB). The GRF SSMP is available from TCF or RWQCB staff; all of the harvesting and road maintenance operations on the Garcia River Forest must be in compliance with the SSMP. For Big River and Salmon Creek, we were required to develop a Water Quality Management and Restoration Plan, which was incorporated into the management plan for BR/SC and included in its entirety as an appendix. WLPZ Protection Measures are based primarily on the framework established in the Forest Practice Rules (FPR). We have chosen to supplement the FPR requirements for our policies in Gualala, Big River and Salmon Creek rather than creating entirely new requirements (e.g. the GRF SSMP) so as to provide for greater consistency and clarity with existing expectations and professional practices. In all of our operations we and our contractors will comply with all applicable regulations and TCF-imposed obligations.

BR/SC and Gualala WLPZ Protection Measures

[Taken, without editing, from the Big River and Salmon Creek IRMP]
The California Forest Practice Rules and other requirements of the NCRWQCB and DFG provide extensive and complex protections for watercourses. By most estimations, combined they are the world's most comprehensive and restrictive regulations governing forestry operations near watercourses. These rules are designed to protect against changes in sediment delivery, shade, large wood recruitment, late seral wildlife habitat, bank stability, and many other issues. The rules were developed in response to major declines in salmonid habitat conditions over the last three decades.

In general, aquatic conditions seem to be slowly recovering from the past practices and current regulatory protective measures should prevent further degradation. But it is unclear whether aquatic conditions are recovering quickly enough to recover and sustain salmonids, particularly in light of human impacts on other life stages. The acceleration of both aquatic and terrestrial restoration measures proposed in this Plan is intended to improve the prospects for the recovery and maintenance of salmonids in the Big River and Salmon Creek Forests.

As stated above, improvement of spawning and migration habitat for salmonid species is a key management goal for the Fund and one of the principal motivations for the acquisition of the Forests. Prohibiting development and agricultural uses on the properties will preclude the largest possible impacts on water quality, followed by comprehensive property-wide road assessments to identify and prioritize sites with sediment delivery potential (the treatment of which will occur over the next ten to fifteen years at an estimated expense of over $5 million). In addition, the following silvicultural practices …also will be implemented to improve water quality:

1. Upslope silviculture. Practicing principally uneven-age single-tree selection silviculture to maintain a mature forest across the Forests with minimal openings will reduce the potential hydrologic impacts of even-aged management, which studies at Caspar Creek (http://www.fs.fed.us/psw/topics/water/caspar/) have linked to temporary increases in peak flows, sediment yields, and ambient temperature. Uneven-aged management does, however,

require more frequent entries and increased road infrastructure, which is why the next strategy is so important.

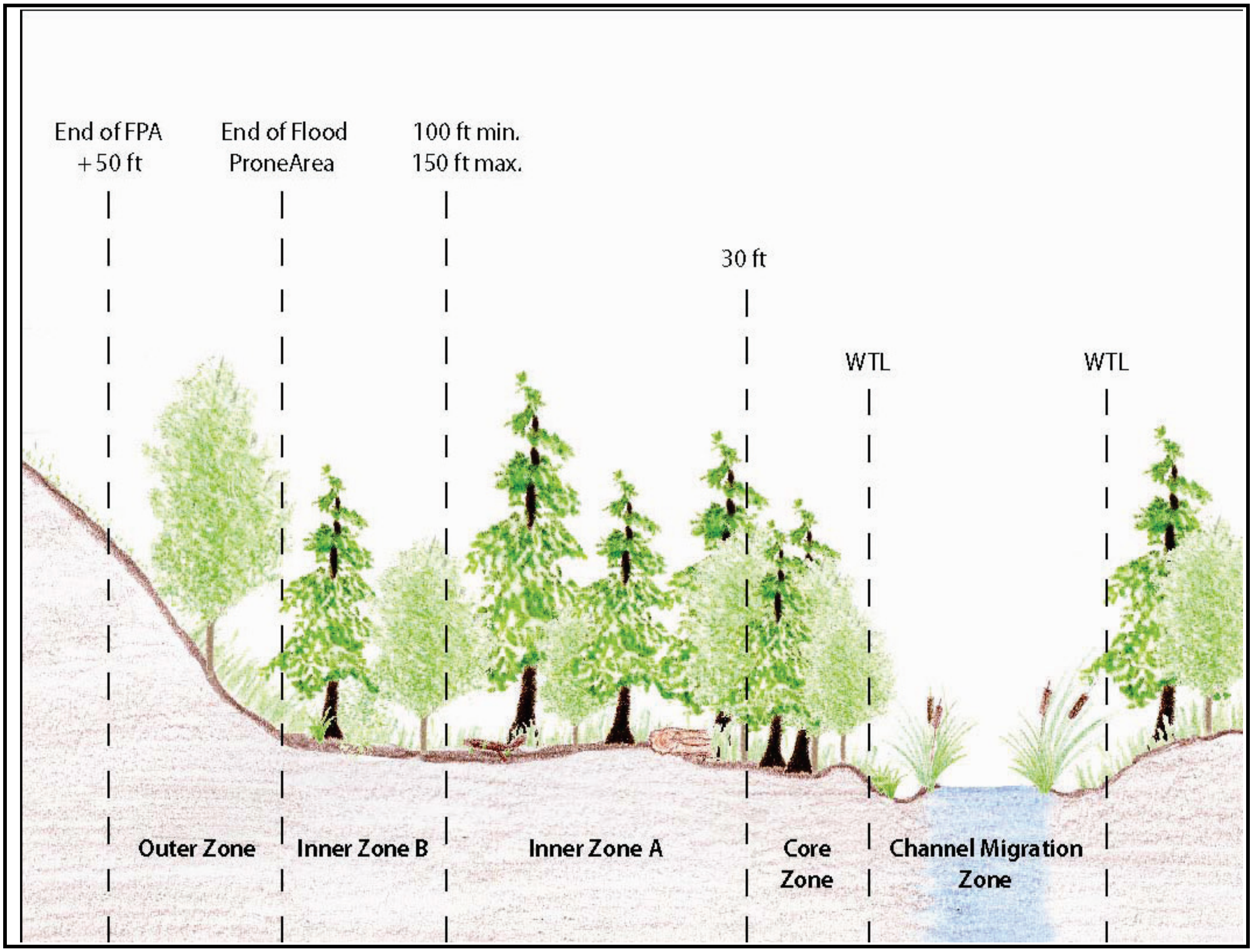
2. Increased riparian protection. In addition to standard Watercourse and Lake Protection Zone measures, forest management will include increased canopy retention across all classes of streams.

Specific Gualala and Big River/Salmon Creek WLPZ Protection Measures
Class 1 Watercourses:

Timber operations within the Class I WLPZ have been designed and will be conducted to protect, maintain, and contribute to restoration of properly functioning salmonid habitat and listed salmonid species. To achieve this goal, timber operations will:

- Prevent significant sediment load increase to a watercourse system or lake
- Prevent significant instability of a watercourse channel or of a watercourse or lake bank.
- Prevent significant blockage of any aquatic migratory routes for any life stage of anadromous salmonids or listed species.
- Prevent significant adverse effects to stream flow.
- Protect, maintain, and restore trees (especially conifers), snags, or downed large woody debris that currently, or may in the foreseeable future, provide large woody debris recruitment needed for instream habitat structure and fluvial geomorphic functions.
- Protect, maintain, and restore the quality and quantity of vegetative canopy needed to provide shade to the watercourse or lake to maintain daily and seasonal water temperatures within the preferred range for anadromous salmonids or listed species where they are present or could be restored; and provide a deciduous vegetation component to the riparian zone for aquatic nutrient inputs.
- Prevent significant increases in peak flows or large flood frequency.

Profile View of Class I WLPZ in flood prone areas and channel migration zones (not to scale)



Channel Migration Zone: When a CMZ is present upslope of the WTL it is incorporated into the Core Zone. No timber harvesting is proposed in this zone.

Core Zone: The primary objective for this zone is streamside bank protection to promote bank stability, wood recruitment by bank erosion, and canopy retention. Timber operations are generally excluded from this zone and limited to actions which meet the objectives stated above or improve salmonid habitat consistent with 14 CCR 916.9 subsections (a) and (c). The width of the Core Zone is 30 feet measured from the watercourse transition line or lake transition line. No timber harvesting is proposed within the 30 foot wide core zone. **TCF has elected to increase the required core zone from 30 feet to 50 feet.**

Inner Zone A: The primary objective for this zone is to develop a large number of trees for large wood recruitment, to provide additional shading, to develop vertical structural diversity, and to provide a variety of species (including hardwoods) for nutrient input. This is accomplished through the establishment of high basal area and canopy retention by retaining or more rapidly growing a sufficient number of large trees. Additional specific objectives include locating large trees retained for wood recruitment nearer to the Core Zone and maintaining or improving salmonid habitat on flood prone areas and CMZs when present. Timber operations within WLPZs are limited to those actions which meet the objectives stated above or to improve salmonid habitat consistent with 14 CCR 916.9 subsection (a) and (c).

The Inner Zone A generally encompasses the portion of the flood prone area from 30 feet beyond the WTL (Core Zone perimeter) up to 150 feet from the WTL. The minimum width of the Inner Zone A shall be the greater of the area from the landward edge of Core Zone to the landward edge of the Inner Zone B or 70 feet. The maximum width is 120 feet. **Within Inner Zone A harvesting is subject to the following additional restrictions:**

- The silvicultural method in this area is single tree selection.
- The post harvest stand shall have a minimum 80% overstory canopy cover.
- The post harvest canopy may be composed of both conifers and hardwood species and shall have at least 25% overstory conifer canopy.
- The post harvest stand shall retain the 13 largest conifer trees (live or dead) on each acre of the area that encompasses the Core and Inner Zones.
- Large trees retained shall be the most conducive to recruitment to provide for the beneficial functions of riparian zones (e.g. trees that lean towards the channel, have an unimpeded fall path toward the watercourse, are in an advanced state of decay, are located on unstable areas or downslope of such an unstable areas, or have undermined roots) are to be given priority to be retained as future recruitment trees.
- Harvesting is planned so that the QMD of the flood prone area timber stand will increase.

When no floodplain or Channel Migration Zone is present the maximum width of the WLPZ is 100 feet, the harvest restrictions in the core zone and inner zone A apply.

Inner Zone B: The Inner Zone B is applicable when there are very wide flood prone areas. The Inner Zone B encompasses the portion of the flood prone area from the landward edge of the Inner Zone A (i.e.150 feet from the WTL) to the landward edge of the flood prone area. The landward edge of the Inner Zone B (i.e. the landward perimeter of the flood prone area) shall be established in accordance with flood prone area. Timber operations are permitted in this zone when conducted to meet the goals of this section, including those for the Inner Zone as follows: The primary objective for this zone is to develop a large number of trees for large wood recruitment, to provide additional shading, to develop vertical structural diversity, and to provide a variety of species (including hardwoods) for nutrient input. This is accomplished through the establishment of high basal area and canopy retention by retaining or more rapidly growing a sufficient number of large trees. Additional specific objectives include locating large trees retained for wood recruitment nearer to the Core Zone and maintaining or improving salmonid habitat on flood prone areas and CMZs when present. Timber operations within WLPZs are limited to those actions which meet the objectives stated above.
Within Inner Zone B harvesting is subject to the following additional restrictions:

- The silvicultural method in this area is single tree selection.
- The post harvest stand will retain the 13 largest conifer trees (live or dead) on each acre of the Core and Inner Zones.
- Postharvest stand shall have a minimum 50% overstory canopy cover.
- The post harvest canopy may be composed of both conifers and hardwood species and will have at least 25% overstory conifer canopy.
- Harvesting is planned so that the QMD of the flood prone area timber stand will increase.

Outer Zone: There is no outer zone due to application of uneven aged silvicultural practices. If, in the future, we institute even-age harvest methods an Outer Zone will be implemented pursuant to the current WLPZ rules.

Slope Class	Class II-S WLPZ Zone Width (feet) Core/Inner Zones	Class III ELZ Width (feet)	Wet Area ELZ Width (feet)
<10%	0 / 50	30	30
10 - 30%	15 / 35	30	30
30 - 50%	15 / 60	50	50
>50%	15 / 85	50	50

Class II Watercourses:
All Class II WLPZs shall be composed of two zones regardless of the watercourse type: a Core Zone and an Inner Zone. The Core Zone is nearest to the water; the Inner Zone is contiguous to the Core Zone and is furthest from the water. The width of the Core and Inner Zones vary depending on the following three factors: (i) side slope steepness in the WLPZ, (ii) whether the watercourse is a Class II-S or Class II-L watercourse type, and (iii) whether the watercourse is within a watershed in the coastal anadromy zone or outside the coastal anadromy zone *(all watercourses within TCF ownership are within the coastal anadromy zone).*

Class II Large:
Core Zone: *30 feet in which no harvest may occur.*

Inner Zone: The widths of the Inner Zone is 70 feet and adjacent to the core zone forming a total zone of 100 feet for all class II L streams. Harvesting within the inner zone is allowed providing the 13 largest trees per acre are retained and at least 80% canopy is retained. Silvicultural systemsfor harvesting are limited to the use of commercial thinning or single tree selection.

Class II Standard:
Core Zone: Variable zone (0-15 feet) based on slope in which no harvesting can occur.

Inner Zone: Variable zone (35-85 feet) based on slope at least 50% of the total canopy covering the ground shall be left in a well distributed multi-storied stand configuration composed of a diversity of species similar to that found before the start of operations. The residual overstory canopy shall be composed of at least 25% of the existing overstory conifers.

Class III streams: Using the variable width Equipment Limitation Zone (ELZ) defined by the FPR, where there are no overstory retention requirements under the FPR, the Fund will retain at least 50 percent canopy, and a minimum of 25 percent overstory conifer.

[Note: conformance with all canopy requirements will be measured as an average across not less than a 200-foot lineal WLPZ segment—the same as the FPR.]

The Fund believes these three simple measures of increased retention (one per stream class) a) complement the project goals and the process and review requirements of the existing regulations; b) are efficient for foresters to implement in the field; and c) offer higher confidence that aquatic habitat conditions will improve.

In acquisition funding agreements for Big River and Salmon Creek, the Fund committed to management practices that, among other things, "establish riparian buffers that are wider than required under the Forest Practice Rules." The Fund's forest management policies meet that requirement by providing greater canopy retention within the WLPZ and increased basal area and canopy retention upslope from the WLPZs. A specific example of the wider buffer is the no-cut buffer along Class I streams which has been expanded from 30 feet to 50 feet from the stream—a significant expansion. Additionally, the predominant silviculture beyond the formal WLPZ buffers will be single-tree selection which substantially extends the effective riparian buffer width.

XVI. Harvesting Operations

One of the key planning aspects for timber harvest operations is choice of yarding method—ground or tractor-based and cable or skyline systems. The yarding method choice for a specific harvest unit should be based on the silvicultural system, and the site-specific topography and access. The two primary yarding methods most commonly employed are tractor yarding and cable skyline yarding. Tractor yarding includes tractors with winches and chokers, tractors equipped with grapples or rubber tired skidders with grapples or winches. Tractor yarding is generally used on gentle terrain up to 55% slope. Tractors may be used on steeper slopes where cable yarding is infeasible due to access problems or on long corners where deflection for skyline logging is inadequate. Cable skyline yarding consists of a running skyline or preferably a standing skyline with a carriage, either system should be capable of elevating the logs above the existing tree canopy. Cable logging is used on steep slopes, generally over 50%, where slopes are long and planer or concave. Cable yarding on convex slopes can result in a ground lead situation which can cause unnecessary damage to residual timber or the logging equipment. The key to successful cable yarding is to ensure that there is adequate deflection in the logging unit to suspend the logs above the ground and tree canopy.

The decision to use cable or tractor logging systems is generally an easy one to make. The coast range is very steep and highly dissected with many drainages which make for easy cable logging settings and the ridge tops are reserved for tractor logging. There is a range of slopes between 50-65% where either method may be judged to be adequate in the eyes of the forester laying out the timber harvest unit. Cable logging may be used on shallow slopes were the logs would otherwise be adverse skidded to a landing above the harvest area and conversely tractors may be employed where there are adequate roads and landings downhill of the harvest area. The decision to use one method over the other in this "gray" area is generally made by using the equipment that is required on the rest of the job for example a shallow slope may be cable logged if the rest of the job is predominately cable logging. Or tractors may be used on steeper slopes if there is so little steep ground that bringing in a cable yarding machine for a few acres is deemed infeasible or uneconomical. Tractor long lining is a common practice where winch lines are pulled down hill and the logs are winched up to the tractor sitting in a stationary position. This technique is generally used when the slopes are very short and do not justify the expense of a cable machine and the tractor itself does not operate on the steep slope. Other methods which are suitable for unevenage management techniques are helicopter or balloon yarding which are used when access is limited or there is no access because of excessive road construction or stream crossings requirements to get road access to a harvest unit.

Yarding method decisions are reviewed by the Senior Forester and are discussed in the field consultations. Yarding method and any unusual access situations are described in THPs and are also included in our more readily-available THP summaries.

XVII. Contractor Selection

TCF will utilize contractors in several roles in the management of these properties—from forestry and wildlife surveys to logging and road maintenance. There are several reasons for this—as a relatively new enterprise TCF is not in a position to take on significant staff obligations and many of the most experienced professionals already have contract businesses set up. Additionally we can not guarantee year-round work in some areas. We will strive to use the highest quality professionals available—from owl calling to bridge repair. At least initially we will put most logging jobs out to bid, although we will select the firm that offers the best combination of price, performance, and experience. Other contracts, such as for road maintenance and security, will likely be negotiated directly with the professionals who have the most experience in the area and want the work. Especially for logging, road, and security contracts, ensuring safe working conditions and selecting contractors with good safety records will be an important concern. Additional forestry project work (e.g. owl surveys, preparing and supervising a THP) will be drawn from the area's experienced consulting biologists and foresters. In those situations we will seek to utilize the consultant as a full team member to solicit their ideas on how to meet our objectives. In all roles we have a strong preference for local expertise because it helps support local communities and the timber-based economy. We are concerned about the relative lack of young professionals in the field and will seek to create opportunities that encourage viable business opportunities for young loggers and technicians. In all our efforts we will strive to pay a good and fair wage, to reward performance, and to encourage professional development.

XVIII Staff Training

The Conservation Fund has taken advantage of the high quality of local contractors and chosen to keep our staff relatively small. TCF recognizes that staff will need training in specific areas, appropriate to their positions. Training will be provided as deemed necessary by a supervisor as the staff person's responsibilities grow, or as requested by the staff person. TCF will train staff to encourage individual strengths. TCF recognizes that the SFI 2010-2014 Standard, Objective 16 and FSC US Forest Management Standard, C4.1b encourages employees to improve their skills in sustainable forestry practices through appropriate training and education sufficient to their roles and responsibilities. Each employee has an annually updated job description outlining individual responsibilities and participates in an annual performance review.

Staff Training Expectations

	Timberlands Manager	Registered Professional Forester	Forestry Technician	Office Manager	Forest Carbon Analyst
Participate in SFI Implementation Committee and other forestry associations	x				
Sustainable forestry principles and SFI & FSC standards	x	x	x	x	x
Best management practices: specific to streamside and road management	x	x	x		
Principles related to	x	x	x		

reforestation, invasive plants and animals, forest resource conservation and aesthetics					
Responsibilities under the US Endangered Species Act, Salmonid Protocol, NSO Protocol and Red Legged Frog Protocol	x	x	x		
Safety precautions	x	x	x	x	x
OSHA regulations	x				
Business Management	x				
Public Outreach	x			x	
Emerging Technologies	x	x	x	x	x
Forest carbon quantification and verification					x
Road engineering	x	x			

XVIV. Forest Certification

The Conservation Fund has committed to seeking dual certification under the Forest Stewardship Council and Sustainable Forestry Initiative programs. All properties are to be managed in compliance with the 2010-2014 SFI Standard, Section 2 and the FSC US Forest Management Standard, v1.0 (available at www.sfiprogram.org and www.fscus.org respectively). The Conservation Fund supports the efforts of the SFI Implementation Committee (SIC) by actively participating in the California SIC meetings and programs and retains records of the SICs submittal of annual data to SFI, Inc. regarding inconsistent practices.
An initial scoping audit was completed on the Garcia River Forest in May 2006. A full audit and annual surveillance audits were successfully competed on the Garcia River, Big River, and Salmon Creek forests in all subsequent years, with a full recertification audit to take place in November 2012 that will include the Gualala River Forest.

XVV. Community Engagement

TCF seeks involvement from the local community at several stages of its activities. A public meeting was held to review the management plan for BR/SC, much like a meeting was held in Point Arena to review the GRF IRMP prior to adoption. Interested parties are invited to participate in a tour of each THP either before or shortly after submission, and again following completion of the operation. In addition, TCF staff is available to respond to questions or concerns raised by the local community. TCF prepares and broadly disseminates an Annual Report that describes major activities on the properties, changes to policies, and monitoring results. Should a dispute arise between TCF and a local citizen, neighbor, partner organization, current or potential contractor, or other interested entity, TCF will first seek to resolve the dispute through open communication, prior to more formal dispute resolution through mediation or litigation. Records of disputes will be made available to the lead certification auditor. In all situations, TCF strives to be a good neighbor and fair employer, and will hold itself to high professional standards in its dealings with the local community, contractors, Native American tribes, public agencies, and all other interested parties.

reforestation, invasive plants and animals, forest resource conservation and aesthetics					
Responsibilities under the US Endangered Species Act, Salmonid Protocol, NSO Protocol and Red Legged Frog Protocol	x	x	x		
Safety precautions	x	x	x	x	x
OSHA regulations	x				
Business Management	x				
Public Outreach	x			x	
Emerging Technologies	x	x	x	x	x
Forest carbon quantification and verification					x
Road engineering	x	x			

<u>XVIV. Forest Certification</u>

The Conservation Fund has committed to seeking dual certification under the Forest Stewardship Council and Sustainable Forestry Initiative programs (FSC-US Forest Management Standard version 1.0) and Sustainable Forestry Initiative (2015-2019 Standard), available at https://ic.fsc.org/united-states.298.htm and http://www.sfiprogram.org/sfi-standard/forest-management-standard/. The Conservation Fund supports the efforts of the SFI Implementation Committee (SIC) by actively participating in the California SIC meetings and programs and retains records of the SICs submittal of annual data to SFI, Inc. regarding inconsistent practices. An initial scoping audit was completed on the Garcia River Forest in May 2006. A full audit and annual surveillance audits were successfully completed on in all subsequent years, with a full recertification audit to take place every five years.

<u>XVV. Community Engagement</u>

TCF seeks involvement from the local community at several stages of its activities. A public meeting was held to review the management plan for BR/SC, much like a meeting was held in Point Arena to review the GRF IRMP prior to adoption. Interested parties are invited to participate in a tour of each THP either before or shortly after submission, and again following completion of the operation. In addition, TCF staff is available to respond to questions or concerns raised by the local community. TCF prepares and broadly disseminates an Annual Report that describes major activities on the properties, changes to policies, and monitoring results. Should a dispute arise between TCF and a local citizen, neighbor, partner organization, current or potential contractor, or other interested entity, TCF will first seek to resolve the dispute through open communication, prior to more formal dispute resolution through mediation or litigation. Records of disputes will be made available to the lead certification auditor. In all situations, TCF strives to be a good neighbor and fair employer, and will hold itself to high professional standards in its dealings with the local community, contractors, Native American tribes, public agencies, and all other interested parties.

PROGRAM ON HIGH CONSERVATION VALUE FORESTS, IMPERILED SPECIES, AND REPRESENTATIVE SAMPLE AREAS
The Conservation Fund's North Coast Forest Conservation Program
Primary author: Evan Smith
Original version December, 2008; expanded September 2010, 2011, 2012, 2014

Document background

This program description was prepared to assist the audit team in evaluating compliance with the requirements of the SFI & FSC forest certification systems and to guide the forest planning and monitoring conducted by The Conservation Fund. It builds on an earlier version (12/28/2008) with expanded sections detailing Imperiled Species and Representative Sample Areas. This document references and expands upon the "*Garcia River Forest Integrated Resource Management Plan*," the "*Big River and Salmon Creek Forests Integrated Resource Management Plan*," and "*Conservation Prospects: A review and analysis of existing conservation plans, land use trends and strategies for conservation on the north coast of California*." All three plans are available in the reference documents section of the North Coast Program website-- http://www.conservationfund.org/projects/north-coast-forest-conservation-initiative/north-coast-reference-documents. While some of the material in this summary is duplicative of the management plans it provides additional detail that is of specific interest to FSC/SFI auditors; this is intended to be a stand-alone policy applicable across all properties (and any additional acquisitions in California).

Introduction

The Conservation Fund (TCF) is required to identify areas that because of significant conservation values should have special management practices. This requirement is imposed by TCF's internal forest management planning approach (see Forest Management Policies section IV, Critical Landscape Features) and by the requirements for sustainable forest management certification. For consistency purposes this document will primarily reference language from the Forest Stewardship Council (FSC) US Forest Management Standard, especially Principle 9; we prefer the term "features" over "forest" because many of the highest priority conservation elements are the non-forested features within a forested landscape. This discussion is also linked to Sustainable Forestry Initiative Standard, Section 2, Indicator 4.1.3. The basis for most of this program comes from two important conservation planning exercises, "*Conservation Prospects for the North Coast*" and the Conservation Action Planning assessment in the *"Garcia River Forest Integrated Resource Management Plan,"* described in more detail below.

Conservation Prospects

In August 2005, after two years of research and review, TCF completed "*Conservation Prospects for the North Coast: a review and analysis of existing conservation plans, land use trends, and strategies for conservation on the North Coast of California*." This plan was prepared under a contract for the California State Coastal Conservancy. The principal author of the plan was Jenny Griffin, then a consultant to TCF. "*Conservation Prospects*" systematically identifies the highest conservation values for the region based on a broad set of past conservation plans and develops recommendations for future conservation efforts. The two principal recommendations are to:

- Move quickly to establish "working landscape" conservation management on large, strategically located forest and agricultural properties in resource-rich watersheds in Humboldt, Mendocino and Del Norte counties.

- Focus other fee or easement acquisitions on unique resources that are essential to conserving high-priority coastal resources, such as coastal estuaries, old-growth redwood forest stands, coho salmon refugia, floodplains, and California Coastal Trail segments.

In addition to these general recommendations, the report reviews and catalogs 154 individual conservation plans for the region and provides a detailed spatial synthesis assessment of the seven plans deemed to be the most broadly relevant and instructive. The seven plans were chosen on the basis of data quality, scientific principles, format, and mandate and consist of:

1. *California North Coast Ecoregion Aquatic Conservation Strategy Recommendations,* The Nature Conservancy of California, Fall 2003;
2. *California North Coast Ecoregional Plan,* The Nature Conservancy of California, June 2001;
3. *Completing the California Coastal Trail*, California State Coastal Conservancy, January 2003;
4. *Mendocino County Coastal Conservation Plan,* Mendocino Land Trust, April 2003;
5. *A GIS-Based Model for Assessing Conservation Focal Areas for the Redwood Ecoregion,* Conservation Biology Institute and Save-the-Redwoods League, 1999;
6. *Recovery Strategy for California Coho Salmon*, California Department of Fish and Game, 2004; and
7. *Strategic Plan Update,* Pacific Coast Joint Venture, 2004.

The 13-page chapter of "*Conservation Prospects"* on the Mendocino Coast Hydrologic Unit (which contains all of the TCF properties) draws from 15 local plans in addition to the seven core regional plans. In general, "the Mendocino Coast HU is consistently one of the most highly valued regions of the North Coast" by the conservation plans synthesized. Specific features that are recognized as of high conservation value include pygmy forest, coastal dunes, coastal estuarine wetlands, seabird rookeries, spawning areas for anadromous fish, and old growth forests (note that redwood-Douglas fir and tanoak forests were not identified as high conservation value).

The report was developed over a 24 month period in collaboration with state agencies and conservation groups; 41 organizations or individuals provided technical review for the assessment. The report is frequently cited by newer conservation plans and initiatives on the North Coast.

Garcia River Forest Conservation Action Planning

Occurring nearly simultaneous with the development of "*Conservation Prospects*" was a much more targeted exercise in conservation planning for the Garcia River Forest (GRF) led by The Nature Conservancy and utilizing their "Conservation Action Planning" process (also known as "5-S"). As described in the GRF Integrated Resource Management Plan (Section II, Identification of Conservation Targets and Associated Indicators) this was "designed to help identify conservation targets, develop strategies to protect those targets, take action, measure success, and adapt." Among the numerous features evaluated, five were identified as Conservation Targets: anadromous fish bearing stream, redwood/Douglas-fir forest, oak woodland/grassland, non-riverine wetlands, and Northern spotted owl.

Each conservation target has identified indicators with quantitative monitoring metrics relating to distribution, viability, and quality. For example, the selected indicators for anadromous fish bearing streams include percent fines less than .85mm (spawning sites); percent fines less than 6.5mm (spawning sites); mean weekly average water temperature (Class I streams); mean pool shelter rating (Class I streams); primary pool frequency (Class I streams); riparian canopy cover (Class I streams). Nine additional indicators were identified for further evaluation.

The primary references used in the Conservation Action Planning process were:

- Low, Greg. 2003. *Developing Strategies, Taking Action & Measuring Success. Landscape – Scale Conservation: A Practitioner's Guide*. The Nature Conservancy, Arlington, Virginia.

- The Nature Conservancy. 2005. *Conservation Action Planning Workbook, Version 4b*. The Nature Conservancy. Arlington, Virginia.

The Conservation Action Planning process is the premier tool for conservation and restoration planning within a conservation biology framework. It has been used at thousands of sites across the world.

As part of the GRF Integrated Resource Management Plan (IRMP), the Conservation Action Planning process was led by Mark Reynolds and Jen Carah, ecologists with The Nature Conservancy. The GRF planning team included an additional twelve experts from the fields of forest management, land conservation, and watershed restoration. A well-attended public meeting to solicit comment on the draft plan was held in nearby Point Arena, CA, and numerous additional consultations were provided by recognized experts and the local community. The plan has been approved by the State Coastal Conservancy, the California Department of Fish and Game, and The Nature Conservancy.

Land Acquisition Evaluations

In order to document the conservation values of the property, TCF prepared a Land Acquisition Evaluation prior to commitment of acquisition funding from the state agencies. These documents include detailed descriptions of vegetation types and species occurrences, as well as more general information about physiographic features and local ecology. They are developed in consultation with staff from the California Department of Fish & Wildlife (DFW) and need to be approved by DFW. Land Acquisition Evaluations prepared for each California North Coast forest have formed the basis on ongoing ecological monitoring and planning. Relevant information from the Land Acquisition Evaluations is excerpted below in the sections on specific conservation features.

HCVF definition from the FSC-US Forest Managment Standard (v1.0)

FSC defines High Conservation Value Forests as those that possess one or more of the following High Conservation Values (HCVs):

1. HCV forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g., endemism, endangered species, refugia), including RTE species and their habitats;
2. HCV forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance;
3. HCV forest areas that are in or contain rare, threatened or endangered ecosystems;
4. HCV forest areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control);
5. HCV forest areas fundamental to meeting basic needs of local communities (e.g., subsistence, health); or,
6. HCV forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

[note: this definition was updated by FSC in 2010, the change in the FSC HCVF definition does not result in changes to the TCF HCVF definition.]

TCF Definition of HCVF

The Garcia River, Big River, Salmon Creek, Buckeye and Gualala River properties were acquired by TCF expressly because of their conservation value. The properties possess significant conservation values, as documented in the Land Acquisition Evaluations prepared for the property, including habitat for numerous endangered species. It could be argued that all of the North Coast should be considered High Conservation Value Forests, but more realistically only the most exceptional and sensitive areas of this exceptional and sensitive landscape should be classified as HCVF. The TCF team used this exercise to identify those elements that deserve more than just recognition and protection as part of a conserved working forest but are truly critical conservation values, significant at a regional level. Based on the analysis done as part of *Conservation Prospects* and the GRF IRMP, TCF has identified the following areas as High Conservation Value Forest features:

a) Oak woodlands and grasslands
b) Pygmy cypress forest
c) Old growth coniferous forest
d) Salmonid spawning streams.

Grasslands and salmonid spawning streams are obviously not "forest," but occur within or on the edge of forests and are recognized as HCVF features because of their critical importance and sensitivity to management practices.

In addition to this list, many additional areas and elements were considered. All portions of the properties have some degree of ecological value—whether it is habitat for the Northern spotted owl or ability to support carbon storage. And all of the properties are used for recreation, public education, and to a limited extent, foraging. And there are many fine-scale elements that have significant conservation value—snags, trails, etc. The above definition is designed to recognize those elements that are <u>regionally-significant</u> and deserve special management attention. The definition also considers the degree of threat—many of the above-listed elements are still vulnerable under current laws and regulations. Public drinking supplies are not present on the property but probably would not be considered as a separate HCVF element because they would likely be correlated with and enveloped by the salmonid spawning area designations and because of the high degree of existing stream and watershed protections under the Forest Practice Rules, Regional Water Quality Control Board requirements, and TCF Forest Management Policies.

<u>TCF Inventory of HCVF</u>

Oak woodlands and grasslands. Oak woodlands and grasslands were mapped on the Garcia River Forest as part of the planning process for the Ecological Reserve Network (ERN). All significant areas (>10 acres) were included in the ERN and are to be managed solely for their ecological value. More fine-scale mapping of the hardwood and grassland community types was completed in 2008 by The Nature Conservancy under a research grant from the USDA Forest Service related to the distribution and control of Sudden Oak Death. This digital imagery-based vegetation mapping has been groundtruthed by TNC staff and represents a significant advancement in the field of plant community mapping. Currently we track 613 acres of Oak Woodland and 369 acres of Grasslands on the Garcia in our GIS—not all Grasslands are natural meadows, a small portion are probably old landings. Big River / Salmon Creek is situated farther west than Garcia and consequently is primarily a coniferous forest with less of these arid forest types. No oak woodlands or grasslands were identified as part of the forest stand typing (using aerial photos) completed by John Nickerson in 2007. Analysis of the Department of Fish & Game California Vegetation database (CalVeg) indicates 6 acres of Canyon Live Oak vegetation type on the Big River tract and 523 acres of Annual Grass/Forbs on Big River and 24 acres on Salmon Creek. CalVeg is notorious for overstating oak and grassland areas because of the difficulty in using remote sensing to differentiate oak from tanoak and early seral forest conditions from native grasslands. Based on initial field review these sites are not true oak woodlands or grasslands, but brushy former clearcuts and landings. Currently we track 0 acres of Oak Woodland and 0 acres of Grasslands on BR/SC in our GIS. Gualala contains 115 acres of Grassland and 91 acres ofOak Woodland. The Buckeye forest has 812 acres of grassland and no designated oak woodland.

Pygmy cypress forest. Salmon Creek contains the only known occurrence (on TCF properties) of this rare natural community type, which are limited to former marine terraces with thin, nutrient-poor, acidic soils underlain by a hardpan. According to CalVeg, there should be 122 acres of pygmy forest on Salmon Creek but the entire area was assessed as part of the field work for the Lower Salmon Creek THP and amendment and only stands 57718 and 57719 (reported as 11 gross acres, but 3 acres of roads/landings) were identified as having pygmy cypress forest characteristics. This community type does not usually grade into commercial forest types; typically there is a fairly sharp demarcation, but field staff are knowledgeable of the characteristics of pygmy forest and will readily observe any additional stands if they are present. If field surveys reveal additional pygmy forest areas, they will be added to this inventory. Currently we track 8 acres of Pygmy Cypress Forest in our GIS, a single location on Salmon Creek near the Iron Gate access point.

Old growth coniferous forest. Unfortunately, due to the extensive logging of coastal Mendocino County, there are no old growth stands on the property. Old growth stands are defined as having the majority of the canopy in trees established prior to 1800—even if harvest or other disturbance has occurred within the stand. Individual old growth trees do occur on these properties—although to a very limited extent. They usually result from the release in the early to mid-1900s of suppressed trees when the old growth overstory was removed. They are not mapped but are fully protected under the wildlife tree retention requirements (see TCF Forest Management Policies). Currently we track 0 acres of Old Growth in our GIS.

Salmonid spawning streams. While there is excellent mapping of fish-bearing streams (Class 1 watercourses) and there is decent understanding of salmonid distribution within these watersheds, there has not been a detailed assessment of individual spawning areas. Precise location of spawning areas is not critical to the HCVF policies but will likely be the subject of future monitoring. Surveys by Department of Fish & Game, The Nature Conservancy, and North Coast Regional Water Quality Control Board have indicated coho presence in North Fork, Signal, Blue Waterhole, and Inman creeks on the Garcia River Forest (as well as the mainstem), whereas steelhead are widely documented (assume they are using just about every Class 1 stream on our properties). On Big River, coho are documented in the mainstem, Two Log, North Fork and Laguna Creek. Coho are documented along most of the length of Salmon Creek and Hazel Creek. On the Gualala River, coho are documented on the North Fork Gualala River and Dry Creek. The Buckeye Forest Baseline Report states that coho salmon have been identified on the property but does not name specific streams. Currently we use our GIS to track the number of miles of Class I stream (36 on Garcia, 24.5 on Big River, 10 on Salmon Creek, 16 on Gualala and 29 on the Buckeye Forest.); this approach slightly overstates the amount of actual salmonid spawning streams, because some portions of Class I streams are above fish passage barriers, but is the best information currently available. The most significant barrier is a waterfall and logjam in the upper North Fork of Garcia; other anthropogenic barriers (usually culverts, but a couple of log jams as well) are being inventoried and repaired as they are discovered.

<u>TCF Protection Measures for HCVF</u>

General measures. The most significant threats to any HCVF element would be residential development, forest fragmentation, vineyard conversion or grazing—all have been prohibited by TCF's acquisition and the permanent conservation restrictions on the properties. This limits the number of potential threats to the much smaller subset of forest management, road building and/or maintenance, recreation, trespass and neglect. Appropriate protection measures for HCVF are incorporated in the TCF Forest Management Policies, as described below. New road building projects carefully reviewed by TCF staff (both because of its expense as well as the potential environmental impact) and are included in proposed THP's or Department of Fish and Game projects such as Fisheries Restoration Grant Projects. Guidelines for road construction and maintenance are described in the TCF Road Management Plan. Recreation policies have been developed for these properties, to date we have a pedestrian and equestrian access permit system for Big River and Salmon Creek. Garcia is favored for hunting and a small number of permits to hunt are issued each year, primarily to neighbors. Trespass is a major concern on the property, particularly as it relates to illegal marijuana cultivation. All the properties are actively patrolled by TCF staff and contractors and thoroughly gated to discourage trespass. Fortunately, marijuana cultivation is not common in pygmy cypress or oak woodlands and grasslands. Sudden Oak Death does occur on the Garcia and Gualala Forests and will likely infect the HCVF oak woodlands. At this time SOD occurs in isolated areas and does not appear to significantly threaten the oak woodlands. There is no effective and affordable treatment or vaccination against SOD in a forested setting, so treatment will consist of maintaining an ecologically balanced and healthy forest. For all these reasons, protection of the HCVF is well-integrated with the design and implementation of the projects. Additional specific references are provided below.

Oak woodlands and grasslands. TCF Forest Management Policies (Section IV) states, "All true oak (Quercus spp.) woodlands and native grasslands are to be preserved." In addition, the vast majority of the oak woodlands and grasslands on TCF property are included within the Ecological Reserve Network (ERN) on the Garcia River Forest. Management of the ERN is described in the GRF IRMP but all management activities must be designed and implemented to further the ecological goals. In the case of oak woodland and grassland this means that prescribed fire or selective harvest to address conifer encroachment or to control the spread of Sudden Oak Death would be permitted under direction of TNC.

Pygmy cypress forest. TCF Forest Management Policies (Section IV) states, "All pygmy forest is to be preserved." Salmon Creek contains the only known occurrence of this rare natural community type on TCF properties. The area northwest of the Lower Salmon Creek THP Unit A (also mapped as stand #57719) and north of Units D and F (approximately mapped as stand #57718) are to be protected from future harvest and monitored for potential impacts. Pygmy forest occurs along a gradient, according to soil and hydrological variations, and there may be pygmy characteristics within the adjoining managed forest. Unique pygmy features that are encountered within a harvest area would be retained under Forest Management Policies Section X, Retention Requirements.

Old growth coniferous forest. Unfortunately, this does not exist within the TCF ownership. Should any new stands be identified or new property be acquired, all old growth coniferous forest would be preserved. Individual old growth trees are preserved on TCF property whenever they are encountered.

Salmonid spawning streams. Protection for salmonid spawning streams is provided for by the Forest Management Policies Section XIV, WLPZ Protection Measures, and includes measures related to upslope silviculture, road improvements, and increased riparian buffer protection. Additional details are available within the Forest Management Policies and the GRF Site-Specific Management Plan approved by the North Coast Regional Water Quality Control Board.

TCF Monitoring of HCVF

Periodic monitoring of HCVF will be integrated into ongoing monitoring activities on the properties and will occur at different scales and timeframes as necessary. Two categories of monitoring will occur: 1) biophysical—related to the distribution and condition of the HCVF features, and 2) programmatic—related to the effectiveness of the protection measures.

Biophysical monitoring will consist of:

- Ongoing vegetation mapping as part of forest inventory updates and Timber Harvest Plan preparation, with updated forest stratification approximately every ten years.
- Ongoing rare plant surveys in the areas within and adjoining planned Timber Harvest Plans and Road Improvement or Decommissioning Projects.
- Occasional evaluations of Sudden Oak Death distribution and mortality on Garcia River Forest by The Nature Conservancy and or TCF.
- Aquatic habitat typing by The California Department of Fish and Wildlife have been completed on TCF forests, and are tentatively scheduled to be re-assessed approximately every ten years.
- EMAP aquatic monitoring on Garcia River Forest by The Nature Conservancy and the North Coast Regional Water Quality Control Board—initial assessments completed, re-assessments in approximately ten years.

- Annual summer season stream temperature monitoring at multiple sites on all properties (multiple partners).

Programmatic monitoring will consist of 1) an annual evaluation of whether the HCVF features are being sufficiently protected and if there are any new threats to consider and 2) a long-term evaluation of the water quality and stream habitat condition response to TCF forest management and watershed restoration practices. The former will occur as part of the Annual Program Review; the latter will be developed over the next decade based on observations in the habitat assessment and EMAP measurements (see the GRF Aquatic Monitoring Plan in the IRMP).

Representative Sample Areas. Ecosystem type definition

Identification and protection of Representative Sample Areas (RSA) are explicitly required as part of the FSC-US Forest Managment Standard (C6.4) in order to ensure the conservation of ecosystem types that are not protected through HCVF or other requirements. [Definition from FSC Standard*: **Representative Sample Areas (RSAs)** are ecologically viable representative samples designated to serve one or more of three purposes: 1) To establish and/or maintain an ecological reference condition; or 2) To create or maintain an under-represented ecological condition (i.e., includes samples of successional phases, forest types, ecosystems, and/or ecological communities); or 3) To serve as a set of protected areas or refugia for species, communities and community types not captured in other Criteria of this Standard (e.g., to prevent common ecosystems or components from becoming rare)*]. In the context of the North Coast there are many ecosystem types and conditions present, from ocean shore to old growth forest. The TCF Forests all occur within the Northern California Coastal Forest Ecoregion (NA0519), as defined by Rickets et al, "*Terrestial Ecoregions of North America: a conservation assessment*" (Island Press 1999). More traditional forest classification systems show similar categorization, e.g. Northern California Coast Section (263A) in "*Description of the ecoregions of the United States*" (Bailey, R.G., US Forest Service, 1995).

Northern California Coastal Forest Ecoregion conservation status

Rickets et al describe the Northern California Coastal Forest Ecoregion as a Class 1 ecoregion, or "Globally outstanding ecoregion requiring immediate protection of remaining habitat and extensive restoration." Urgent action priorities developed by the WWF include greatly increasing "…the number of certified forests where timber is being harvested sustainably," which is "…essential for maintaining the integrity of ecosystems outside protected areas." At 18.7% protected, the Northern California Coastal Forest Ecoregion is one of the most protected forest types in the world (Schmitt, C.B., et al. "*Global analysis of the protection status of the world's forest*," Biological Conservation, 2009). The Convention on Biological Diversity targets 10% protection of each ecoregion as necessary to maintain biological diversity, thus the Ecoregion can be considered well-protected.

The vast majority of the Northern California Coastal Forest Ecoregion is analyzed as part of "*Conservation Prospects*," which recognized two principal recommendations as conservation priorities

- Move quickly to establish "working landscape" conservation management on large, strategically located forest and agricultural properties in resource-rich watersheds in Humboldt, Mendocino and Del Norte counties.
- Focus other fee or easement acquisitions on unique resources that are essential to conserving high-priority coastal resources, such as coastal estuaries, old-growth redwood forest stands, coho salmon refugia, floodplains, and California Coastal Trail segments.

It does not recommend the additional preservation of redwood forest unless it contains some of the high value features (where they occur, those same features are protected within the TCF Forests through the HCVF program).

Identification of Representative Sample Areas

For the purpose of this program we classify the following as Representative Sample Areas—Mendocino Headlands State Park, Jackson State Demonstration Forest, Maillard State Reserve, and the Ecological Reserve Network of the Garcia River Forest. These are large-scale formally-protected landbases containing a diversity of representative natural habitat conditions.

There are countless habitat conditions and successional stages that could be considered for the purpose of defining Representative Sample Areas. The most significant of these, such as oak woodlands, are protected through the HCVF program described above. Less significant examples could include riparian alder stands and natural (not herbicided and planted) early successional stands. Within the portion of the Northern California Coastal Forest Ecoregion that is actually forested (so setting aside the coastal scrub, pygmy cypress, oak woodlands and other non-forest ecosystem conditions) there is relatively little spatially-explicit variation—almost everything is dominated by redwood, Douglas fir, and tanoak and is less than 100 years old. Other tree species do occur but are almost never a large component of a stand. In addition to vegetation typing, certain ecological processes create significant features to consider, for example forest fires and landslides can and do create successional pathways with some different characteristics.

The process of identifying RSAs within this somewhat indistinctive landscape becomes somewhat irrelevant when looking at the conservation status and management of surrounding lands. In addition to all TCF properties being permanently conserved, there are a number of other large landholdings with similar features which are also permanently conserved. For example, adjoining the Big River property is the Big River unit (7,334 acres) of the Mendocino Headlands State Park and the Jackson Demonstration State Forest (48,652 acres). Due to the shared management history, the State Park is almost identical in conditions to TCF's Big River tract, and is permanently protected with little to no harvesting or road building expected. Comparatively, the State Forest is thirty to fifty years more developed, with significantly older and denser forest conditions prevalent, and will be managed for both continued late-seral forest development as well as some modest level of harvesting (both even-aged and uneven-aged). While the Garcia River Forest does not have the same level of protected land nearby it does adjoin an old growth reserve and contains a 8,264 acre Ecological Reserve, which in addition to being permanently protected from development and conversion can also only be managed for late-seral and other desired ecological conditions. Looking beyond the protected lands, due to the significant land use and forestry restrictions imposed on the surrounding landscape a wholesale change in ecological patterns is unlikely.

As it relates to designating RSAs, it is possible that some existing but niche habitat type is unlikely to persist on the landscape. For example red alder stands less than 30 years old are very uncommon because red alder stands are almost exclusively located in riparian zones and due to the Forest Practice Rules (dating to the 1970s); new clearings in riparian zones are relatively rare (only triggered by flood scouring). They provide a unique and valuable wildlife habitat and enrich stream nutrient conditions, however it would likely be illegal to try to encourage the development of new alder stands and it would certainly be impractical to try to freeze in time the existing stands. The habitat types that are most likely to decrease in abundance are early successional stands, due to the decrease in even-aged management practices. However early successional stand conditions are still being perpetuated to some extent on private lands and were likely an almost non-existent component of the pre-European landscape. The ecological process least represented is probably fire, due to 50+ years of aggressive fire suppression. Reintroducing low-intensity ground fires is a long-term objective for TCF but will require a significant shift in forest structure and community acceptance. And despite the suppression efforts, fires still occur, as shown by the summer of 2008 when over 54,000 acres burned in Mendocino County—so recently burned areas are not lacking and will continue to persist on the landscape. The more pervasive threat to habitat conditions and distribution will likely be climate change, which cannot be prevented through the designation of RSAs, and the extensive network of protected lands already provides the best hope for adaptation and species persistence.

In summary, numerous forest stand types and processes were considered for RSA designation, and the following summarizes the salient conclusions.

1. Old growth forests and Oak woodlands and native grasslands are important and would receive RSA designation if they were not already recognized and protected through the more-stringent HCVF designation.
2. Late-seral conditions are the highest priority feature in the coniferous forest, even when not occupied by Northern spotted owl or marbled murrelet. At the site-scale, protection of existing individual features is recommended by the California Department of Fish and Game and occasionally required during Timber Harvest Plan review, as well as required in TCF's retention policies. At the landscape-scale, over 100,000 acres of similar coniferous forest in Mendocino County is managed for development and retention late-seral habitat conditions, which is in excess of conservation biology guidelines for maintaining biodiversity.
3. Young coniferous forest has not been identified as high wildlife or social importance and will continue to be created on the landscape through ongoing even-aged harvesting activities on private lands; therefore it is unnecessary to include in a RSA.
4. Hardwood riparian stands (of all ages) are gradually being succeeded by coniferous stands. They are a unique and valuable type but impractical to deliberately maintain as a RSA.
5. Fire is the most significant process that is under-represented on the landscape and burned conditions and features are probably under-represented compared to pre-European settlement conditions. TCF is taking steps to be able to re-introduce fire (and by extension, burned conditions) but is decades away from safe implementation.

To summarize, because of the widespread protected nature of the region, the extensive regulatory system restricting land use change and harvest practices, and the existing pattern of habitat conditions and ecological processes present on the landscape, our conclusion is that the designation of additional Representative Sample Areas is not necessary and would not be ecologically beneficial. This conclusion will be re-evaluated at least every ten years, with stakeholder input, as part of a planned update to TCF's Management Policies.

Protection and management of Representative Sample Areas

Ongoing preservation and management of the Representative Sample Areas is the responsibility of the landowner, California State Parks Department, California Department of Forestry and Fire Protection, and The Conservation Fund, respectively. All properties are covered by management plans consistent with the public mission of the organization; in addition management plans and actions are reviewed by outside advisory groups. The adequacy of these protection measures will be re-evaluated at least every ten years, with stakeholder input, as part of a planned update to TCF's Management Policies.

Consultation regarding HCVF and RSAS

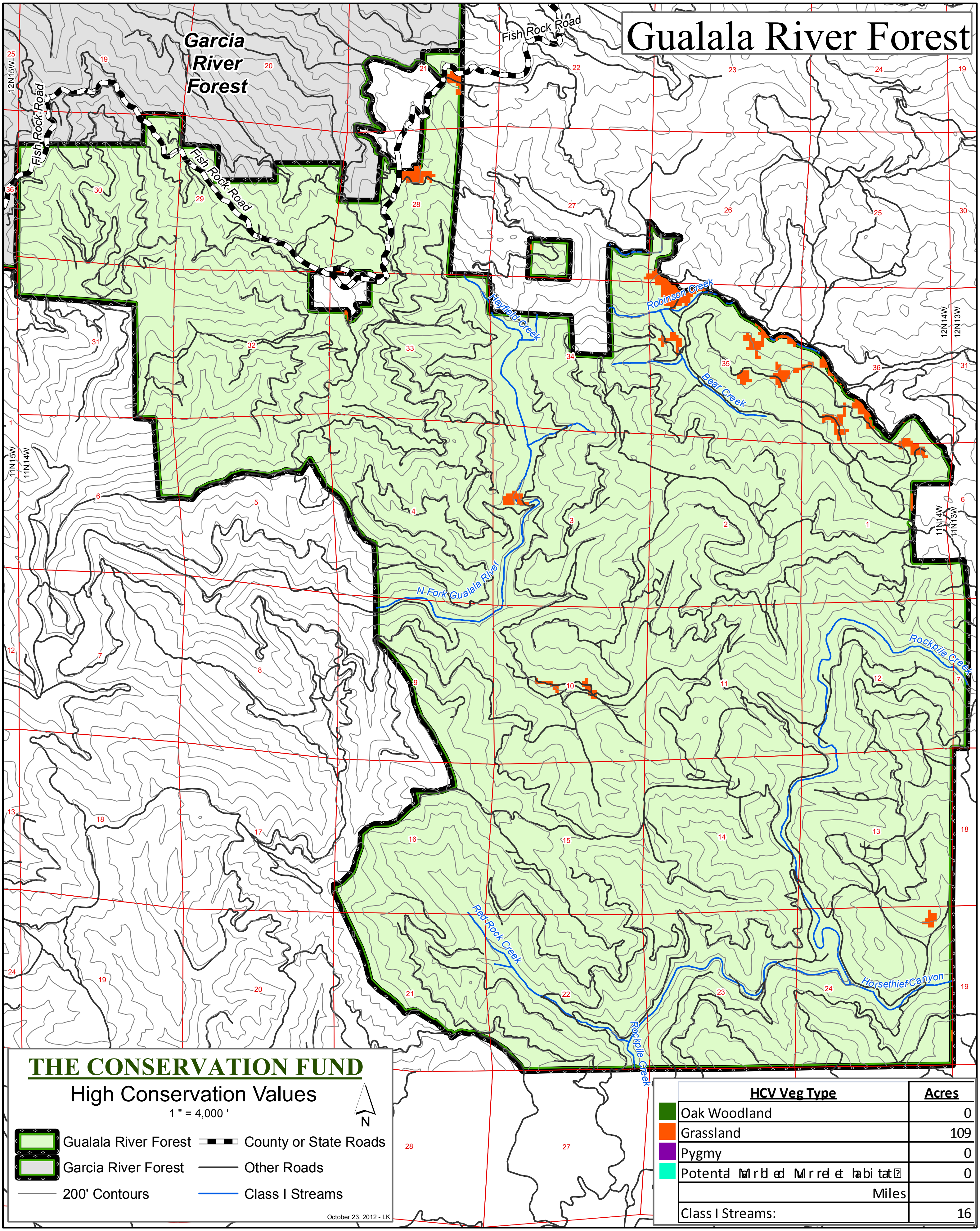
The FSC-US Forest Management Standard explicitly expects some level of stakeholder consultation as part of the HCVF and RSA identification and protection process. As described above, the identification of the four HCVF features was based on two well-respected conservation biology planning efforts which were openly developed, are publicly available and have been thoroughly reviewed by natural resource agencies, environmental organizations and the local communities. In addition the HCVF/RSA features descriptions and protection measures have been part of the TCF Policy Digest, which is a publicly available document that has benefited greatly from community and agency review, including by our Advisory Council. The most significant contributors to the policies include: Jen Carah (The Nature Conservancy), Linda Perkins (Sierra Club), and Alan Levine (Coast Action Group). The TCF Forest Management Policies are discussed as part of every THP field review (which includes both an internal staff and an open tour); the public tours draw a broad range of stakeholders, including students, neighbors, and local environmentalists. More recently, we have also benefited from the extensive HCVF and RSA consultation and analysis conducted by the Mendocino Redwood Company which manages an adjoining and much larger landbase and came to very similar conclusions regarding high priority features and protection measures.

Imperiled Species

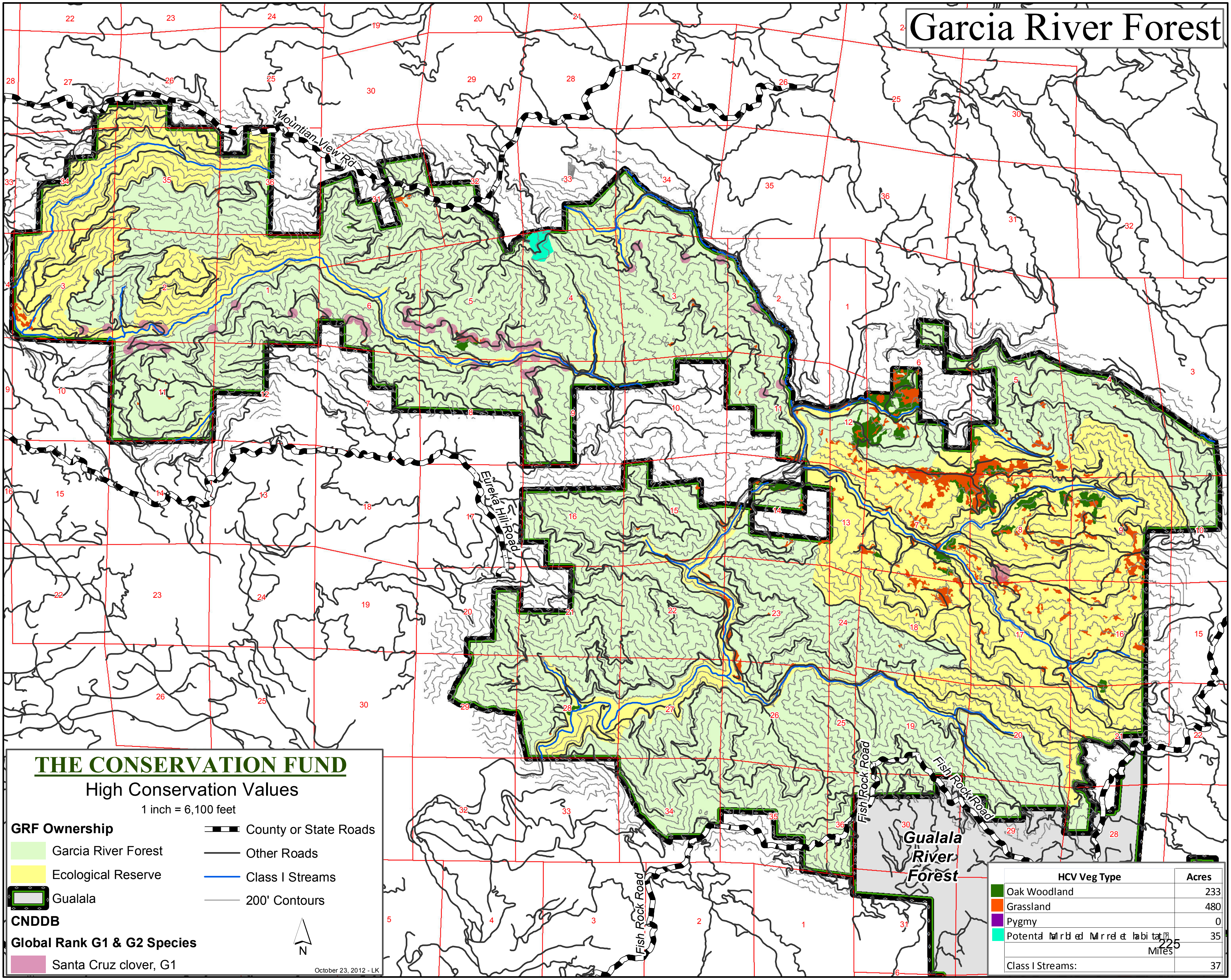
The SFI standard specifically requires identifying and protecting species that have been identified as Globally Critically Imperiled and Globally Imperiled (G1 and G2 status, respectively). The California Natural Diversity DataBase (CNDDB) maintains all recorded sitings of G1/G2 species, as well as other listed species and species of concern. The following G1/G2 species have been identified on TCF properties:

Species name	Common name	Location	Notes and protection measures
Trifolium trichocalyx	Monterey clover	Big River, in a road cut bank near the Elephant Seal and ELF THPs	This G1 and state and federally endangered plant was identified by TCF in 2011 prior to a road upgrade project. Per CDFG permit, the single location was fenced and protected, and will be monitored. It is the only location known outside of a handful of sites in Monterey County.
Agelaius tricolor	Tricolored blackbird	McGuires Pond, private property adjoining Big River	The detection of this G2/G3 species is from a single day in 1992 and it has not been observed since. Given their preference for open riparian and field habitats they are unlikely to be found on TCF property or impacted by TCF management.
Hesperocyparis pygmaea	Pygmy cypress	Salmon Creek, between the Lower Salmon Creek THP and the property border	This G2 plant species is not state or federally listed. Within TCF ownership, it occurs in one stand, and is protected as part of the pygmy forest HCVF area.
Trifolium buckwestiorum	Santa Cruz clover	Garcia and Gualala, along mainline roads	This G1 species was detected by TCF botanists and has been confirmed along multiple sections of road. Per CDFG recommendations, several sites have been fenced for protection and all locations are monitored.

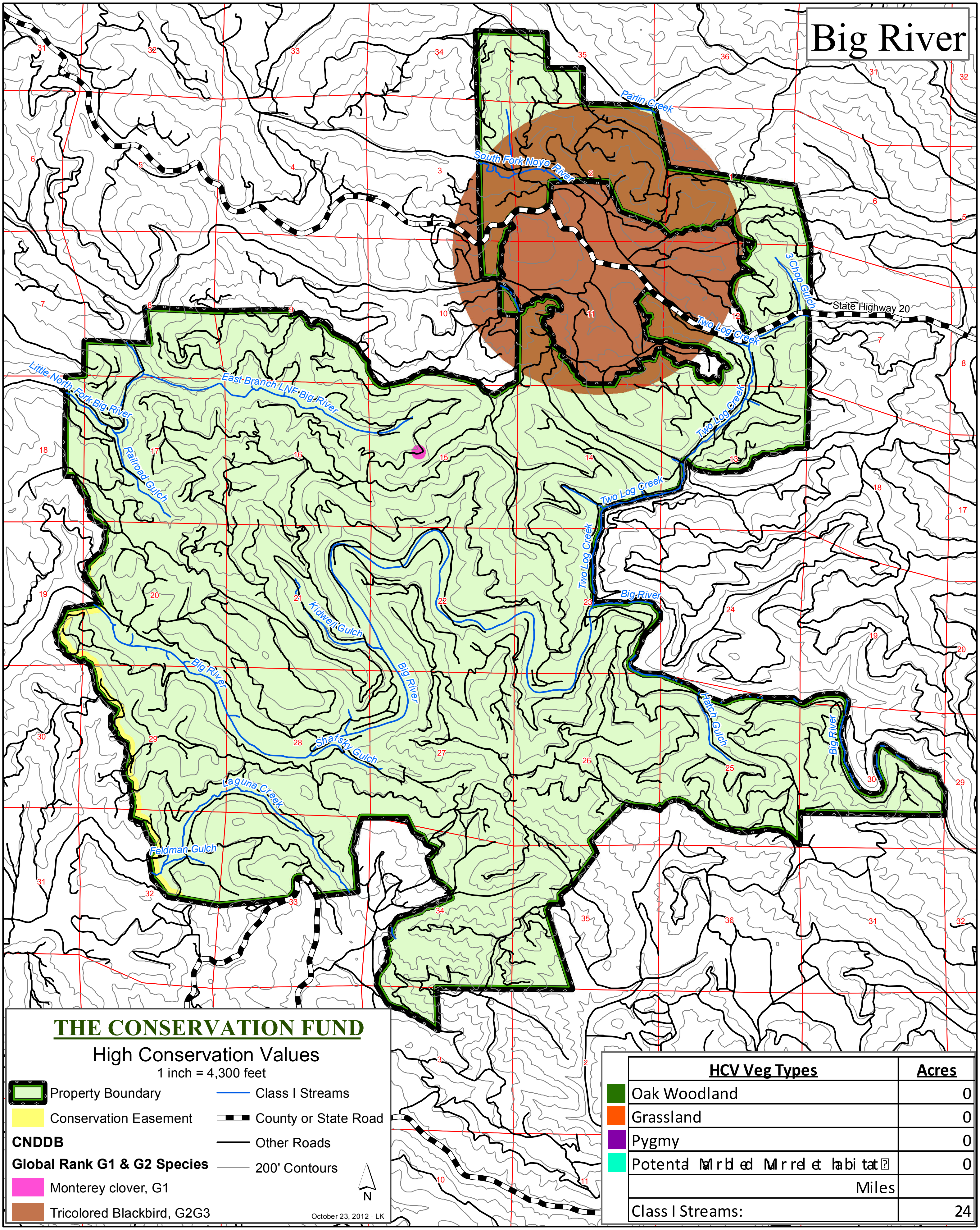
There are a few other rare plants that may yet be found on the property, but given the extensive surveys by TCF botanists prior to any ground disturbing activity, it seems highly unlikely they will go undetected.



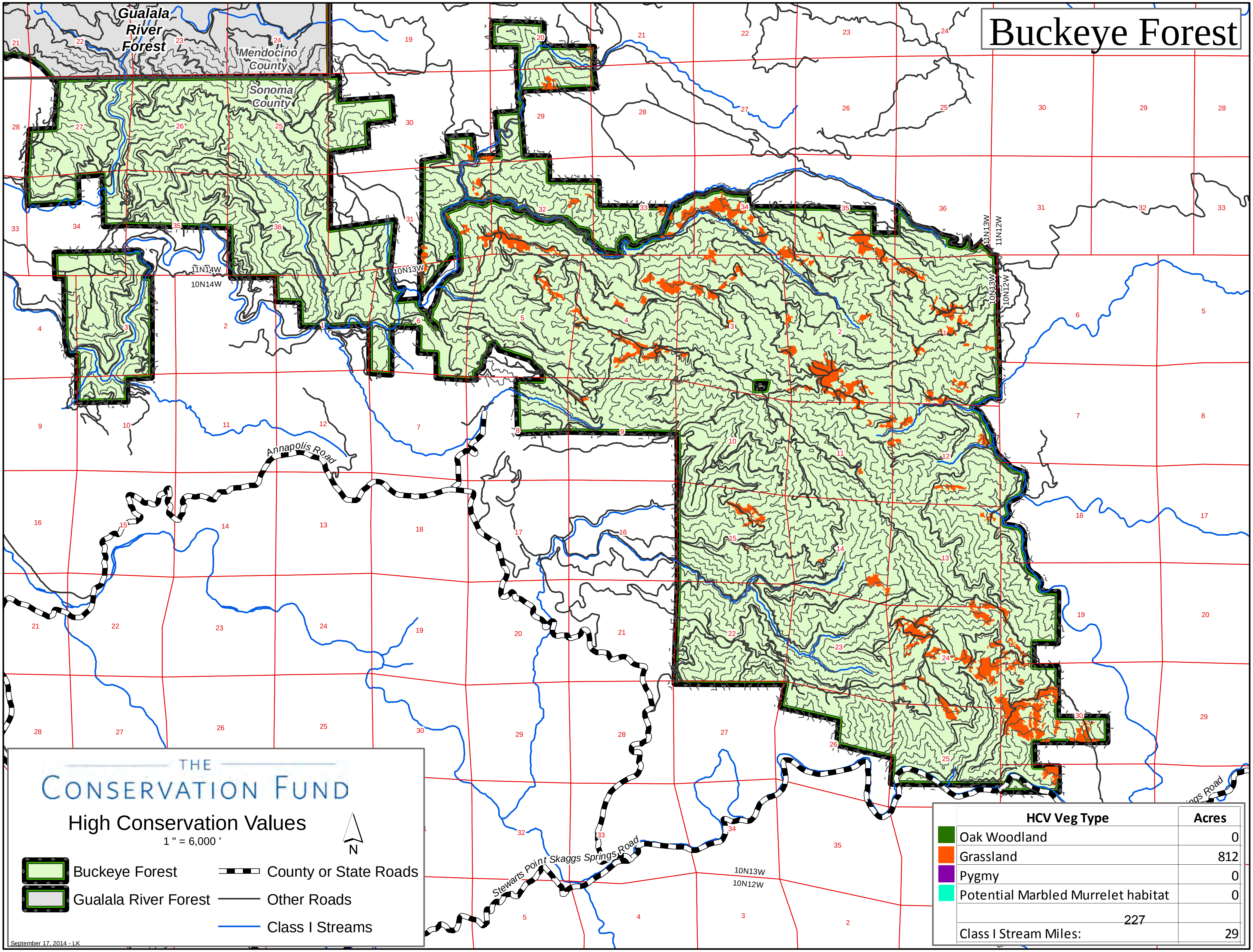
HCV Veg Type	Acres
Oak Woodland	0
Grassland	109
Pygmy	0
Potenta Mrbled Mrrelet habitat	0
	Miles
Class I Streams:	16



HCV Veg Type	Acres
Oak Woodland	233
Grassland	480
Pygmy	0
Potental Marbled Murrelet habitat	35
Miles	
Class I Streams:	37

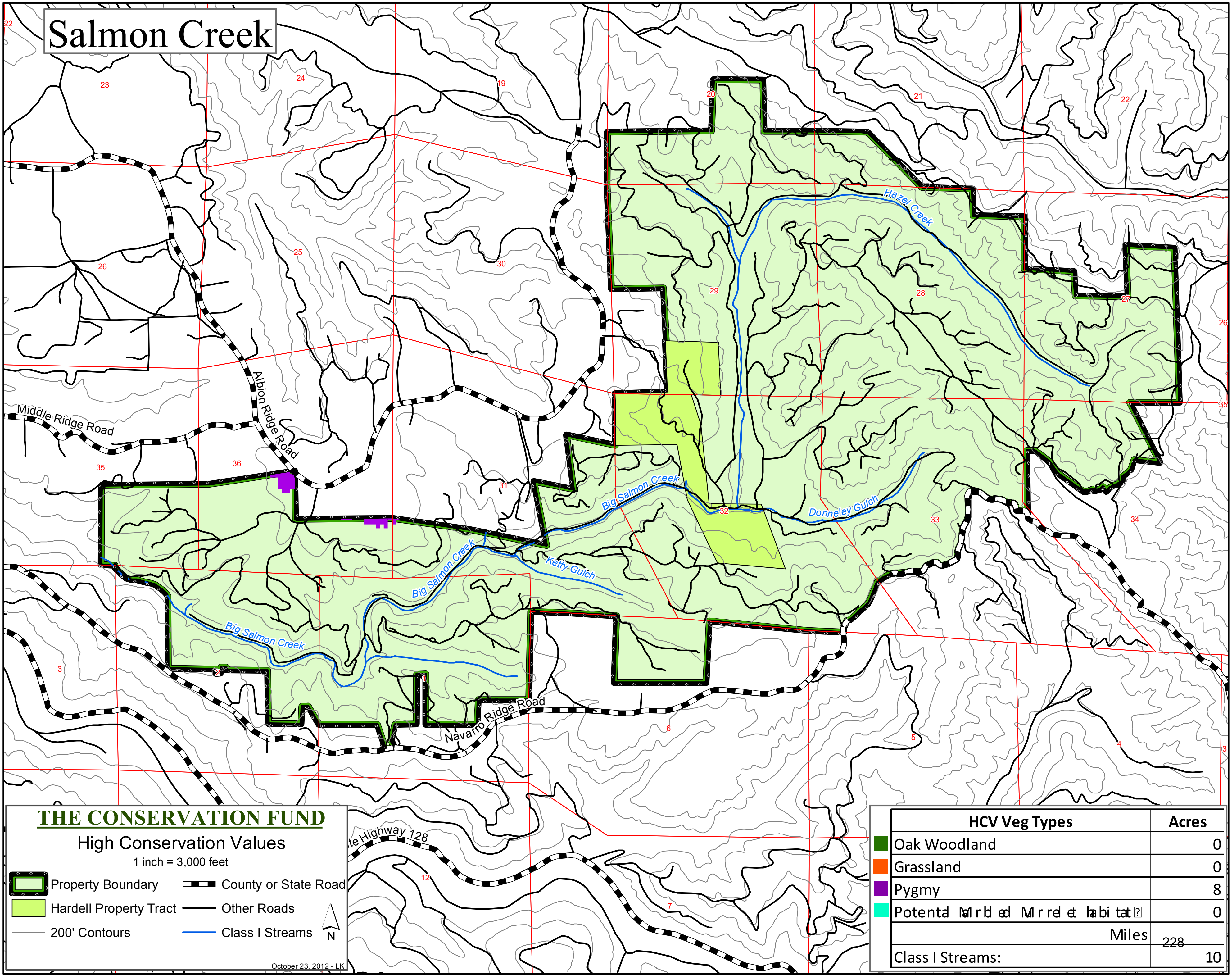


HCV Veg Types	Acres
Oak Woodland	0
Grassland	0
Pygmy	0
Potenta Mrbled Mrrelet habitat	0
	Miles
Class I Streams:	24



Buckeye Forest
Gualala River Forest
Mendocino County
Sonoma County
11N14W
10N14W
10N13W
11N13W
11N12W
10N12W
Annapolis Road
Stewarts Point Skaggs Springs Road
THE CONSERVATION FUND
High Conservation Values
1 " = 6,000 '
N
Buckeye Forest
Gualala River Forest
County or State Roads
Other Roads
Class I Streams
September 17, 2014 - LK
HCV Veg Type | Acres
Oak Woodland | 0
Grassland | 812
Pygmy | 0
Potential Marbled Murrelet habitat | 0
227
Class I Stream Miles: | 29

Salmon Creek



HCV Veg Types	Acres
Oak Woodland	0
Grassland	0
Pygmy	8
Potenta Mrbled Mrrelet habitat	0
Miles	228
Class I Streams:	10

HERBICIDE APPLICATION AND HARDWOOD MANAGEMENT POLICY
The Conservation Fund's North Coast Forest Conservation Program
Principal authors: Madison Thomson and Scott Kelly
October 2012, revised October 2016

Overview

The Conservation Fund acquired the Garcia River Forest in 2004, Big River and Salmon Creek in 2006 and Gualala River Forest in 2011. The Buckeye Forest was acquired by Sustainable Conservation, Inc. in 2014 and is managed by The Conservation Fund. All of the forests have been harvested by previous landowners for forest products and some of the second growth stands have unnaturally high proportion of hardwoods, especially tanoak, as a result of the previous harvests.

Control of the tanoak composition within the forest is a priority for The Conservation Fund. The California Forest Practice Rules (14CCR 912.7(d)) require: "The site occupancy provided by group A species (conifer) shall not be reduced relative to group B species (hardwoods)." In 2016 Measure V was passed by the Mendocino County voters, which reads: "trees taller than five (5) meters, which have been intentionally killed and left standing for longer than ninety (90) days (except those that are left for the benefit of wildlife habitat) be considered a public nuisance. It makes the responsible party liable for any damage if: 1) it is within one-thousand (1,000) meters of a structure, a public or private roadway or fire lane, electrical or telecommunication poles or lines, or water sources such as rivers, creeks, ponds or lakes; or 2) it is within the CAL FIRE State Responsibility Area. Measure V declares that standing dead trees left over 90 days can be declared a public nuisance. Through our Sustainable Forestry Initiative (SFI) and Forest Stewardship Council (FSC) certification, we are obligated to prove compliance with FSC Principle #1 and SFI Principle #7 that state "certified properties must comply with applicable federal, provincial, state, and local forestry and related environmental laws, statutes, and regulations."

Reduction in the use of herbicides over time is an important objective to The Conservation Fund and alternatives to herbicide treatments have been and will continue to be evaluated. In addition, we will strive to stay informed as new research becomes available related to the efficacy and environmental impacts of various herbicides. The following document has been prepared to outline our herbicide application and use policies to control tanoak and exotic invasive species on the north coast forest properties.

Tanoak Management

Hardwood species, including tanoak, pacific madrone, chinquapin, California bay and alder, are an important ecological component of north coast forests. Hardwood mast is an important source of food for a variety of wildlife species and the trees often possess a variety of structural attributes (basal hollows, cavities, large limbs, etc) which are extremely valuable for wildlife habitat. However, past management practices have resulted in an unnaturally high abundance of hardwoods, specifically tanoak in many areas that historically were dominated by conifers. As such, TCF is committed to pursuing management practices that reduce the tanoak component, increase conifer site occupancy, and transition our forests toward a more historically appropriate species composition while retaining high quality hardwood stands and individual trees for wildlife habitat.

Tanoak's unique physiological attributes allow it to be a component of north coast forests at a variety of successional stages. Tanoak is extremely shade tolerant meaning that it can persist and grow at relatively low light levels. Because of this characteristic, tanoak regeneration is often ubiquitous in the understory of stands with moderate to high overstory crown cover. Redwood and Douglas-fir are less shade tolerant than tanoak and regenerate poorly under partial canopy. When overstory trees are removed through timber harvest or natural disturbances, the tanoak in the understory "releases" and grows upward to occupy the vacated growing space. As this occurs, redwood and Douglas-fir regeneration and growth is often hindered. Tanoak also sprouts vigorously when cut or damaged, allowing it to rapidly colonize sites after fire, logging, and other disturbances. Because of tanoak's ability to sprout and grow in shade or low light conditions, many stands across TCF ownership that were once conifer dominated now possess an unnaturally high composition of tanoak due to repeated overstory harvests with no tanoak control treatments.

The common approaches to tanoak control are: direct herbicide treatment of the tree or sprouted stump, manual felling also known as "high stumping" or logging. To date herbicides have been The Fund's primary method of tanoak control but other methods have been tested and used by the Fund and described below.

Hardwood reduction activities (without any commercial timber harvest) may also be pursued in areas outside Timber Harvest Plans where stands are overstocked with hardwoods.

Many tanoak dominated stands on our tracts were treated with Imazapyr or Triclopyr by previous owners. Those treatments were successful in that they reduced hardwoods and allowed for improved conifer growth but were broad in scope killing all hardwood species at the expense of other forest values. The herbicide application policies described below are intended to reduce tanoak while considering other forest values such as wildlife habitat, aesthetics and fire danger and also reducing our reliance on herbicide use for tanoak control in the future. We expect that as the forest matures and the conifer canopy closes that hardwood reduction treatments will no longer be needed, but this is a process that may take multiple entries or 30-40 years.

Depending on the structure and composition of a given stand, there are a variety of approaches that we may take toward tanoak management. The following is a summary of management policies that we use to drive the decision making process on a stand by stand basis. These generalized policies are subject to change as new information becomes available and the results of previous tanoak reduction projects become apparent.

- All true oak (Quercus spp.) woodlands and individual trees are to be preserved.
- Where the post-harvest tanoak basal area would exceed 30 square feet of basal area per acre (averaged across the stand), hardwoods shall be controlled through manual falling or

herbicide treatment through direct basal injection (hack-and-squirt) to provide a post-harvest tanoak basal area of 15-30 square feet per acre. (This may take more than one entry to achieve).

- In stands with a moderate tanoak component where conifers are well established in the overstory, selective falling of tanoaks to release existing conifers will be employed. While the tanoak stumps will likely resprout, the conifers should have established dominance and will eventually shade-out most of the sprouts. In this type of incremental treatment (selective falling), clumps of tanoaks and tanoaks, which do not compete with desirable conifers, will be retained.
- In stands with a significant tanoak component which also possess a substantial conifer component in equal and lower crown classes, selective herbicide treatments will be employed. Stands that fall into this category generally have over 75 square feet of tanoak basal area/acre and over 75 square feet of conifer basal area/acre. Tanoak trees that are directly competing with healthy, established conifers will be targeted for treatment. Those tanoaks that are not directly competing with established conifers will be retained. Selective falling of tanoaks can cause excessive damage to residual conifers when numerous hardwood trees are cut. Because of this, herbicide will generally be the primary method of tanoak reduction in stands with both significant tanoak and conifer components.
- In stands with a significant tanoak component and minimal conifer stocking, a more broad scale herbicide treatment coupled with conifer planting will be employed. With this type of treatment, the majority of the tanoak in a given stand will be treated and conifer seedlings will be planted either shortly before or shortly after tanoak treatment.
- Tanoak logging may be pursued as an alternative to herbicide in certain cases if a market for tanoak logs develops and the tanoak can be harvested without damaging the residual conifers. Even where hardwood logging is utilized, there may be a need for post harvest herbicide treatment in order to control tanoak sprouting and prepare the site for conifer regeneration.
- The Big River and Salmon Creek tracts posses a number of young plantations (less than 15 years old) that were established by the previous landowner. In these stands, tanoak reduction will be accomplished in conjunction with pre-commercial thinning using brush or chain saws. In addition to tanoak, other brush species such as Blue Blossom, and small trees are cut in order to create growing space for the healthiest, best formed conifer specimens. Mechanical thinning is generally preferred to herbicide application in these stands due to the greater control of spacing and species composition.

The herbicide primarily recommended for use of tanoak control is imazapyr. The primary application method will be via frilling or “hack and squirt.” Using this method, a series of cuts are made around the stem of the tree and the herbicide is applied directly to the tree’s vascular tissues. This application method greatly reduces the total quantity of herbicide required and minimizes the risk of drift onto non-target species and other resources. Additional herbicides for tanoak control may be considered in the future as they are developed and tested. The following is a list of guidelines that are to be followed with

FRILLING OR HACK AND SQUIRT herbicide applications:

- All applications must be by a licensed pesticide applicator with a good safety track
- record and in compliance with EPA-approved label recommendations.
- Detailed contract specifications shall be provided to minimize risk of over- application or misapplication.
- Frilling or Hack and Squirt shall not occur within 100 feet of any property line herbicides will be applied within 50’ of neighborhood property lines.
- Work will be closely supervised by TCF staff or consulting foresters.
- Notification signs will be posted in logical locations at least 30 days prior to applying herbicides.
- Records on all applications will be compiled by TCF staff, submitted to the county and available upon request.
- The effectiveness of treatments will be monitored by TCF staff.
- No hardwood species other than tanoak shall be treated
- Retain all hardwoods (>18” DBH) per acre. Exceptions to the general retentions guidelines may be adopted on a site specific basis if in the opinion of the project forester the general guidelines are not adequate to reduce the hardwood component to a level low enough to allow conifer regeneration and growth.
- There will be no hardwood control with herbicides in Class I, II or IV WLPZs or within 25 feet of a class III watercourse; manual falling or girdling of small hardwoods may be used within these restricted areas as part of a riparian shade enhancement project designed to increase conifer site occupancy and growth.

The results of different tanoak control techniques will be monitored over time and our policies will be revised as new information becomes available. We recognize that because of soils and aspect some sites are naturally dominated by tanoak and we will avoid tanoak reduction activities in these stands. Tanoak reduction projects will be focused on the more productive sites with evidence of past conifer dominance (i.e. stumps, suppressed conifer regeneration).

Invasive Exotic Species
Invasive exotic species such as French Broom, Jubata Grass and various thistles have been introduced onto the properties as a result of past management activities, primarily by contaminated equipment. Controlling the spread of these invasive species is a priority for the Fund. Herbicide are the primary tool used for the control of invasive exotics but other methods such as manual removal are also employed. Specifically on Salmon Creek, French Broom and Jubata Grass are removed annually by hand with the cooperation of the “Salmon Creek Project Team” In areas with extreme infestations of exotics, such as those found on Big River, we believe that herbicide application is the safest and most cost effective alternative for the control of those species.

Various precautions are taken with all herbicide applications to ensure that adverse impacts to the environment and human health are minimized. The following is a list of guidelines that are to be followed with **FOLIAR** herbicide applications:

- All applications must be by a licensed pesticide applicator with a good safety track
- record and in compliance with EPA-approved label recommendations.
- Detailed contract specifications shall be provided to minimize risk of over- application or misapplication.
- Indicator dye will be used to enable better monitoring, and applications areas will be
- flagged in advance,
- No foliar herbicides will be applied within 50’ of neighborhood property lines.
- Work will be closely supervised by TCF staff or consulting foresters.
- Notification signs will be posted in logical locations at least 30 days prior to applying herbicides.
- Records on all applications will be compiled by TCF staff, submitted to the county and available upon request.
- The effectiveness of treatments will be monitored by TCF staff.

There will be no herbicide application in Class I, II or IV WLPZs or within 25 feet of a class III watercourse.

ROAD MANAGEMENT POLICIES
For The Conservation Fund's North Coast Forest Conservation Program
Primary author: Scott Kelly
May 24, 2007, revised September, 2012, 2014

<u>Introduction</u>
The Conservation Fund owns approximately 73,000 acres in Mendocino and Sonoma County, California. The tracts consist of the 24,000 acre Garcia River Forest, the 12,000 acre Big River Forest the 4,000 acre Salmon Creek Forest, the 13,900 acre Gualala River Forest and the 19,552 acre Buckeye Forest. The Garcia River Forest was acquired by The Conservation Fund in 2004; the previous landowner conducted some minor road maintenance activities and remediation projects however the forest land and roads have been essentially inactive since 1998. The Conservation Fund acquired the Big River and Salmon Creek forests in 2006 from Hawthorne Timber Company in Fort Bragg who were actively managing the forest for timber production. The Conservation Fund acquired the Gualala River Forest in 2011 and the Buckeye Forest in 2013 the previous landowners conducted some minor road maintenance activities and remediation projects however the forest land and roads have been essentially inactive since 1998. A 17 acre vineyard and pond were developed on the Buckeye Forest in the early 2000' however no other management activities have occurred. The Conservation Fund intends to actively manage the timber resources on all five properties to improve stocking and growth across the ownership and to actively manage the road system and riparian conditions to improve watershed health and use by anadromous fish. Therefore, it has become a priority to improve and maintain access to the timberlands from the existing road system.

It has been documented that forest roads can contribute significant sediment to streams. Increased stream sediment can result in cemented gravels reducing salmonids ability to spawn and/or inhibiting salmonid fry emergence. High sediment levels can also cause pool filling and associated reduction in pool habitat. Extreme sediment loads can cause stream temperatures to be elevated due to the reduction in stream depth. Near stream roads can also reduce stream shading where the road is very wide or very close to the stream. Reduced stream shading has been linked to increased water temperature which stresses juvenile salmonids.

The Garcia River, Gualala River and Big River have been identified by the EPA and are on the 303(d) list of impaired waterbodies. The listed stressors include sediment and temperature. The Gualala is also listed for Aluminum on the mainstem downstream of The Fund's property. Placement of a waterbody on the 303(d) list acts as the trigger for developing a sediment control plan, called a TMDL, for each water body and associated pollutant/stressor on the list. At this time the Garcia River is the only river that has an action plan for the TMDL and many of the sediment reduction activities in this document have been adopted to conform to the Garcia TMDL and are implemented throughout the ownership.
Recent management practices by TCF and previous landowners have reduced road related stream sedimentation and improved long-term road stability. Specifically many bridges and multi-plate culverts have been installed to replace standard culverts on class I streams. Class II watercourse crossings have been rock armored and new culverts buried to grade. Watercourse and Lake Protection Zone (WLPZ) roads have been rocked or otherwise improved to reduce stream sedimentation caused by near stream roads. Many other forest roads have been rocked and drained by outsloping or use of rolling dips. The use of ditch reliefe culverts is being minimized to reduce the potential for culvert failure and road maintenance costs.

Objectives

The Conservation Fund is committed to continue this trend of road improvement over time and has developed and will continue to refine this Road Maintenance and Improvement Plan to:

1) Reduce sediment inputs resulting from the existing road network as well as reduce inputs from new roads.
2) Develop proactive measures to help reduce stream sedimentation as a result of road runoff and cooperate with regulatory agencies involved with timber harvest planning.
3) Develop a timeline for road maintenance activities.
4) Act as a guide to foresters who are actively developing timber harvest plans or other projects on the properties.

Planned road maintenance will be in conformance with The Conservation Funds overall forest management goals. The Conservation Funds immediate goal for new properties is to maintain access through grading and maintaining existing mainline roads. These roads form the core of the road system and provide access for fire suppression, log hauling, wildlife surveys, future road improvement and abandonment projects and other management activities. It is expected that maintenance and improvements of secondary roads will be carried out in conjunction with Timber Harvest Plans or as part of larger Watershed Improvement projects.

Timeline

It is The Conservation Fund's goal is to develop a road system which provides access to the property for timber harvest, fire protection and wildlife resource monitoring while reducing annual maintenance activities and expense and potential watershed impacts. It is expected that the property will generally be managed with unevenage silvicultural systems and a 10-20 year re-entry period. Most road improvement projects will generally be done in conjunction with THP's and therefore the timeline to rotate through the property with road upgrades will be similar as the overall harvest schedule (within the first 20 years). Projects which require a 1603 stream alteration permit and do not otherwise qualify as an emergency repair will necessarily be conducted in conjunction with timber harvests or another CEQA project.

The Conservation Fund will conduct property wide assessments of all the roads on each tract using the road inventory and assessment system developed by Pacific Watershed Associates and others. The assessments will be used as a planning tool to prioritize sites for repair and to assist in the evaluation procedure for road decommissioning.

Road Maintenance and Improvement Guidelines

The purpose of this section is to aid resource professionals to identify forest road attributes that will assist in determining whether a road should be maintained in its current configuration, reconfigured with upgraded drainage structures or decommissioned. Some of the primary objectives and constraints identified during land management planning were: 1) Improve fisheries and wildlife habitat. 2) Maintain or improve the current level of access. 3) The landowner is willing to bear higher management costs in the future that arise from reconfiguring the roads if it results in other operational and environmental benefits.

To reduce sediment delivery from the road surfaces emphasis will be placed on increasing the number of drainage points along roads and reducing the potential for diversion at culverted watercourse crossings. On low gradient roads (0-4% grade) roads will be primarily drained by outsloping with occasional dips or ditch relief as necessary. On higher gradient roads (5-10+% grade) roads will be drained primarily with rolling dips in combination with outsloping and inboard ditch relief culverts as necessary. It is expected that most roads will be improved so as to be drained by a combination of out sloping with rolling dips. However ditch relief culverts cannot be completely abandoned and will be used where necessary. To reduce sediment from watercourse crossings up to 3 criteria will be met: 1) New culverts and culverts proposed for replacement will be sized to meet the 100 year storm event. 2) New or replaced culverts will be installed such that the culvert is at stream grade and deep enough that a critical dip can be constructed to provide protection against stream diversions. 3) A trash rack or stake shall be installed upstream of the culvert to catch or turn debris prior to reaching (and blocking) the pipe.

New roads will be designed with gentle grades wherever possible and long rolling dips will be constructed into the road or the road shall be outsloped to relieve surface runoff. Where possible watercourse crossings will be designed such that road grades dip into the crossing and then climb out of the crossing, eliminating the need for abrupt critical dips. Crossings will be rock fords or temporary crossings on secondary roads which see only periodic activity to reduce maintenance requirements. Minor crossings on permanent roads can be converted to rock fords over time.

The Handbook of Forest and Ranch Roads prepared by Weaver and Hagans 1994 will be used as a guideline for all proposed road construction and improvement projects. Specific projects and locations will be mapped and site specific prescriptions for each project will be included in the appropriate THP, TMDL, SSMP or other guiding document.

Road Abandonment Plan

There are three criteria to consider in determining which roads can be abandoned. The first is focused on environmental considerations. Roads located near (within the WLPZ) of a class I or class II stream or constructed on unstable slopes such as active landslides or headwall swales are likely candidates for abandonment due to their potential contribution to in-stream sediment. Road construction across headwall swales and unstable slopes can result in mass wasting events, delivering large amounts of sediment to the watershed. They pose an ongoing maintenance problem caused by constant bank sloughing which block roads and plug ditches and culverts.

The second criterion is that roads to be abandoned must not cut off or substantially reduce access to areas where future management is anticipated. In the case where a road has been determined to be undesirable due to its location but access is still required the landowner is obliged to maintain the existing road or find another route. Reconfiguring the road network is a difficult, time consuming and costly task and will have long term effects on management activities. The likely result is that any new road system will be designed for yarder logging and to minimize the total road mileage.

The third criteria is that road abandonment does not result in the construction of a replacement road that is environmentally unsound. Removing a road from a stream zone with the intent of moving upslope can require that the landowner make a value judgment between, for example, a near stream road and a road constructed on steep slopes with multiple watercourse crossings. Improving existing roads with rock surfacing, rolling dips and oversized culverts or bridge installation is generally the least costly alternative compared to relocating a road system and should be considered when no clear beneficial alternative is available.

In areas with excess roads it may be desirable to abandon or decommission roads or reduce their status to “temporary” to reduce potential sediment delivery. Temporary roads and decommissioned roads are similar in that permanent and temporary watercourse crossings are removed for an indefinite period of time. Road decommissioning differs from abandonment in that a decommissioned road may be rebuilt at a later date if in the opinion of the land owner it is the least damaging alternative.

The economics of road abandonment also contributes to the decision making process. Unfortunately it is not practical to use a “one size fits all” prescription for road abandonment. Some roads, which appear to be poorly located, may have to remain in place because they service a larger area with good arterial roads. While it may be physically possible to relocate a road it may not be in the best interests of the landowner to do so due to the excessive cost involved . The types of roads which will be a priority to evaluate as potential candidates for abandonment are listed below.

1. Roads that parallel watercourses and dead end in landings are good candidates for abandonment or repair because of their proximity to streams and their lack of arterial roads. These are the highest priority because they can be abandoned or decommissioned without impact to future management.
2. Roads that cross unstable areas or headwall swales can be abandoned if alternate routes exist to both ends of the subject road. Roads crossing unstable areas are deemed to be the second priority for abandonment because there are fewer roads on unstable slopes than WLPZ roads and the management implications and fieldwork necessary to make an informed decision will delay the decision making process.
3. Long term plans should include abandonment and replacing or upgrading roads that are poorly located but are necessary in the short term for forest management.

It is felt that proper implementation of this plan will reduce the potential for excess runoff and diversions common to forest roads. Over the long term the reduction in stream sedimentation will improve salmonid habitat conditions and reduce yearly maintenance costs.

CERTIFIED PRODUCT CHAIN-OF-CUSTODY PROGRAM
For The Conservation Fund's North Coast Forest Conservation Program
March 1, 2010, revised September 2012

Note to Licensed Timber Operators, Log Haulers, and Log Buyers
This document is being provided to you because it is required by The Conservation Fund's certification under the Forest Stewardship Council standard for forest management and chain-of-custody for logs. The purpose of this policy is to ensure that wood products which originate on our properties are appropriately accounted for and do not become inappropriately labeled. All logs generated on our Mendocino properties are certified under the Forest Stewardship Council US Forest Management Standard (v.1.0) and Sustainable Forestry Initiative Standard (section 2). Use of the Forest Stewardship Council logo or other origin claims is restricted to those facilities that have undergone an independent certification of their compliance with the Forest Stewardship Council Chain-of-Custody standard. The Conservation Fund's participation in this program should not impose any additional burdens on our contractors and customers other than standard log security and accounting. If you have any questions about this policy, please contact Scott Kelly at (707) 272-4497.

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Forest Certification Status
The Conservation Fund's North Coast timberland (Garcia River, Big River, and Salmon Creek, Mendocino County, California) were certified as sustainably managed by the Forest Stewardship Council and the Sustainable Forestry Initiative on October 12, 2007. The Gualala River Forest was certified in 2012. Buckeye Forest, Sonoma County, California will be certified in 2014. Audits are conducted annually to ensure continued eligibility and are available at http://www.conservationfund.org/our-conservation-strategy/focus-areas/forestry/north-coast-conservation-initiative/north-coast-forest-reference-documents/

Section 1, Control System Documentation
1.1 The Conservation Fund has implemented a documented control system in order to responsibly track log sales under Generally Accepted Accounting Principles (GAAP) and to address the Principles of Chain-of-Custody control as set forth by the FSC.
1.2 The Conservation Fund's designated Chain of Custody Control Administrator is Scott Kelly, the senior forester responsible for, among other things, log sales and harvest administration. Scott Kelly is responsible for education of employees and contractors, as well as for implementation of the documented control system for Chain of Custody of FSC-certified wood products sold by The Conservation Fund from its properties in Mendocino County, California.
1.3 Scott Kelly is assisted in this documentation by Margery Hoppner, staff accountant, who manages the log sale accounting process and reconciles trip tickets, scale records, mill receipts, and contractor payments.

1.4 A sample Trip Ticket and Log Sales Record are attached at the end of this document. Instructions for the trip ticket are provided to the log hauler. Instructions for the Log Sales records are contained in The Conservation Fund's accounting procedures manual.

<u>Section 2, Confirmation of Inputs</u>

2.1 The Conservation Fund is engaged in the business of selling logs and does not purchase logs or any other FSC-certified wood products. Therefore, confirmation of inputs is not applicable, except that The Conservation Fund will be responsible for ensuring that log decks in the forest contain only logs originating on that property and that log trucks exiting the property only contain logs that originated on the property.

2.2 It may be required for The Conservation Fund or its partners to purchase small quantities of conifer logs for installation in streams as restoration projects. Those logs are intended for permanent installation and will not be considered an input for the purpose of Chain of Custody accounting.

<u>Section 3, Separation/Demarcation of Inputs</u>

3.1 The Conservation Fund has a system for ensuring that FSC-certified products are clearly identified. The Conservation Fund timber harvest and log sale activity is only conducted for The Conservation Fund's properties, all of which are certified. Thus, there are no non-FSC products involved.

3.2 Physical separation/segregation of certified and non-certified products is achieved by not involving any non-certified logs in The Conservation Fund's activities. There are no inputs (either certified or not), thus no non-certified logs will ever be brought on the property and mixed with certified logs.

3.3 Logs are identified as certified through paperwork supplied by The Conservation Fund to the purchasing mill.

<u>Section 4, Secure Product Labeling</u>

The Conservation Fund does not use on-product labels during the sale of logs. The Conservation Fund accepts the responsibility to ensure that the FSC Logo Pack and labels are not used by unauthorized users or for any unauthorized use.

<u>Section 5, Identification of Certified Outputs</u>

Certified products are identifiable by field marking and trip ticket paperwork that clearly identifies the purchaser and seller of the logs. The certified status of the logs is communicated in writing (through the log sales agreement and by sharing this document) by The Conservation Fund to the purchaser.

The Conservation Fund operates an accounting system that records log species, volume, and grade information for all log deliveries. This includes reconciliation between the trip tickets provided by the LTO and log hauler, scale records provided by the scaling bureau, and payment receipts provided by the purchasing mill.

Payment is issued by the purchasing mill upon receipt (and scaling) according to the terms of the log sales agreement. Because no invoices are issued it is incumbent on The Conservation Fund to communicate the certified status of the logs to the purchaser (which is done through this document and the log sales agreement). A copy of The Conservation Fund's Chain of Custody certificate will be provided to the purchasers upon request.

Section 6, Record Keeping

6.1 The Conservation Fund maintains appropriate records of all log sales (which is the same as outputs of certified products) in accordance with Generally Accepted Accounting Practices (GAAP).

6.2 The Conservation Fund's records are sufficient to satisfy a financial auditor or an independent assessor seeking to trace back any given certified product output pool or load back to the specific certified forest of origin.

6.3 The Conservation Fund's records are sufficient to allow an independent assessor to determine the rate of production of certified logs from the certified forest, as well as to determine the certified product delivered to each manufacturing facility.

6.4 All records related to certified products sold by The Conservation Fund will be kept for a minimum of five years.

Section 7, Training

7.1 The Conservation Fund will supply this procedure to all contractors and explain the COC procedures.

7.2 The Conservation Fund will include this COC procedure as an exhibit in all timber sale contracts, and train all contractors, buyers and loggers on the procedure.

7.3 The Conservation Fund will maintain a database of all personnel who have received the COC procedure and related training.

7.4 Distribution of the procedure and related training will take place with all new contractors and loggers at the beginning of a new contract or sale. Personnel who are already familiar with the procedure will receive it in each additional contract.

THE CONSERVATION FUND
TEMPLATE -- TRIP TICKET:

THE CONSERVATION FUND **TRIP TICKET**

America's Partner in Conservation *150*

14951 "A" Caspar Road, Box 50, Caspar, CA 95420 (707) 962-0712

DATE _____/_____/_______ TRUCK NO./ DRIVER _______________

TRACT NAME ____________________ THP NAME ______________________

LOGGER ________________________ SOURCE CODE ________________

FSC/SCC COC-00102N
FSC 100%

BUYER _________________________ DESTINATION ___________________

OF LOGS RW___ DF___ WF___ ww___ HW___ OTHER______________

RECEIVED BY______________________________________ DECK NO.____________

White - Logger Canary - Trucker Pink - Mill Goldenrod - Owner

COMMITMENT TO SAFETY AND HEALTH OPERATING POLICY,
The Conservation Fund's North Coast Forest Conservation Program
Primary authors: Evan Smith and Scott Kelly.
November 28, 2011, revised September, 2012

Commitment to Safety and Health

A. Safety and Health Policy

The Conservation Fund (TCF) is firmly committed to maintaining a safe and healthful working environment across all its offices and programs. This document guides TCF activities on its California timberlands to ensure safe operations. To achieve this goal TCF has implemented a comprehensive Injury and Illness Prevention Program. This program is designed to prevent work place incidents. The designated Safety Coordinator is responsible for monitoring the performance of each team member to ensure compliance in conducting an affective Injury and Illness Prevention Program.

Special statement on forestry-related risk--The field of forest management inevitably involves travel, heavy equipment, challenging terrain, and variable weather conditions—all serious contributors to risk. All employees and contractors should be cognizant of those risks and develop the judgment to evaluate conditions and act in a safe manner. Driving to and from the forest is probably the most dangerous activity we engage in—it is very important that we slow down and pay attention. The most important piece of safety equipment is what sits under the hardhat, behind the safety glasses, and between the ear plugs—use your brain! Every team member is responsible for thinking about the safety of themselves and everyone else present. TCF's North Coast program is a loosely-organized team of employees, contractors, consultants, partners, and volunteers—we rely on these individuals to exercise good safety skills. It is critical that we be cognizant of the conditions around us and the safety preparedness of those around us and those that might visit the site later. We owe it to ourselves and the families of those we work with to conduct all our activities safely.

Each individual is responsible for their own safety at the work place. The safety coordinator can assure that programs and policies are in place to provide for a safe working environment however it is the responsibility of the individual to implement the safety policies and make their own working environment as safe as possible.

Specific policies—

1. *No alcohol or drug use on the property.*
2. *Maintain a daily log of where people are working and an emergency contact system in the event of an emergency or someone not returning in a timely fashion. Each employee has been issued a SPOT GPS device, which tracks an employee's location and allows an emergency signal to be sent. This device has essentially replaced the daily log.*
3. *Remind visitors and tour participants of potential risks and necessary precautions.*

4. *Annual safety training will be developed for everyone that works in the woods if it is not already part of their professional licensing requirements (eg Licensed Timber Operator).*
5. *First Aid Kits are available in the TCF office and vehicles.*
6. *Indications of illegal marijuana cultivation will not be investigated by field staff but reported to the property's security patrol who will report it to law enforcement personnel.*

B. Vehicle Operation

Driving to and from the forest is probably the most dangerous activity we engage in it is very important that we slow down and pay attention while operating company vehicles on the street or on company lands. Driving in the forest exposes the driver to narrow winding gravel roads which can be very slick when wet and require extra caution when operating a motorized vehicle.

- All persons operating a vehicle on company property are required to possess a valid driver's license.
- All persons operating an ATV or other off road vehicle shall have received proper training from a certified ASI Rider Course Instructor or equivalent. To enroll in an ATV Rider Course, call the national, toll-free enrollment number, 1-800-887-2887.
- Use common sense, do not drive in dangerous conditions or terrain beyond your ability to safely operate the vehicle, when in doubt, slow down or walk.

C. Chainsaw Operation

Staff is required to read the owner's manual carefully before operating a chain saw. Wearing proper safety equipment and protective clothing is required. When using a chainsaw be sure to keep the cutting area clear of spectators, note any overhead hazards, including hanging tree limbs and utility lines, keep the chain clean, sharp and lubricated, keep both hands on the saw handles, and let the saw come to a complete stop before reaching for the chain or blade. For further safety regulations regarding chainsaw usage please consult http://www.osha.gov/OshDoc/data_Hurricane_Facts/chainsaws.pdf

D. Herbicide Application

Only Certified Pesticide Applicators may apply herbicides. Staff will read and follow all chemical label directions. Apply herbicides at minimal levels in accordance with the label and targeted to specific weed problems. Wearing proper safety equipment and protective clothing is required. A notice of intent must be submitted to Mendocino County 24 hours prior to application; a pesticide use report must be filed by the 10th of the month; herbicides should be contained and not be allowed to drift unto a neighboring property; and immediately notify Mendocino County Agriculture Commissioner of any changes to our permit. To promote transparency and communication, TCF will post signs in the forest at the locations where herbicides are proposed for use 30 days prior to their

application. For more information please consult
http://www.epa.gov/oppfead1/safety/resource.htm

E. Personnel Safety

Many minor injuries such as cuts, scratches, bee stings, and ankle sprains can be prevented by wearing proper safety equipment or protective clothing. When working in the woods around heavy equipment all personnel shall wear hardhats and boots. Long pants are also required while working in the forest. Other recommended personal safety items include:

- Eye Goggles
- Ear Plugs
- Long sleeve shirt
- Gloves
- Tecnu or other poison oak prevention treatments.

F. Contractor Safety & Training Policy

The Conservation Fund shall only employ contractors that have good safety records and up-to-date training. Specifically, only Licensed Timber Operators in good standing may conduct timber harvesting operations and only Certified Pesticide Applicators may apply herbicides. Prior to the start of each work project (e.g. logging job, road opening, weed control treatment, etc) the Safety Officer will conduct a discussion of the safety concerns and ensure contractors are aware of TCF's safety expectations. For professions that do not have formal licensing requirements that address safety, such as consulting biologists and botanists, The Conservation Fund will emphasize the importance of accident avoidance and communication and seek to resolve any safety concerns they may have.

G. Company Housekeeping Policy

Good housekeeping is a critical part of the safety program. Keeping work areas neat and clean reduces the risk of on the job injuries. Well organized work areas increase the ability of employees to perform their jobs efficiently and safely. In addition a clean workplace is a source of good morale, improved quality and partner satisfaction. Each employee is responsible for keeping his or her work area neat and orderly. Housekeeping inspections may be conducted as part of regularly scheduled or impromptu safety inspections.

II. PERSON(S) WITH AUTHORITY AND RESPONSIBILITY FOR IMPLEMENTING THE PROVISIONS OF THIS INJURY AND ILLNESS PREVENTION PROGRAM (IIPP)

The North Coast Timberlands Manager shall serve as the Safety Coordinator, with authority and responsibility for implementing the provisions of this program.

Responsibilities assigned to the Safety Coordinator, Site Supervisors, and Employees are described in general on the following pages.

All employees and contractors of TCF are responsible for working safely and maintaining a safe and healthful work environment. It is a condition of employment.

The North Coast Timberlands Manager will assume the overall responsibility for this program as the Safety Coordinator. These duties include:

- Ensuring that adequate financial, personnel and material resources are available, including identifying safety leaders for projects and training needs.

- Ensuring employees receive specific training for each task they are expected to perform, and whenever new processes or chemicals are introduced into the workplace.

- Leading by example.

- Recognizing safe work practices as part of performance reviews.

- Encouraging employee involvement.

- Investigating and correcting any unsafe action or condition reported to them.

- Holding employees accountable for poor safety performance by utilizing re-training and company disciplinary procedures.

All TEAM MEMBERS (employees, contractors and lead partners) will be responsible for the implementation of this program at his/her work area. These duties include:

- TAKING PERSONAL RESPONSIBILITY FOR THEIR OWN SAFETY AND THE SAFETY OF OTHERS.

- Understanding that working safely is a condition of employment.

- Participating in developing safety rules, procedures, and improvements.

- Obeying safety rules, procedures and work practices.

- Wearing all required Personal Protective Equipment (PPE).

- Reporting all injuries, no matter how minor, to their supervisor immediately.

- Reporting all "near-misses" and hazardous conditions to their supervisors.

- Participating in the safety effort by demonstrating an understating of training received and the ability to perform tasks safely.

- Participating in tailgate and general safety meeting.

- Learning to manage “self-safety” by developing proactive (prevention) skills in decision-making.

- Communicating safety suggestions to supervisors or contract representatives.

III. **SYSTEM FOR ENSURING THAT ALL WORKERS COMPLY WITH SAFE AND HEALTHY WORK PRACTICES:**

A. Informing employees of the provisions of our Injury and Illness Prevention Program (IIPP):
B. Recognizing employees who perform safe and healthful work practices.
C. Training employees whose safety performance is deficient; and
D. Disciplining employees for failure to comply with safe and healthful work practices.

IV. **SYSTEM FOR COMMUNICATING WITH EMPLOYEES:**

A. Safety Meetings

TCF requires frequent tailgate meetings with individual work-groups to discuss safety issues and resolve problems. At a minimum, employees will be exposed to ½ hour per month of safety training/discussion. Also, tailgating will be held whenever work conditions change – e.g. foresters moving from burning to marking trees, contractors working at a mill site in an area which affects employees, special construction or maintenance projects are taking place, etc. to alert and/or remind employees to potential hazards.

B. Training

All employees will receive an overview of the IIPP during their initial orientation and can review a copy provided by their supervisor. Additional training, such as First Aid and Interagency Wildland Fire Certification, will be made available on an as needed basis. Employees and contractors that desire additional training should notify their supervisor or the Safety Officer.

C. Written Communications

TCF produces informational memos and handouts covering various safety topics. These sources of communication are posted for review by all employees. They include safety inspection reports and safety committee meeting minutes.

TCF's written IIPP is also assessable to all employees.

D. Anonymous Notification Procedures

TCF has a system of anonymous notifications whereby an employee who wishes to inform TCF of work place hazards may do so anonymously by notifying Safety Coordinator in writing or over the phone. The Safety Coordinator shall investigate, or cause to be investigated, all such reports in a timely manner.

V. HAZARD IDENTIFICATION

TCF will identify and evaluate work place hazards when the program is first established; whenever new substances, processes, procedures, or equipment are introduced to the work place that represents a new occupational safety and health hazard and whenever TCF is made aware of a new or previously unrecognized hazard.

A. General Elements To Identify and Evaluate Work Place Hazards
   1. Review of applicable General Industry Safety Orders and other safety orders that apply to the operation.
   2. Review of industry and general information (including Material Safety Data Sheets for chemicals used) about potential occupational safety and health hazards.
   3. Investigation of all incidents and unusual events that have occurred at these facilities.
   4. Periodic and/or scheduled inspections of general work areas and specific work stations.
   5. Evaluation of information provided by employees.

B. New Safety and Health Concerns

It is a requirement of all employees and contractors to notify the Safety Coordinator and provide appropriate documentation (location, MSDS, potential hazards, etc.) regarding any new substance, process, or equipment prior to its introduction to the workplace.

C. Employee Reporting of Hazards

Employees are required to immediately report any unsafe condition, unsafe action or other hazard that they discover in the work place to their supervisor or any safety committee member. No employee will be disciplined or discharged for reporting potential work place hazards or unsafe conditions.

Employees who wish to remain anonymous may report unsafe conditions as described above.

VI. PROCEDURE TO INVESTIGATE OCCUPATIONAL INJURY OR ILLNESS

A. Employee Responsibility

Employees shall immediately report all injuries occurring at work, no matter how slight, to their supervisor.

B. Supervisor's Responsibility

It is the Supervisor's responsibility to complete an Incident Investigation Report and, IF THE INJURED NEEDS TO GO TO A MEDICAL PROVIDER OFF-SITE, TO ACCOMPANY THE INJURED. The Supervisor will immediately alert the Safety Officer of any injuries requiring treatment other than first aid.

C. Incident Investigation Procedure

Incident where a hazard or condition persists after the occurrence of an incident, incidents where there is a potential for recurrence, and incidents where the Safety Officer judges that procedural or training deficiencies may have contributed to the incident will be investigated.

They may be investigated by the supervisor and employee only, an appointed investigator, or an incident review team depending on the nature and/or severity of the incident.

Employees have the right to an independent investigation by someone other than their supervisor if they feel additional investigation is necessary. All incidents will be investigated at the time of occurrence, or as soon thereafter as possible, but in no case later then twenty-four hours.

When appropriate, these investigations may include complete statements from the employee(s) involved, any witnesses to the injury and the injured employee's supervisor. A copy of all Incident Investigation Reports will be forwarded to the Safety Officer for review. Employees who do not cooperate with incident investigations will be subject to TCF's disciplinary policy.

VII. PROCEDURE TO CORRECT UNSAFE OR UNHEALTHYCONDITIONS, WORK PRACTICES, AND WORK PROCEDURES IN A TIMELY MANNOR BASED ON THE SEVERITY OF THE HAZARD.

A. Workplace Hazards

The causes of all incidents will be documented and reviewed immediately. Corrective actions including condition repair/modifications, retraining or disciplining for unsafe actions will be initiated immediately. Safety procedures will be reviewed, if necessary, by the combined efforts of the affected employees, supervisors and safety manager and or safety committee. Training programs and safe job operating procedures will also be modified, if appropriate, to prevent reoccurrence.

B. Imminent Hazards

When an imminent hazard exists which cannot be immediately abated without endangering employees and or property, all exposed employees will be removed from the area except those necessary to correct the existing condition. Employees needed to correct the hazardous condition shall be provided with the necessary training and Personal Protective Equipment. All such actions taken and dates they are completed shall be documented.

VIII. PROVISIONS FOR TRAINING AND INSTRUCTION

A. Policy

Awareness of potential health and safety hazards as well as knowledge of how to control such hazards is critical to maintaining a safe and healthful work environment. TCF is committed to instructing all employees in safe and healthful work practices. To achieve this goal, TCF shall provide training to each employee with regard to general safety and emergency procedures. Training shall also be provided by the effected employees' supervisor for any hazard or safety procedure specific to the employees work assignments as mandated by regulations or company safety programs. Records of all training shall be maintained in employee files.

B. When Training Will Occur.

1. When the program is first established.
2. To all new employees.
3. To all employees given a new job assignment for which training has not previously been received.
4. Whenever new substances, processes, procedures or equipment which represent a new hazard are introduced into the workplace.
5. Whenever TCF is made aware of a new or previously unrecognized hazard.
6. Whenever an employee, through observation or investigation is found deficient, they will be retained.

Supervisors must familiarize themselves with the safety and health hazards to which employees under their immediate direction and control may be exposed. Supervisors *shall be responsible to provide their employees with safety training to minimize or eliminate such exposure.*

C. Areas of Training

All areas or items identified in the IIPP.

All areas or items identified as specific to the performance of any task.

IX. RECORDS OF THE STEPS TAKEN TO IMPLEMENT AND MAINTAIN THE PROGRAM

Records of scheduled and periodic inspections to identify unsafe conditions and work practices, including person(s) conducting the inspection, the unsafe conditions and practices that have been identified and the action taken to correct the identified unsafe conditions and work practice. These records shall be maintained for at least one year. Documentation of safety and health training for each employee, including employee name or other identifier, training dates, types of training, and training providers. This documentation shall be maintained at least one year.

Social Benefit/Impact Assessment Memo
The Conservation Fund's North Coast Forest Conservation Program
Primary authors: Jenny Griffin and Evan Smith
Original: August 25, 2008; Updated September 2012

social: L socialis, fr. socius companion, ally, associate; akin to L sequi to follow. Of or relating to human society, the interaction of the individual and the group, or the welfare of human beings as members of society (Websters Seventh New Collegiate Dictionary, 1972).

The Conservation Fund's North Coast Forest Conservation Program endeavors to have a very positive impact in our local community. This is due in part to our charitable mission as a non-profit organization, which is broader than just environmental protection, and references economic development and education. It is also explicitly addressed as part of the Garcia River Forest Integrated Resource Management Plan:

"The Plan identifies and describes in detail the following general management goals:

- *Improve ecological conditions by increasing the viability of selected "conservation targets" identified during the planning process.*
- *Generate sufficient revenue to cover the costs of property taxes, on-site maintenance, management and restoration projects and, potentially, generate net revenues for other conservation initiatives.*
- *Practice continual improvement through adaptive management based on monitoring of ecological, financial and social values.*
- *Support the local business community by utilizing local contractors and suppliers.*
- *Engage the local community by providing compatible public access, educational and recreational opportunities."*

We pride ourselves on being very cognizant of and sensitive to the potential social impacts (positive and negative) of our forest management activities and the role we play in the community.

We have identified five primary social elements as integral to our program and organize our evaluation of potential social impacts/benefits around these elements. We have not had a formal prioritization of these elements—all are important for our evaluation and monitoring. The five elements, and examples of how they are addressed, are:

- Creative arts (eg. College of the Redwoods and Mendocino Art Center photography and painting workshops, elementary school writing and art projects, etc.)
- Economic/financial (e.g. employment, log sales, carbon sales, etc.)
- Recreational (e.g. interpretive walks, passive recreational access, Boy Scouts and Sierra Club hikes, Audubon trips, etc.)
- Science/education (e.g. EMAP project, UC Davis research, Humboldt State and other surveys, SONAR projects, PWA workshops, stakeholder tours, etc.)
- Spiritual (e.g. open space values, Children and Nature programs, Leopold and Thoreau philosophy-based programs, and access/utilization by Native tribes)

We consider social benefits as an integral part of our management planning. The social elements are assessed and described in various sections of our forest management plans, which include policies on such issues as recreational access, scientific monitoring priorities, and preference for local goods and services. In addition to management planning, our operational decision-making also includes evaluation of potential social impacts—ranging from maintaining a viable logging industry to resolving the concerns of a neighbor. Our forest management policies have very clear requirements for community engagement and local procurement—we require that every timber harvest plan and major watershed restoration project have publicly available summaries and provide opportunities for field tours before and after operation. We continually ask for feedback from the local community through tours and informal meetings and routinely adjust programs or projects to address concerns. As described above, having a positive impact in the community is a program objective; we evaluate our success at meeting this objective as part of our annual operations review. The discussion and results of the annual operations review then inform the next year's workplan and as appropriate will be included in updates to the management plans.

As part of our annual monitoring, we publicly report (via the Annual Review) our data on key activity metrics. Most relevant to this topic is reporting on local economic contribution, participants in our public access program, and number of public tours we host. In addition to these three metrics that seem to best track the community interest, we usually also include short features on specific harvests, restoration projects, or safety issues. We also keep a log of any criticisms the program receives and how those are resolved. These metrics and concerns are also reviewed annually by the local Advisory Council.

APPENDIX I

The Conservation Fund Option A

Plan to Determine Long Term Sustained Yield

Scott Kelly, North Coast Timberland Manager, RPF 2408

Version 3/26/14

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1. Introduction

This document is intended to describe the sustainable management and harvest levels for The Conservation Fund's timberlands in Mendocino County, California. In 1973 the California Board of Forestry and Fire Protection (the Board) adopted the Z'berg-Nejedly Forest Practices Act authorizing the development and implementation of the Forest Practice Rules (FPRs) which govern timber-harvest-related activities on private and non-federal public forestlands in California. In 1994, the Board passed a series of regulations that require timberland owners to demonstrate "Maximum Sustained Production of High Quality Timber Products" (MSP) by either, (1) submitting an "Option A" timber harvest plan, (2) preparing a sustained yield plan ("Option B"), or (3) following a set of prescriptive silvicultural requirements ("Option C"). The three options for meeting the MSP requirement are named after Forest Practice Rules sections 913.11 (a), (b), and (c), respectively.

The Conservation Fund (TCF) currently owns and operates 53,403 acres of redwood and Douglas-fir forest land in Mendocino County, California, made up of the following tracts of land:

- Garcia River Forest, 23,769 acres, acquired in 2004
- Big River Forest, 11,707 acres, acquired in 2006
- Salmon Creek Forest, 4,213 acres, acquired in 2006; and additional adjoining 177 acres purchased in 2011
- Gualala River Forest, 13,537 acres, acquired in 2011.

All properties are permanently protected from development through conservation easements (held by The Nature Conservancy for Garcia and Gualala) and an Offer to Dedicate (held by the Wildlife Conservation Board for Big River and Salmon Creek). As described further below, this Option A is set up with separate descriptions and calculations of LTSY for each property to provide greater transparency regarding our management and operations. TCF anticipates that it will occasionally own other properties as part of its conservation real estate business that it does not anticipate conducting forest management operations on, those properties will not be included in the Option A.

TCF has elected to submit an Option A per California Forest Practice Rules 14CCR 913.11, which addresses management effects on timber resources, while considering watersheds, fisheries, wildlife, recreation, and employment. MSP is demonstrated by modeling specific silvicultural regimes while considering non timber resources such as stream zones, wildlife habitat requirements, visual resources and conservation easements. The results are termed The Long Term Sustained Yield.

In preparing this document we strove to follow the Guidelines for completing an Option A as described in the California Forest Practice Rules (14 CCR 913.11 (a)) by presenting an analysis of the following forest resources across TCF's ownership:

- Forest growth and harvest levels considering the proposed harvest regimes,
- silviculture implemented to realize the stated goals of the plan,

- consideration of non-timber forest values, including Watercourse and Lake Protection Zones, wildlife habitat retention, recreation, and visual considerations as they relate to the long term sustainability of the forest, regional economic vitality and employment and aesthetics.

1.1 Description of The Conservation Fund Forestlands

Orientation. The Conservation Fund owns and operates 53,403acres of redwood and Douglas-fir forest in four properties located between Fort Bragg and the Sonoma County border. The lands are segregated into four discrete management units which were acquired through four separate acquisitions. The Garcia River Forest was acquired in 2004. The Big River and Salmon Creek Forests were acquired in 2006, and the Gualala River Forest was acquired in 2011. The 177 acre Hardell property was also acquired in 2011 and is managed as part of the Salmon Creek Forest. The goal of the acquisitions is to protect the land in perpetuity from development or timberland conversion and maintain them as working commercial forests managed for timber production, wildlife habitat preservation and enhancement, as well as limited recreation. Funding for the purchases was made possible through low interest loans, grants from the Wildlife Conservation Board and State Coastal Conservancy, and private contributions from The Nature Conservancy, TCF and other organizations.

Location. TCF's forestlands are situated in the coast range of California from Highway 20 and west of Highway 101 extending south to the Sonoma County line. The Big River Forest (11,707 acres) is primarily within the Big River watershed adjacent to and south of Jackson Demonstration State Forest and Highway 20. Salmon Creek (4,204 acres) is in the Big Salmon Creek watershed bounded by Albion Ridge Road on the North and Navarro Ridge Road on the South. The Garcia River Forest (23,780 acres) is primarily within the Garcia River Watershed, bordered by Mountain View Road on the north and Fish Rock Road on the south. The Gualala Forest (13,542 acres) is south of and adjacent to the Garcia Forest and is bounded by Fish Rock Road on the north and the Sonoma County Line on the south.

Geology. The topography of TCF's forestlands ranges from gently sloping marine terraces along the Mendocino coastal plain in the western portions of the Big River and Salmon Creek Forests, to increasingly steep, rugged terrain in the eastern part of the Garcia and Gualala Forests. The Geology of the Coast Range is underlain by a variety of marine sandstones known as the Franciscan Formation. The geomorphology of the coastal mountains has been strongly influenced by two on-going processes: tectonic uplift and fluctuations in sea level. The landscape was especially affected during historic periods of low sea levels, when the coastline was farther west. During these events, streams down-cut and form deeply incised valleys with steep-sided inner gorges. Once sea level rises (as at present) and the coastline advances, streams aggrade, the deep coastal valleys partially in-fill and estuaries formed at the mouths of larger streams.

Climate. Average daily temperatures range from a high of 66.5 degrees (Fahrenheit) during July to a low of 43.6 degrees (Fahrenheit) in December. Annual precipitation ranges from 50 to 80 inches, primarily occurring in the winter.

Forest types. Redwood *(Sequoia sempervirens)* and Douglas-fir *(Pseudotsuga menziesii)* are the dominant conifer species on the forests. Other conifers present include sugar pine (*Pinus* *lambertiana*), grand fir *(Abies grandis),* western hemlock *(Tsuga heterophylla),* and Knobcone/Monterey Pine hybrid pine. Hardwoods comprise a substantial secondary component and are represented principally by tanoak *(Lithocarpus densiforus* var. *densiflorus)* and madrone *(Arbutus menziesii).* The mixture of species shifts with distance from the coast, harvest history of the area, exposure, and soils. Redwood is dominant in the western portions of the properties with Douglas-fir and hardwood increasing from west to east. Some of the inland areas would be classified as Douglas-fir series by Sawyer and Keeler-Wolf (1995), and Holland (1986).

Unique ecological communities. As part of TCF's management planning process we have identified unique areas that are reserved from harvest. The Mendocino Pygmy Cypress Forest is a unique ecological community that occurs only in coastal Mendocino County and within the TCF ownership is only present on the Salmon Creek Forest. The California Natural Diversity Database (CNDDB) recognizes it as a community that is "rare and worthy of consideration" (2003). The pygmy forest series covers approximately 7 acres in Salmon Creek. It is reserved from harvest modeling for the purpose of calculating LTSY.

True oak stands composed largely of black oak (*Quercus kelloggii*) Oregon white oak (*Quercus garryana) and* Shreve's oak *(Quercus parvula var. shrevei*) are present on the Garcia River Forest and, to a lesser extent, the Gualala River Forest. Per the TCF management policies for wildlife habitat retention, true oak stands, individual true oak trees and California Chinkapin (Chrysolepis chrysophylla) will be retained (protected from harvest) wherever possible. Known true oak stands are reserved from harvest modeling for the purpose of calculating LTSY. Currently we track 613 acres of Oak Woodlands on the Garcia River Forest and 91 acres of Oak Woodlands on the Gualala River Forest in our GIS database.

In addition to these unique ecological areas, we also reserve from harvest planning certain riparian buffers and Northern Spotted Owl Activity Centers, as described further in Section 4: Non Timber Resources.

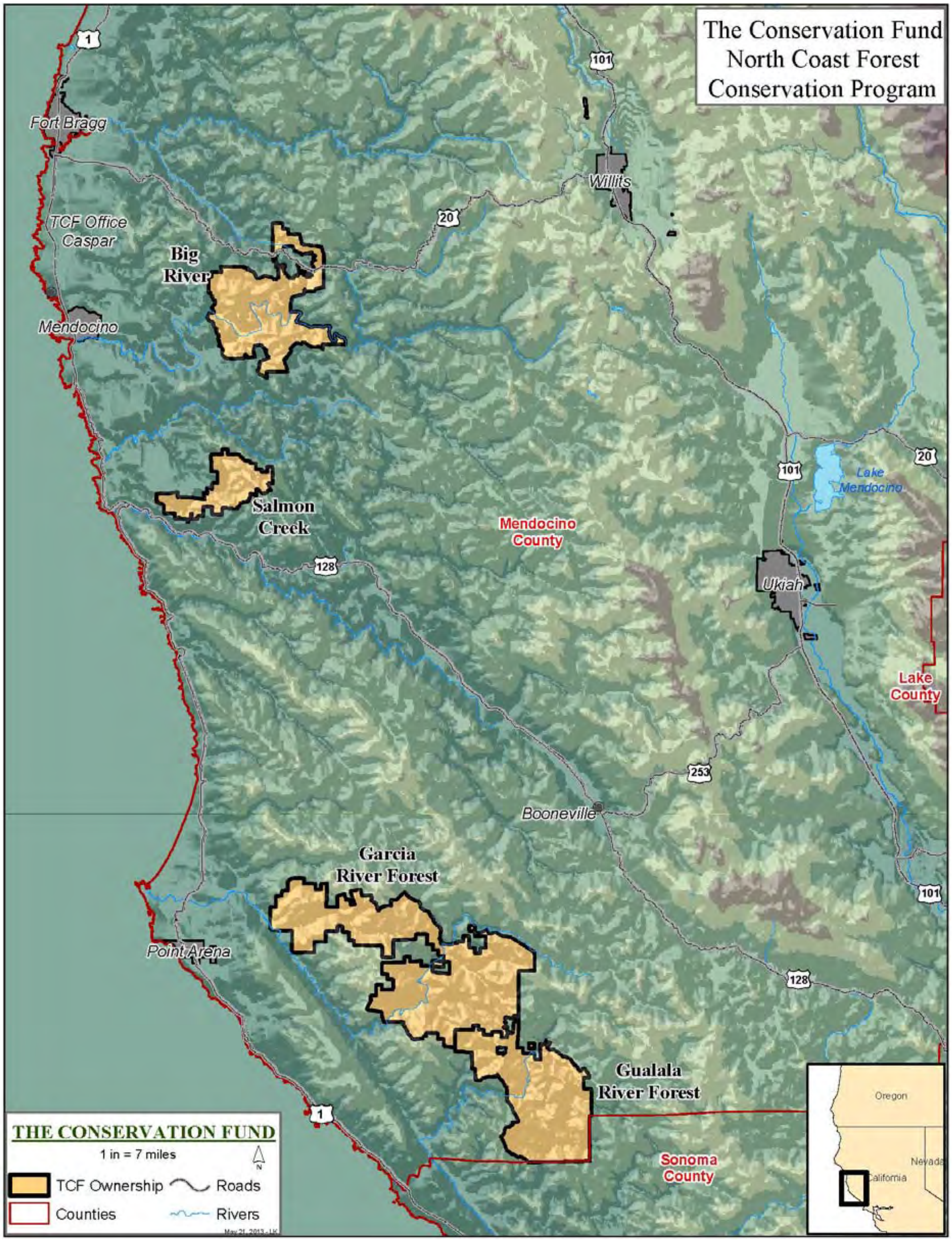


Figure 1: Location Map

Harvest History. All of TCF's ownership has been managed for forest products since the late 1800's or early 1900's. Early harvest efforts started at the mouths of watersheds and progressed upstream and up-slope to the ridgelines. Initial logging activities generally clearcut the old growth forests, then burned the slash while the logs were still on the ground before yarding them downhill to the river systems. Oxen were used to pull logs to mills or river systems. The rivers often served as the transportation routes to the mills and splash dams were commonly used to transport logs downstream on Big River. Subsequent entries into the forests further inland were commonly accomplished with steam donkeys and railroads. During the 1940s, crawler tractors replaced steam donkeys to yard logs and trucks replaced railroads to transport logs to the mills.

Improvements in technology and markets, coupled with tax laws in the 1940s and 1950s that encouraged landowners to remove 70% of their conifer stocking resulted in harvests that removed the larger, healthier trees leaving inferior trees and poorly stocked forests. Since that time the forests have been regrowing and harvested with variable intensities often in response to changes in ownership which necessitated harvesting to "pay for the land". Until the passage of the Z'Berg Nejedly Forest Practice Act in 1973, and the subsequent development of the Forest Practice Rules, little effort was made after harvest to ensure that harvested areas were restocked. The resulting forests consisted of unnaturally high densities of competing vegetation, primarily tanoak. This condition limited the ability of redwood and Douglas-fir to grow and achieve historic stocking levels in some stands.

Recent Harvests. More recent harvests by previous landowners on Salmon Creek and Big River have utilized the clearcutting regeneration method which has produced a variety of well-stocked 5-30 year old plantations. The selection regeneration method, where used, has resulted in unevenage or uneven size class forests with tree ages ranging from approximately 1-120 years of age. Recent harvests by the previous landowners on the Garcia and Gualala Forests predominantly utilized shelterwood removal or seed tree removal prescriptions which have resulted in young even-aged stands ranging from 30-60 years of age. Though conifers dominate the forests overall, tanoak and other hardwood species dominate some of the younger stands and lower quality sites found in the Garcia and Gualala Forests. Past silviculture has been market driven and has also influenced the species distribution. Historically, redwood has been preferentially selected for harvest. Therefore the forests contain a higher percentage of Douglas-fir than would be expected to occur naturally or in the absence of a market driven harvest regime.

Current Management. All of TCF's California holdings are managed to increase conifer stocking through uneven-aged silviculture, with sustainable harvest levels and significant environmental protections. Harvests typically consist of single-tree selection with some group selection and transition silviculture, supplemented with the occasional pre-commercial thinning or hardwood reduction treatment. The intent of our silviculture is to maintain and improve conifer stocking and volume as well as wildlife habitat conditions for both terrestrial and aquatic species. By the end of the planning horizon the target stocking for Big River and Salmon Creek is 50 MBF/acre, for Garcia River and Gualala River forests the target stocking is 35 MBF/acre. The targets were chosen based on observed timber productivity for each tract, major species composition, and initial stocking. Big River and Salmon Creek are predominantly redwood site class II with average starting stocks of 21.2 MBF/acre and 27.9 MBF/acre respectively, whereas Garcia and Gualala are predominantly Douglas-fir site class III with average starting stocks of 10.7/MBF/acre and 8.6/MBF respectively. Timber harvests will be designed such that they meet the stated silvicultural goals in an economically and socially responsible manner. Management plans and policies for each property are publicly available and regularly reviewed by a local advisory council. All of TCF's forestry operations are designed to be in conformance with all applicable law as well as the protocols of the Sustainable Forestry Initiative (SFI) and the Forest Stewardship Council (FSC). Both SFI and FSC require that our forest practices utilize best management practices, utilize silvicultural practices which are sustainable, and preserve and protect valuable fish and wildlife habitat as well as other high conservation forest values such as pygmy forests. The overall goals of SFI and FSC are complimentary to TCF's overall forest management strategy including the requirement for a conservation easement restricting timberland conversion. In addition to SFI and FSC certification, TCF has four forest carbon offset projects verified and registered using the Climate Action Reserve (CAR) Forestry Offset Protocols (versions 2.1 and 3.2). As a result TCF can sell carbon offsets generated by the forests' sequestration of CO_2. TCF is audited annually by independent third party auditors both for the SFI and FSC forest certification programs and the CAR forest carbon offset program. TCF's ability to sell carbon offsets is dependent on our ability to demonstrate that we are voluntarily harvesting less than the allowable maximum volume per year as defined by the Forest Practice Rules. This Option A will complement TCF's desire to demonstrate sustainable harvest practices while providing for other forests values. More information is available at http://www.conservationfund.org/our-conservation-strategy/focus-areas/forestry/north-coast-conservation-initiative/

1.2 Maximum Sustained Production of High Quality Timber Products

As described in 14 CCR 913.11(a), MSP is achieved by meeting the requirements outlined below.

(a) *Where a Sustained Yield Plan (14 CCR § 1091.1) or Nonindustrial Timber Management Plan (NTMP) has not been approved for an ownership, MSP will be achieved by:*

(1) *Producing the yield of timber products specified by the landowner, taking into account biologic and economic factors, while accounting for limits on productivity due to constraints imposed from consideration of other forest values, including but not limited to, recreation, watershed, wildlife, range and forage, fisheries, regional economic vitality, employment and aesthetic enjoyment.*

(2) *Balancing growth and harvest over time, as explained in the THP for an ownership, within an assessment area set by the timber owner or timberland owner and agreed to by the Director. For purposes of this subsection the sufficiency of information necessary to demonstrate the balance of growth and harvest over time for the assessment area shall be guided by the principles of practicality and reasonableness in light of the size of the ownership and the time since adoption of this section using the best information available. The projected inventory resulting from harvesting over time shall be capable of sustaining the average annual yield achieved during the last decade of the planning horizon. The average annual projected yield over any rolling 10-year period, or over appropriately longer time periods for ownerships which project harvesting at intervals less frequently than once every ten years, shall not exceed the projected long-term sustained yield.*

(3) *Realizing growth potential as measured by adequate site occupancy by species to be managed and maintained given silvicultural methods selected by the landowner.*

(4) *Maintaining good stand vigor.*

(5) *Making provisions for adequate regeneration. At the plan submitter's option, a THP may demonstrate achievement of MSP pursuant to the criteria established in (b) where an SYP has been submitted but not approved.*

Long Term Sustained Yield (LTSY) is defined in the California Forest Practice Rules (14CR 895.1) as "the average growth sustainable by the inventory predicted at the end of a 100-year planning horizon." This Option A outlines such an approach to harvesting, related growth and overall inventory levels over the 100-year period.

The LTSY considers growth from all forested stands that are eligible for harvest. As described in more detail below, stands which are not eligible include a) class I and class II stream "no harvest" buffers as required by the California Forest Practice Rules and TCF's Integrated Resource Management Plan, b) NSO core habitat retention areas surrounding known NSO activity centers, c) oak woodlands, and d) areas designated as "no harvest" by a conservation easement which includes a 300 foot wide buffer between Mendocino Headlands State Park and TCF's Big River Forest. The LTSY was calculated with the use of FORSEE, a growth simulator for the redwood and Douglas-fir regions of coastal California that relies on the CRYPTOS growth and yield model.

The planning approach in this Option A reflects forest management and planning considerations, harvesting practices and silvicultural prescriptions that are compliant with the California Forest Practice Rules, adhere to the Forest Stewardship Council's Pacific Coast Standards, adhere to Sustainable Forestry Initiative standards, and are compatible with TCF's wildlife habitat management strategies and forest management policies. TCF's wildlife management strategies are discussed in detail in section 4. The intent of our silviculture is to maintain and improve conifer stocking and volume as well as wildlife habitat conditions for both terrestrial and aquatic species. Timber harvests will be designed such that they meet the stated silvicultural goals in an economically and socially responsible manner.

1.3 Plan Organization

LTSY for The Conservation Funds California holdings is calculated independently for each forest and combined to develop the total LTSY. This is advantageous for TCF and CALFIRE because it allows for greater transparency and in the event there is a change in RCF ownership pattern LTSY will not need to be re-calculated for the remaining forest. If a change in ownership occurs we will either calculate the individual LTSY for the new property or subtract a property out of the Option A without requiring major changes to the base document and calculations. LTSY will be presented for each forest along with the specific constraints and silvicicultural prescriptions particular to the forest. Although not anticipated, a partial sale of one or more forests exceeding 10% of the total ownership will trigger the need to recalculate the LTSY, similarly, a land purchase would also require that LTSY be recalculated.

This plan will present our inventory growth and yield methodology and findings, general silvicultural constraints and guidelines, constraints from wildlife, range and forage and other forest values as well as regional economic vitality.

1.4 Adaptive Management

This plan is subject to changes based on change in our ownership pattern, catastrophic events such as fire, or change in inventory due to inventory updates. The inventory will be updated approximately once every 10 years or as necessary to maintain our desired level of accuracy. The new inventory will be compared to our initial calculation of LTSY as well as our growth and regeneration estimates. Any necessary adjustments to the LTSY will be explained and amended to this Option A.

2. Summary of Inventory and Growth and Yield Methods

2.1. Overview of inventory methodology

TCF uses a stratified random sample to calculate the initial volume estimate on each property. TCF's timber inventory data is derived from two levels of forest stratification. First, the ownership is divided into four Management Units, based on the four individual properties. Second, within each Management Unit, timber stands are identified, which are groups of trees with similar tree heights and canopy densities. For the Big River and Salmon Creek properties, stands were identified using algorithms that analyze data derived from digital aerial photography and LiDAR imagery and recorded through a Geographic Information Systems database. Compared to the traditional stand-typing methodology (which works very well in even-aged forests), this quantitative approach offers greater ability to capture variability in uneven-aged mixed species forests where stands are less well defined. The stands are then assigned a vegetation label based on tree height, tree density and the coefficient of variation of height. In general, stands are between 5 and 30 acres although some stands are larger. For more details on this stand delineation and forest stratification methodology, see Golinkoff, J. S. 2013.

An example of the final stand delineation and stratification process is shown in Figure 2 below.

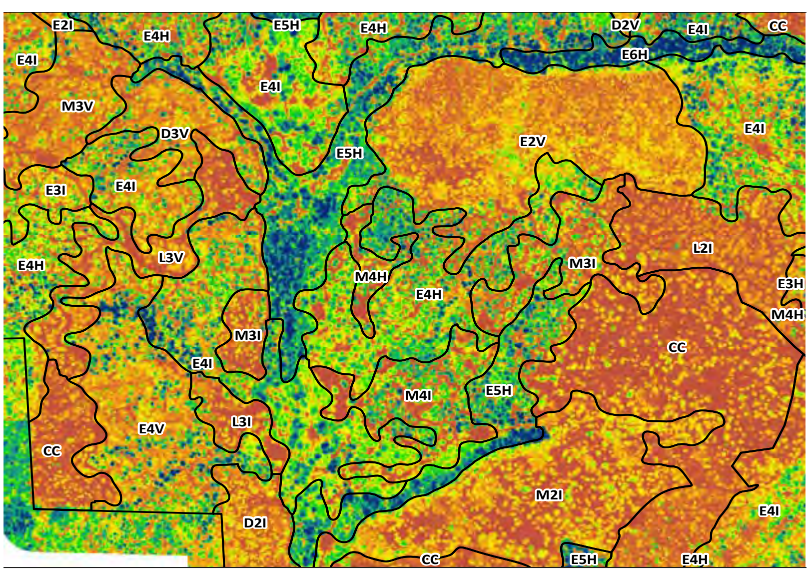


Figure 2: Example of final stand delineation and stratification.

The first letter of the strata is % Canopy Cover (O,L,M,D,E) O=open 0-20%, L=low 21-40% etc. The second letter is mean height of the dominant trees (1,2,3 etc) in 25' height increments. The third letter is the coefficient of variation of height which is an indicator of stand structure. (H=homogenous, I=intermediate and V=variable). CC is for recent Clearcut where the regeneration has not reached 25' in average height. For example an M3V stand has moderate canopy cover, the average height of 75 feet and the canopy ht is variable. M3V stands are young and have variable heights and are the kind of stands expected to develop from an older clearcut or shelterwood removal harvest.

A different approach to inventory was used on the Garcia and Gualala Forest due to their heterogeneous forest conditions and poorly defined stand boundaries resulting from past management. Micro stands or cells were used on the Garcia and Gualala Forests to stratify the forest. A cell is a small area between 1/10th and 1/2 acre in size in which the tree size and canopy condition is known through LiDAR data. The cells are then assigned a unique vegetation label based on tree height, tree density, and species composition which is the basis for the stratified sample. Once the cells are established with strata assigned to each cell, variable radius plots were installed within randomly selected cells (one plot per cell) to obtain estimates of conifer and hardwood stocking, volume, downed wood and conifer and hardwood regeneration. Plots are allocated to each stratum in order to meet statistical confidence targets. Unsampled cells are assigned tree lists based on the average cell within their stratum. All of the forests, Big River, Salmon Creek, Garcia River and Gualala River included in this Option A have an estimate of net conifer volume with at least 10% accuracy at the 90% confidence level. TCF's current inventory estimates are based on approximately 1,900 sample plots distributed across all four properties.

The cells were used in the inventory to account for stand variability; the cells were then grouped by tree height, tree density, and species composition (if known). The stands were then given a strata label based on those attributes identical to the system used in the cell nomenclature. The FORCEE model uses the stands to derive the harvest schedule presented in this Option A. A more detailed discussion of timber stand delineation can be found in Appendix A: "Big River and Salmon Creek Forest Stratification" and appendix B: "Garcia and Gualala Forest Stratification and Sampling Design".

2.2. Methodology to Determine Maximum Sustained Production

TCF used the FORESEE (4C) growth and yield simulator in combination with our inventory data and management prescriptions to make projections of forest growth and inventory over time. The model allows TCF to test different management scenarios over time and space to develop a comprehensive harvest plan which meets the silvicultural, environmental, social, and economic goals of TCF. Maximum Sustained Production (MSP) is calculated for the next 100 years by modeling forest growth and harvests with constraints on certain stands such as riparian corridors, NSO core areas and special prescriptions in some of the conservation easement areas. This modeling connects spatial timber stand information in TCF's GIS database to tree lists in a Microsoft Access databases. Each stand has a tree list which assists in inventory estimates and guides the activity in the growth and yield model. Information generated for each stand includes the following information:

- **Vegetation Type / Stratum** – Each stand is given a stratum label based on average tree height, variation of tree height, and crown closure. The strata are the basis for the stratified sampling design and are used to calculate volume and basal area for each stand.

- **Volume and basal area for conifer and hardwoods species** – Volume and basal area are calculated for each stand based on the inventory results. Inventory sampling intensity is based on the coefficient of variation within each stratum.
- **Site Class** –The Soil Survey Geographic database (SSURGO) was used to make an initial determination of site class. In addition a minimum 3 site trees were measured for each strata to validate the SSURGO site index. Site index was calculated for each species and then converted to the corresponding site class. The SSURGO data was generally in agreement with our findings therefore TCF's model uses the SSURGO site data. The average site class for each strata is assigned to all stands of similar strata in which site data was not specifically collected
- **Timing** – Harvest timing is based on the initial stand condition, pre-designated harvest cycles (for old clearcuts) and minimum harvest volume to trigger the initial and subsequent entries.

A stand is only considered for harvest if it satisfies the timing and volume requirements designated by the management prescriptions, described below and input into the model. Stand constraints are then evaluated which may affect the silvicultural regimes available for a particular stand. Silviculture in unconstrained stands is chosen by the model based on a hierarchal approach starting with selection as the preferred silviculture and working down through transition, commercial thinning, variable retention and finally rehabilitation. Some stands do not meet any of the criteria and consequently are grown forward with no harvest and are reviewed again by the model during the next harvest cycle.

Both growth and harvesting simulations occur using the 4C growth model. 4C runs within a Microsoft Access database and calls routines that grow tree lists forward. TCF's planning used an iterative approach to identify a blend of silvicultural methods, tanoak reduction, harvest levels, and re-entry interval that achieve TCF's management objectives.

2.2.1 Management Objectives

Some of the important management objectives and policies considered in TCF's modeling are:

- **<u>A non-declining inventory at the ownership level.</u>** For each property, overall harvest volume should be less than growth volume for a sufficient enough period of time to significantly increase conifer volume. By the end of the 100 year planning period harvest will increase to approach 100% of growth in the unconstrained (unrestricted for NSO, WLPZ, etc) forest and will represent MSP. When including the constrained acres, inventory increases significantly across all time periods.
- **<u>Reliance on uneven-age management techniques</u>.** TCF's long-term silvicultural objective is to primarily use single-tree and group selection. Harvests on less mesic (dryer) sites, which have a greater component of Douglas fir and sugar pine, may necessitate some variable retention harvests, in order to achieve successful natural regeneration.
- **<u>Restoration of forested stands with high levels of tanoak competition</u>.** In order to achieve adequate conifer stocking levels for future growth and management many stands, especially on the Garcia and Gualala forests, will require some form of tanoak reduction and control to occur concurrently with timber harvests. TCF currently uses a combination of techniques to control tanoak; Imazapyr applied by the "hack and squirt" technique is most commonly used to control

tanoak individual tree felling to release conifer seedlings and saplings is also used to control tanoak stocking levels.

- **<u>Development and maintenance of desired habitat conditions</u>.** The development and maintenance of desired conifer stocking and structural conditions in the forest will result in an increase in available forest habitat over time through the development increased forest cover and large tree habitat as indicated by an increase in volume and basal area over the 100 year planning horizon.
- **<u>Appropriate management of sensitive areas such as riparian corridors and NSO habitat</u>** Stands constrained by riparian corridors and sensitive species habitat or conservation easement have been identified and the silviculture regime is selected to accommodate the constraint. In some cases, the constrained harvest area will not be harvested.

2.3. Site Occupancy, Stand Vigor, and Regeneration

Ensuring adequate site occupancy, maintaining good stand vigor, and making provisions for adequate regeneration are important to TCF and necessary for ensuring Maximum Sustained Production (MSP). TCF's retention and restocking guidelines are designed to create future healthy stands for continued timber production and improved wildlife habitat. Silvicultural regimes are designed to ensure timber stand health and vigor is maintained or improved by targeting diseased or suppressed trees first.

For forest modeling tanoak is scheduled for reduction within each of the silviculture regimes if it exceeds 30% of the total pre harvest basal area. When tanoak is "removed" the post-harvest tanoak stocking was not allowed to exceed 30 ft^2 per acre for selection and transition silviculture and was not allowed to exceed 15 ft^2 per acre for Variable Retention or Rehabilitation silviculture. These hardwood retention levels were chosen to ensure that hardwoods are a component of our stands and supply necessary mast and structural diversity for wildlife habitat. It is our goal to restore the majority of tanoak dominated stands to a conifer-hardwood species mix that more closely resembles the conditions that existed prior to the commencement of commercial logging activities. Tanoak reduction strategies to be used in the field may vary by stand structure and the applied silviculture, these are discussed in section 3.3.3. True oak stands occur on the Gualala and Garcia Forests containing black oak (*Quercus kelloggii*) Oregon white oak (*Quercus garryana) and* Shreve's oak *(Quercus parvula var. shrevei*) which are restricted from conversion management. On all of TCF ownerships individual true oaks, madrone, alder, chinquapin, California bay and other less common hardwoods species shall be retained wherever possible.

3. Silviculture

The silviculture modeled in this Option A was developed to reflect the provisions of the individual property management plans and the TCF Policy Digest. In addition the silviculture and harvest schedule was designed to meet the target carrying capacity, expressed as volume per acre, of the forests. The carrying capacity of Big River and Salmon Creek was set to 50 MBF/acre, Garcia River and Gualala River forests were set to 35 MBF/acre. These targets were chosen to ensure a reasonable level of stocking was maintained which would result in adequate wildlife habitat throughout the forest and yield adequate harvest volumes. To achieve the volume targets, basal area targets were set for each stand.

Stands with more than 225 ft^2 of BA at the start of the planning period have a target stocking rate of 250 ft^2 of BA at the end of the 100 years. Stands with less than 225 ft^2 of BA at the start of the planning period have a target BA stocking rate of 200 ft^2 BA. It was determined through an iterative process that this combination of harvest and growth constraints results in a reasonable harvest level while leaving enough standing inventory to allow the forest to recover and add additional volume prior to the next entry.

TCF's primary goals are:

- To increase forest stocking over time through carefully applied selective harvesting which results in increased total growth and value of the residual stand as described above.
- Maintain or improve wildlife habitat and water quality by using selection silviculture.
- Contribute to the overall economic viability of the forest products industry by providing predictable employment for forest workers and raw products to the local saw mills.
- Generate revenue through sales of timber and carbon offsets to repay debt, cover operating expenses, invest in property improvements and provide return to funding partners.

There is an emphasis in our management plan(s) on uneven-age management and tanoak reduction to achieve the stated goals. Table 1 below shows the percentage of acres treated by each modeled silvicultural system by period for all of the Forests combined. The model utilizes stand level data generated from our inventory to choose silvicultural prescriptions on a hierarchal basis, selection being the preferred silviculture then transition followed by variable retention and rehabilitation. The modeled output does not choose all available silvicultural systems, however TCF anticipates the need to use all silvicultural systems at some time depending on site specific stand conditions. The modeling results presented in this plan demonstrates that TCF's general approach to achieve MSP is valid; they are not however presented as a concrete plan of action. TCF foresees the need deviate from the planned silviculture from time to time to account for site specific conditions and inherent stand variability. Therefore TCF shall be allowed to deviate from the modeled silvicultural output by a maximum of 10% of the harvested acres per forest on any 5 year rolling average. Reasons for silvicultural deviations may include: insufficient stocking, disease, damaged or decadent forest conditions, intolerant species, difficult site conditions or the need to improve the quality or quantity of important wildlife habitat . Deviations for silvicultural experimentation and investigations are allowed provided they are explained and justified in the THP.

Table 1: Modeled Siviculture treatments by percent of total acres harvested.

Year	WLPZ1	WLPZ2	Ecological Reserve Selection- GRF	Standard Selection	Transition	VR40	VR60	sum %	Sum acres
2014-2018	0.5	12.5	6.6	69.2	11.2	-	-	100.0	7,830.3
2019-2023	0.4	1.6	14.1	83.0	0.9	-	-	100.0	6,637.3

Year	WLPZ1	WLPZ2	Ecological Reserve Selection- GRF	Standard Selection	Transition	VR40	VR60	sum %	Sum acres
2024-2028	2.4	10.6	12.8	73.6	0.5	0.2	-	100.0	7,813.1
2029-2033	9.7	7.1	10.4	72.7	0.0	-	-	100.0	9,578.0
2034-2038	4.8	6.6	9.9	78.6	0.0	-	-	100.0	10,115.2
2039-2043	5.1	1.9	12.8	80.3	0.0	-	-	100.0	7,829.4
2044-2048	8.7	10.4	9.4	71.4	0.2	-	-	100.0	10,642.0
2049-2053	2.0	2.6	9.4	85.8	0.1	-	-	100.0	10,644.5
2054-2058	3.3	8.2	10.9	77.6	-	-	-	100.0	9,168.1
2059-2063	7.6	5.8	6.6	80.0	0.0	-	-	100.0	9,457.5
2064-2068	5.0	9.3	3.5	82.1	0.0	-	-	100.0	8,507.6
2069-2073	4.8	2.3	1.6	90.9	0.3	-	-	100.0	9,012.2
2074-2078	8.2	10.9	2.4	78.5	-	-	-	100.0	10,095.3
2079-2083	6.5	3.4	1.8	88.4	-	-	-	100.0	7,867.7
2084-2088	6.3	9.7	0.5	83.5	-	-	-	100.0	7,728.3
2089-2093	9.7	6.6	0.5	83.2	-	-	-	100.0	8,629.0
2094-2098	7.3	10.7	0.4	81.6	-	-	-	100.0	7,415.1
2099-2103	8.3	3.9	1.1	86.7	-	-	-	100.0	5,688.9
2104-2108	13.6	17.2	0.9	68.2	-	-	-	100.0	6,376.6
2109-2113	7.7	3.7	0.1	88.5	-	-	-	100.0	7,055.1

For modeling purposes the harvest and retention guidelines specified in the forest practice rules were used for all silviculture systems except in the case of single tree selection and group selection where the modeled retention generally exceeds the minimum retention requirements specified in the rules. Future THPs will comply with the Option A, the enforceable retention standards for Selection and Group Selection shall be stated by the submitting RPF in the THP. Unless stated otherwise in the THP, a timber stand shall be considered stocked if the stand meets the post-harvest stocking standards as required by the Article 3 of the FPR.

3.1. Uneven-aged Management

Uneven-aged management is utilized to establish or maintenance of a multi-aged, balanced stand structure, promote the growth of trees throughout a broad range of diameter classes, and encourage natural reproduction. Typical silvicultural systems in uneven-aged management include single tree selection and group selection. Over time, uneven-aged management systems develop trees in at least three age or size classes. Periodic timber harvest in these stands will remove selected individual trees from all age classes or small groups of trees in order to promote the growth of the remaining trees and to create an opportunity for new trees to regenerate and occupy the site.

A majority of the area devoted to timber production will be managed using uneven-aged silvicultural systems. Within the redwood region, this is the most common system utilized by non-industrial forest landowners and others intent upon maintaining forest cover for wildlife habitat and visual quality.

RPF's submitting THP's utilizing selection silviculture will demonstrate compliance with this Option A by incorporating into the plan the following information:

- The site class.
- The average pre harvest conifer basal area and BF volume per acre for each THP or harvest block within THP's.
- The enforceable minimum BA retention standard shall be stated in the THP. The minimum BA must meet or exceed the minimum requirements stated in 14 CCR 913.2(a)(2)(A) for the first decade the Option A is in effect.

Deviations from the harvest cycle constraint by site class will be allowed for up to 10% of each THP or harvest block to allow RPF's to make logical harvest units.

3.1.1. Single Tree Selection

Single tree selection will be utilized to create growing space for younger trees through the development of small openings resulting from removing individual trees. The openings generally range in size between 1/100th and ¼ acre openings within the stand. Single tree selection leads to stands with continuous forest cover, small gaps between trees, and a diversity of tree sizes and ages. With this silvicultural system, the intent will be to enter each timber stand every 10 to 15 years to remove lower quality or defective trees, thin the dominants and co-dominants, and provide openings to accelerate the development of leave trees and a new age class.

Most stands to be managed under the selection system are essentially even-aged, single-canopy 2nd or 3rd growth stands that were initially clearcut and may have had one or more harvests following the initial entry. Thus, it will take multiple entries to achieve the balanced age and diameter distribution we are seeking.

For a stand to be considered for selection harvesting it must contain at least 125 sq ft of basal area. TCF has modeled the removal of a minimum of 25 sq ft of BA of trees between 8-48 inches. Fifteen square feet of basal area were retained from harvest from the largest trees in the stand. The maximum allowable harvest was 1/3 of the conifer BA and/or up to 40% of the standing volume whichever is less. Reentry cycles are determined by site class, site II and better lands are modeled with a ten year harvest cycle and site III lands are modeled with a 15 year harvest cycle. The site class is used as the trigger which indicates the earliest available date a stand can be reentered. In addition to meeting the site class constraint stands must have at least 25 sq ft more basal area than it had prior to the previous entry, this requirement is the primary driver for increasing inventory over time.

3.1.2. Single Tree Selection- Garcia River Forest Ecological Reserve

The Ecological Reserve (ER) Area on the Garcia River Forest is designated for late seral stand recruitment. The ER is composed of approximately 8,000 acres of forest land including TCF's entire ownership within the Inman Creek watershed, a high priority Coho stream. In addition to the standard class I WLPZ there is an additional 100 feet of RMZ and on all class I streams except the mainstem of the Garcia which has an additional 200 foot RMZ. The RMZ is considered part of the Garcia Forest Ecological Reserve and shall be managed as such. To facilitate late seral stand recruitment, harvesting will be essentially thinning from below with some thinning of co-dominants to improve spacing. Defective trees and trees with complex crowns will be left on site to promote the development of a multi storied canopy. TCF has modeled 2 complete entries in the reserve then harvesting was terminated because we believe that the stand will have the appropriate BA, tree size, spacing and structural elements to be left free to grow after 2 harvests.

For a stand to be considered for selection harvesting it must contain at least 125 sq ft of basal area. TCF has modeled the removal of a minimum of 25 sq ft of BA of trees between 8-48 inches. Fifteen square feet of basal area were retained from harvest from the largest trees in the stand. The maximum allowable harvest was 1/3 of the conifer BA and/or up to 40% of the standing volume whichever is less. The minimum reentry cycle is 20 years and a stand must have at least 40 sq ft more basal area than it had prior to the previous entry before it is eligible for harvest again. Class I stream zones within the Ecological Reserve are modeled using the High Retention Single Tree Selection method described below and are restricted to 2 entries on a 20 year harvest cycle.

3.1.3. High Retention Single Tree Selection: Class I inner zone "A" and Class II Inner zones

The goal of the High Retention Selection is to protect and maintain the stream riparian zone and enhance water quality. WLPZ1 require 80% canopy retention and the 13 largest trees per acre be retained, per 14 CCR 916.9(f)(2)(B) and 916.9(g)(2)(B)). The TCF harvest model removes trees subject to these constraints. The canopy and stocking requirements within the WLPZ's shall be in conformance with the forest practice rules unless exceptions are made in the THP per 14 CCR 916.9(v). No other site specific reporting is required by submitting RPF's for WLPZ1 silviculture.

3.1.4. Moderate Retention Single Tree Selection: WLPZ2 , Standard class II zones

The harvest and growth constraints for the Moderate Retention Selection are identical to single tree selection with the following addition: at least 50% of the canopy covering the ground shall be retained per 14 CCR 916.5(e). The TCF harvest model removes trees subject to these constraints. The canopy and stocking requirements within the WLPZ's shall be in conformance with the forest practice rules unless exceptions are made in the THP per 14 CCR 916.9(v). No other site specific reporting is required by submitting RPF's.

3.1.5. Group Selection

Stands managed under the group selection system will consist of small forest patches or harvest groups. The resulting stand will be composed of various age classes and developmental stages concentrated within each group. For modeling purposes, there is no distinction between group selection and single tree selection the growth and harvest constraints for groups are the same as Individual tree selection.

To date groups have been used used when the average volume per acre is low and individual tree selection is uneconomical, stands dominated by Douglas fir or in stands with high hardwood competition. By concentrating harvest volume within groups TCF feels that harvesting costs can be reduced especially in low volume per acre cable yarding areas. In poorly stocked areas groups are useful in establishing regeneration of redwood and Douglas-fir which require direct sunlight to thrive. Groups are placed in all forest stand conditions to avoid the potential for high grading by targeting the best volume areas and, in the case of hardwood dominated areas, restore the site to conifer. To date, TCF's policy has been to supplement regeneration within group openings by planting conifer seedlings if in the opinion of the project forester planting is the best way to secure conifer regeneration. The location of group harvest areas will be on a site specific basis determined by the project RPF. Factors to include when considering groups will be volume per acre, tree species, stand stocking and vigor and current market conditions.

3.1.6. Transition

Transition harvests are designed to transition a stand from an even age state to an uneven-age condition over time. For our purposes, transition harvest will be used in young/small even-age stands resulting from clearcuts or shelterwood removal harvests that will benefit from some selective harvest of individual trees to release the conifers and increase growth and windfirmness of the residual stems. Small openings may be created to promote the development of another age class. Transition harvests will often be coupled with some form of hardwood reduction.

Transition silviculture includes the alternative prescription "Transition with Groups". This silviculture is analogous to group selection and is designed to improve stocking levels of younger age classes and reduce hardwood competition.

For a stand to be considered for transition harvesting it must contain at least 75 sq ft of basal area and no more than 124 sq ft of basal area. TCF has modeled the removal of a minimum of 25 sq ft of BA of trees between 8-48 inches. Fifteen square feet of basal area were retained from harvest from the largest trees in the stand and a total of 50 square feet was retained to meet minimum stocking requirements. Reentry cycles are determined by site class, site II and better lands are modeled with a ten year harvest cycle and site III lands are modeled with a 15 year harvest cycle. The site class is used as the trigger which indicates the earliest available date a stand can be reentered. In addition only one transition harvest is modeled per stand therefore stands harvested using transition silviculture must meet the minimum requirement for single tree selection prior to subsequent entries.

The minimum BA retention standard shall be stated in the THP. The minimum BA must meet or exceed the minimum requirements stated in 14 CCR 913.2(b) for the first decade the Option A is in effect.

TCF's current management is very similar to the management proposed in this Option A. The following table shows TCF's past and proposed THP's with silvicultureal treatments and yarding systems.

Table 2: TCF Management Practices 2007-2013

Property	THP Number	County	Tractor Selection	Cable Selection	Tractor Group Selection	Cable Group Selection	Tractor Transition	Cable Transition	Tractor Seed Tree Removal	Cable Seed Tree removal	Tractor Rehabilitation	Cable Rehabilitation	Tractor VR	Cable VR	Oak Treatment
Garcia River	1-11-109	MEN	94	60	22	82									
Garcia River	1-11-023	MEN	107		412										43
Garcia River	1-06-135	MEN	85	100			4	89							
Garcia River	1-07-035	MEN		370											
Garcia River	1-08-039	MEN	72	37		65		147							
Garcia River	proposed	MEN	200	**135**											
Garcia River	1-08-094	MEN						255			15				90
		MEN													
Salmon Creek	1-06-099	MEN	46	34	43	114			257	59					
Salmon Creek	1-07-191	MEN	219	206											
Salmon Creek	1-10-005	MEN	48	63											
		MEN													
Big River	1-07-060	MEN	105	52											
Big River	1-07-083	MEN	52	11			25		47				56	31	87
Big River	1-08-037	MEN	45	90		48	121	93	23	75					199
Big River	1-09-020	MEN	271	155			12	17							71
Big River	1-09-044	MEN	201				33								
Big River	1-09-097	MEN	100	279			65	47							152
Big River	1-10-030	MEN	271	190											37
Big River	1-11-009	MEN	144	12											
Big River	1-11-057	MEN	71	213	17	87									79
Big River	1-11-114	MEN	154	269	9	15	33								111
Big River	proposed	MEN		236											
Big River	proposed	MEN		196											

3.2. Intermediate Treatments

3.2.1. Commercial Thinning

Commercial thinning is the removal of trees in young growth stands to maintain or increase average stand diameter of the residual crop trees, promote timber growth, improve forest health and control species composition by removing low value forest species. TCF will occasionally use commercial thinning in young even-age stands resulting from prior clearcuts or shelterwood removal harvests.

For a stand to be considered for commercial thinning it must contain at least 75 sq ft of basal area and they must have at least 50% of the conifer basal area in trees less than 14" DBH. TCF has modeled a retention of 100 trees per acre 4" DBH and greater. Reentry cycles are determined by site class, site II and better lands are modeled with a ten year harvest cycle and site III lands are modeled with a 15 year harvest cycle. The site class is used as the trigger which indicates the earliest available date a stand can be reentered. A stand may be eligible for transition or selection harvest after the commercial thin harvest.

The pre and post-harvest stocking requirements listed in 913.3(A) or 913.3(B) shall be the enforceable standard for THP's.

3.3 Special Prescriptions

3.3.1 Variable Retention

Variable retention (VR) is the only even age final harvest system that is anticipated for use by TCF. VR is used to regenerate a new age class on a stand level. Variable retention retains mature trees in a variable configuration. A new even-aged stand is grown beneath or between the retained trees. Retained trees may occur as scattered individuals, in groups, or in combination. Mature trees are retained to improve or maintain habitat value, watershed function, and aesthetic value. VR offers the opportunity to meld the continuous canopy concept of uneven-aged management with larger openings to allow for sufficient sunlight to promote a second age class beneath and between the existing overstory. Per TCF current policy, VR will likely be used sparingly and on sites that are more suited for Douglas-fir and sugar pine. Research from the Pacific Northwest, (Johnson and Franklin 2013) indicates that early successional ecosystems important to some song birds (e.g. olive sided flycatcher) may be missing, VR harvest simulate the early Successional stages of forest development and may be an important component of future management. TCF anticipates at least one THP including VR harvest on each property in the near future.

The pre and post harvest stocking requirements listed in 913.4(d) shall be the enforceable standard for THP's.

3.3.2 Rehabilitation

Rehabilitation will be occasionally utilized for those stands that do not meet the minimum stocking standards set forth in 14 CCR 912.7 and are capable of growing conifers. Generally, these are stands that are currently hardwood dominated but were once conifer dominated as evidenced by conifer stumps, location, or soil type. Under the rehabilitation prescription, hardwood stocking will be reduced through mechanical removal or herbicide application and conifer seedlings will be planted in the vacated growing space.

The pre and post harvest stocking requirements listed in 913.4 (b) shall be the enforceable standard for THP's.

3.3.3 Tanoak Reduction

Hardwoods, specifically tanoak, are naturally occurring in the redwood region and are a minor component of a well-managed coastal conifer forest. Typically, hardwoods comprise 10-30% of a stand's basal area. However, as a result of past management practices, tanoak has become the dominant species or is a significant portion of the forest basal area in some stands. Tanoak is both extremely shade tolerant and sprouts vigorously after being cut or damaged. Because of these physiological traits, once established tanoak is capable of out competing conifers for light and nutrients. Tanoak control will be a necessary part of many silvicultural treatments to ensure that tanoak does not become the dominant tree species within a stand after a commercial harvest has occurred. In the growth model tanoak is “harvested” if it represents represents more than 30% of the total stand BA a target BA of 30 ft^2 between 2 and 20” DBH.

In practice selective “harvesting” of tanoak is the method of control most often used in TCF’s THP’s. Selective harvesting is the application of Imazapyr or manual felling of tan oak trees such that suppressed conifers are released through the harvest of the tanoak. This method is preferred because it directly benefits suppressed conifers, reduces chemical use and is effective when used for manual tanoak control. In addition selective tanoak harvesting reduces dead and down material and helps maintain forest canopy cover for wildlife habitat. When selectively harvesting tanoaks the residual tanoak basal area is less important than effective tanoak removal, a THP shall be considered in compliance with 14CCR 912.7(d) when the selective tanoak control method is specified in a THP.

The herbicide primarily recommended for use of tanoak control is imazapyr. The primary application method will be via “hack and squirt.” Using this method, a series of cuts are made around the stem of the tree and the herbicide is applied directly to the tree’s vascular tissues. Additional herbicides for tanoak control may be considered in the future as they are developed and tested. No hardwood species other than tanoak shall be treated. Mandatory tanoak retention guidelines are listed below.

- Retain all tanoak 20” DBH and larger. These large hardwoods are of the highest value to wildlife because they tend to be the most prolific mast producers and they possess more desirable structural attributes than smaller trees. Exceptions to the general retentions guidelines may be adopted on sites with very high numbers of large tanoaks if retention of all 20” and greater tanoak will not result in sufficient sunlight and growing space for young conifers.
- There will be no tanoak control with herbicides in Class I, II or IV WLPZs or within 25 feet of a class III watercourse. Manual felling or girdling of small tanoaks less than 20” may be used within WLPZ’s as part of a riparian shade enhancement project designed to increase conifer site occupancy and growth on a site specific basis.

Additional TCF policies on forest chemical use, monitoring, and reporting are available; this section focuses solely on the growth and yield considerations. As markets permit, we may choose to harvest tanoak, which will be subject to the same retention requirements as mentioned above. The results of different tanoak control techniques will be monitored over time and our policies will be revised as new information becomes available.

3.3.4 Timber Stand Improvement – Pre-Commercial Thinning and Conifer Release

Pre-commercial Thinning (PCT) is a thinning of smaller trees where merchantable sawtimber is not derived from the thinning operation and the cut material is left on site. PCT is undertaken to increase spacing or release desired conifer trees and control species composition by cutting surrounding inferior conifers or hardwoods. It is designed to direct growth to the remaining trees, generally those with the best form or growth potential. Young conifer stands (typically 5-15 years old) are thinned to prescribed stocking levels, in an effort to produce a desired combination of tree species and density.

Release operations can be used where thinning is not feasible and involves releasing individual trees, or groups of trees, from immediate competition by eliminating over-topping or closely surrounding vegetation. This practice results in increased growth of the remaining trees and is a also a means of controlling tanoak, brush, and invasive weed species. Release is a non-commercial practice, generally utilizing direct stem injection of herbicides or manual felling.

Timber stand improvement activities will be modest in scope (200-400 acres/year for the whole ownership). For this reason timber stand improvement activities are not directly modeled in the Option A and are not expected to result in an increase in growth that would be significant at the ownership scale.

3.4 Even-aged Management

Clearcutting, seed tree removal and shelterwood removal are not modeled for this Option A. However, they may be used in the event of severe damage resulting from natural causes such as fire, wind, or bears to capture mortality and regenerate the site. The pre and post harvest stocking requirements listed in 912.7(b)(1) shall be the enforceable standard for THP's.

4 Non-Timber Forest Resources

Non-timber forest values considered in the calculation of Maximum Sustained Production (MSP) include the conservation and improvement of wildlife and fisheries habitat and attention to various legal restrictions specific to the properties including conservation easements. These considerations impact the determination of LTSY through the application of silvicultural prescriptions that are appropriate for the level of sensitivity in each stand. Community concerns such as viewsheds and recreational opportunities are thought to be minimal and our standard selection silviculture will mitigate those impacts.

The major non-timber forest values factored into determination of LTSY are:

- Protection and enhancement of riparian zones to improve fisheries habitat and water quality; and
- Recruitment and retention of NSO core areas as well as structural and compositional attributes to maintain and improve Northern Spotted Owl habitat and other terrestrial wildlife habitat in general.

In addition to the requirements of the Forest Practice Rules, TCF in cooperation with CDF&W has initiated a large woody debris (LWD) enhancement program on most of its property to accelerate wood production in the stream channel to improve habitat for coho salmon and steelhead trout. To reduce sediment inputs into streams and provide increased riparian canopy cover TCF adopted a 25 foot no harvest buffer on class I and class II stream on the Garcia River Forest in 2007 and a 50 foot no harvest buffer on class I streams on Big River and Salmon Creek. These buffers are utilized in combination with the Anadromous Salmonid Protection Rules adopted by CALFIRE in 2011. The Conservation Fund is also proactively upgrading our road system to reduce sediment inputs into streams. To date we have upgraded almost one hundred miles (at a cost of about $3 million) and we expect our current level of road improvement activity to be maintained.

To promote the maintenance and development of wildlife habitat, TCF has implemented various levels of hardwood reduction to achieve conifer release and maintain forest cover where possible. The following paragraphs describing wildlife tree retention and recruitment are excerpted from TCF's management policies as revised January 2013.

4.1 Wildlife Trees, Recruitment Trees, and Snags

Target: four per acre on average across stand. The following criteria have been developed to assist field foresters to recruit suitable wildlife trees. Trees shall be retained from any of the following groups until a minimum of four recruitment trees per acre have been identified.

- **Snags:** Retain all snags, (all should be retained but only those greater than 18-inch DBH and 20 foot height shall count towards the retention targets).
- **Conifers greater than 48-inch DBH***:* Retain or recruit a minimum of two and not more than four 48" trees per acre for recruitment (unless old growth). In the event there are less than two 48" trees per acre, two trees per acre from the largest size class shall be designated for recruitment from the harvest area.
- **Old-growth trees:** Retain all old growth. Old growth is defined as any conifer tree greater than 200 years old that exhibits outward signs of being old or decadent: such as rounded or flat crown, dead top, excessive branching, or platy bark.
- **Raptor nest trees (active or likely to be re-used):** Retain all.
- **Any hardwood except tanoak:** Retain all.
- **Tanoak:** Retain all tanoak 20" and greater unless site specific conditions exist as justified by the project forester
- **Murrelet habitat trees:** Retain all. Typically large diameter Douglas-fir or other conifer with at least one mossy branch platform capable of supporting an egg: at least 6" in diameter, nearly horizontal, within the canopy of the stand but lower than the surrounding tree tops within 100' radius, covered directly above by at least 50% canopy, and allowing ready flight access and landing paths.
- **Den trees:** Retain all den trees which are defined as trees which have a cavity greater than three inches in diameter and greater than ten feet above ground
- **Trees with basal hollows or other significant features:** Retain all trees with basal hollows defined as trees with significant burn scars protruding 1/3 or more into the bole of the tree, as well as retain all trees with acorn granaries, significant or unusual lichen accumulation, signs of deformity, decadence, unusual bark patterns, or other unique structure or features, eg large excessive branching or flat tops.

4.1.1 Retention Tree General Guidelines

- Wildlife trees or large trees marked for retention are not intended for future harvest and should be retained throughout the planning period. The project forester may "trade" designated retention trees if other more suitable retention trees develop over time.

- Marking of the wildlife trees (with paint or tags) is intended to communicate the recognition of the importance of that stem to future foresters, agency reviewers, and the public.
- In areas with insufficient wildlife trees (less than 4 trees per acre), snags may be created by girdling. For the next 20 years some preference for snag creation and wildlife tree recruitment will be given to cull trees and whitewoods (because of their low financial value) even though they may have a shorter lifespan as a snag compared to redwood.
- All retention is subject to operational considerations; the felling of any tree is permitted when necessary for operator safety, road right of way, or yarding corridors.
- Targets shall be assessed across the entire harvest stand, not on an individual acre basis.
- Preference shall be given for spatial grouping of wildlife trees (clumps of downed wood, snags, and/or wildlife trees).

All of the foregoing requirements and guidelines are subject to further review and amendment as the science and practice of forest management evolves and new research is developed and applied. Because of past practices, some portions of the forests do not have sufficient wildlife features and the initial targets set forth above are intended to guide the long-term retention and recruitment of these features, recognizing it may take two decades or entries to achieve the target distribution.

4.2 Ecological Reserve

The Ecological Reserve was established on the Garcia River Forest in 2006 and is comprised of approximately 8,000 acres set aside for the development of late seral stage forest. Its establishment was required by the terms of the California State Coastal Conservancy's grant to acquire the property. The Ecological Reserve is primarily within the Inman Creek watershed and an interconnecting network of watercourse buffers and other smaller reserve areas which capture the forest biodiversity across the Garcia River Forest ownership. Silviculture within the Reserve is described in section 3.1.2, tanoak control may be used to maintain conifer dominance in harvest areas, however pre commercial stand manipulation is not anticipated. The reserve network is displayed on the GRF map in Section 10.

4.3 Anadromous Salmonids

TCF forestlands are bisected by approximately 87 miles of class I stream capable of supporting anadromous fish. Protecting and improving fisheries habitat is a priority for TCF and its partners. Fishery and riparian corridor protection measures are defined in the Forest Practice Rules. Other restrictions imposed by our management plans or conservation easements may be more restrictive that the FPR's. For modeling purposes the streams and riparian corridors are buffered per the forest practice rules and other TCF constraints as applicable. The buffers are described in detail in table 12, Appendix C. In total approximately 1,743 acres are excluded from harvest and an additional 4,561 acres have harvest restrictions totaling approximately 12% of the forest. Field surveys for each THP may supersede the current modeling. Because of recent LIDAR analysis we are confident in the accuracy of our stream GIS layer and do not anticipate any large changes.

4.4 Northern Spotted Owls

The USF&WS listed the Northern Spotted Owl (NSO) as threatened under the Endangered Species Act in 1990. Each NSO territory is provided a 100 acre core area in which timber harvest is severely limited or prohibited. The Conservation Fund currently tracks 24 NSO territories with activity centers on the properties. For modeling purposes each NSO territory with an activity center on TCF ownership is given a 100 acre core area consisting of the "best" habitat surrounding the nest site. NSO which reside off property are buffered with a 1,000 foot radius and that portion of the radius which falls within TCF ownership is considered a “no harvest” area, in a total of 2,737 acres or approximately 5.1% of the forest is restricted from harvest. NSO territories and corresponding core areas may change yearly and will likely change over time in response to environmental conditions, competition from barred owls or mortality. These changes are not expected to effect the calculation of LTSY.

4.5 Range and Forage

The dominant vegetation type on TCF’s ownership is redwood/Douglas-fir forest. Tanoak and Pacific madrone are the major hardwood species both of which produce significant mast for forage by birds and mammals. Other major conifer species include sugar pine and grand fir whose cones are favored by grey squirrels. Redwood cambium is favored by bears, porcupines and grey squirrels in some areas where other forage is lacking. Brush species favored for wildlife foraging include blackberry, thimbleberry, huckleberry and various grasses and clovers which occupy permanent openings in the forest. It is felt that the species component and percent occupancy will not change due to our management techniques. As openings are created desirable forage species will occupy the site temporally. There are no management activities proposed which would prevent or discourage forest forage species.

Grasslands occur on the Garcia and Gualala forests, some of them are natural with native grasses and some may be relics of conversion attempts earlier in the century either by homesteaders or Native Americans. Native American fire management also had a role in the current distribution of grasslands on the ownership. Grasslands are used by the black tail deer for forage, and feral pigs till up grasslands in search of grubs and mushrooms. TCF’s policy is to maintain the native grasslands and is considering a plan to reintroduce fire to help maintain the grasslands and promote the growth of the native grasses.

5 Regional Economic Vitality and Employment

Since its inception in 1985, The Conservation Fund (TCF) has focused on programs which further both environmental and economic goals. TCF believes that maintaining a strong balance between conservation and economic vitality will in the long run benefit our projects and partners while preserving land in perpetuity. TCF’s goal is to maintain the forest as a commercially viable working forest while simultaneously reinvesting proceeds from the sale of timber and carbon offsets to reduce sediment inputs from roads and improve salmonid and wildlife habitat. TCF believes this strategy helps to maintain the current economic forest products economy and keeps forestland out of development or conversion to non timber resources (which would increase the cost of county services and decrease the viability of the forest industry).

Employment

Within the local area, TCF currently employs 3 full-time foresters and 10 part-time employees or contractors. This group includes our forestry staff and security, contract wildlife biologist, geologists, botanists and other professional foresters. In addition to direct employment, TCF purchases products with approximately 35 vendors and engages in contracts with approximately 53 contractors, most of which are located in Mendocino County. TCF’s forest operations support approximately 50 additional part time jobs. These are primarily logging and log hauling, road construction and reconstruction, and biological studies which support the forest operations.

Historically the majority of the jobs and revenue generated in Mendocino County have come from the timber and fishing industries. Both industries have suffered a severe decline in the last few decades with no clear replacement of the economic inputs.

Forestry jobs, such as those generated by TCF's property management activities, are especially important to the North Coast regional economy. The north coast is in transition to a more diversified economy with fewer forest jobs and increased tourism related service industry jobs. However, on average, North Coast service jobs pay less than forest based jobs. As calculated by the California Department of Forestry and Fire Protection, mean annual wages in 2003 were $19,700 for the tourism sector and $31,721 for timber industry occupations (III-42).

One measure typically used to determine the economic impact of forestry activities is "number of jobs created." TCF maintains a field office in Caspar, California to support the North Coast Forest Conservation Program, providing full-time and part-time employment for local residents. The local office is supported by various staff (legal, human resources, accounting, real estate, etc.) at the main office in Arlington, Virginia.]

Table 3: Direct and Indirect Annual Employment (6 year average)

Employee Group	Number
TCF full-time employees	4
TCF part-time employees	2
Contractors	53
Vendors[1]	35

Although the number of local employees is small, the number of local jobs generated directly by the program is significantly greater since TCF retains many different contractors each year (see Table 1) to perform services on the properties. In selecting contractors, TCF strives to hire local individuals and small businesses. In addition, program activities indirectly support local businesses and related industries by purchasing services from a total of 35 local vendors that have supplied the program since 2006.

As shown in Table 3, North Coast Forest Conservation Program payments for contractual services from 2006-2012 totaled over $2.5 million. The equivalent number of contractor jobs generated by these service payments is estimated based on the mean annual wage of $31,721.

Table 4: Contractual Service Annual Payments (6 year average).

Contract Type	Payment
Logging & trucking	$1,129,194.33

[1] Vendors include non-contractual payments for a range of goods and services from field and office supplies to appraisals, utilities, vehicle expenses, etc.

Contract Type	Payment
SFI, FSC, CAR Certifications	$19,940.33
Inventory & carbon(local)	$68,714.33
Inventory & carbon (fees)	$136121.67
Firefighting	$22,033.83
Professional Services	$1,198,547.33
TOTAL	**$2,574,551.83**
ESTIMATED JOBS	**81.16**

Additional indirect jobs and employment in associated industries, such as milling and lumber sales, are not included in these figures, but also important to the local economy

5.1 Direct and Indirect Economic Impacts

Select direct and indirect economic impacts of the North Coast Forest Conservation Program are summarized in Table 4. Direct economic impacts are "the initial, immediate economic activities (jobs and income) generated by an industry". For the Program, these include the local employment and contractual service payments described in the section above. A significant portion of the Program's direct economic impacts are produced by sustainable logging activities. Unfortunately, recent declining timber prices have affected harvest levels, reducing the quantity of contract payments as harvest levels from the properties has been uneven flow in response to market conditions.

Table 5: Select Direct and Indirect Annual Economic Impacts (6 year average).

Impact Types	Impact Dollar Amount
Direct Impacts	
Contractual service payments	$2,574,551.83
Vendor service payments	$60,670.33
Vendor materials payments	$99,477.17
Permits (DFG & Water Board)	$11,316.00
Timber taxes (State)	$36,326.17
Property taxes (County)	$107,263.67
ANNUAL TOTAL	$2,889,605.17
ANNUAL $/ACRE	$65.57

Economic impacts are "production, employment and income changes occurring in other businesses/industries in the community" as the supply inputs. For the Program, these include payments to vendors for materials and services, and taxes paid. The Program's activities from 2006-2012 have generated $218,000 in timber taxes for the State of California and $644,000 in property tax revenues for Mendocino County. Since 2006, the annual direct economic impacts of TCF's North Coast Forest Conservation Program have averaged approximately 2.9 million dollars annually.

6 Monitoring

The Conservation Fund is in a continual process of improving its knowledge about the forests it manages. The projections described in this Option A serve as a baseline that will be used to make management decisions in the future as we gain experience with the silvicultural prescriptions that have been modeled. It is anticipated that some adjustments may be made to reflect actual (measured vs modeled) growth or other unforeseen changes. In addition to the current inventories and assumptions under which the Option A is based, TCF expects to re inventory all of the forest tracts subject to this option A. Property inventories are expected to be conducted approximately once every 10 years. conduct regular forest inventory updates. In addition to the property wide inventory TCF will continue to measure and monitor the following forest metrics:

- Continual measurement of permanent growth plots
- Sample post-harvest stands
- Experiment with different vegetation management alternatives
- Monitor and inventory some wildlife metrics such as NSO and instream habitat
- Monitor pre-commercial thinning and hardwood reduction success

The periodic inventory updates will be used to check the accuracy of the option A and used to verify the current growth model or re-calculate LTSY. The permanent plots will be used to calibrate or verify our growth assumptions within the growth model. Actual harvest silviculture and acreage will be tracked and compared to the model outputs in the Option A.

The following information will be supplied to CALFIRE on an annual basis:

- Harvest volume and acres by even-aged, uneven-aged, and variable retention silviculture and acres treated for hardwood reduction
- Any ownership changes
- Any changes of forest conditions due to catastrophic events that result in a net change of more than 10 percent of TCF's net conifer volume

7 Harvest Schedule

The harvest schedule projects growth and development of each forest for the next 100 years. Specifically the harvest schedule projected future stand conditions and harvest, growth and inventory levels.

In this TCF Option A plan harvest scheduling was accomplished using the FORSEE growth model, our forest inventory database and a GIS database. Every unique stand was assigned an initial entry period based on the date of the previous entry or past silviculture. For example stands which were previously selected were unavailable for harvest for 10 years following the last entry; stands which were previously clearcut were unavailable for harvest for 40 years following the date of the clearcut entry. One of TCF's primary goals with our forest management is to improve forest stocking and maintain a high level of stocking over time. Therefore, in addition to the silvicultural rules, TCF has developed a set of global harvest constraints unique to each forest, which prevent the harvest model from harvesting every available stand every period. The global constraints control BA and volume removal for each stand and control the rate at which volume removal increases overtime until such time as the modeled harvest does not exceed growth. This results in a relatively steady increase in forest stocks until the constraints are released. The table below shows the global constraints for each forest.

Table 6: Global Harvest Constraints

Global Harvest Constraints						Harvest Cycle (Years)	
Forest	Initial harvest level: MBF/Yr	rate of increase in harvest	Maximum Allowable BA harvest	Maximum Allowable BF harvest	Year Restrictions Lifted	Site Class I & II	Site Class III & IV
BR	3.5	1.5%	25%	35%	2034	10	15
SC	1.5	1.5%	25%	35%	2034	10	15
GRF	1.5	3%	33%	40%	2079	10	15
GUAL	1.5	3%	33%	40%	2114	10	15

The harvest cycle was constrained by site class and lower sites were given a longer harvest cycle. Site class I-II is modeled with a 10 year harvest cycle and site class III and IV is modeled with a 15 year harvest cycle. To accommodate the variation in harvest cycle by class, 5 year planning periods were used in which each stand became eligible for harvest every 5 years subject to environmental constraints and harvest timing constraints.

7.1 Harvest Schedule Deviations

As mentioned above silvicultural treatments were determined by the model using stand data developed from the inventory or growth model. Based on this data the model chose selection silviculture over 90% of the time as the harvest method, however we expect some deviation on the ground from the inventory and modeling assumptions. The modeling results presented in this plan demonstrates that TCF's general approach to achieve MSP is valid; they are not however presented as a concrete plan of action. TCF foresees the need deviate from the planned silviculture from time to time to account for site specific conditions and inherent stand variability. Therefore TCF shall be allowed to deviate from the modeled silvicultural output by a maximum of 10% of the harvested acres per forest on any 5 year rolling average. Allowable prescriptions will include selection, transition and commercial thinning. In the event that onsite conditions dictate that evenage management be used only variable retention or rehabilitation harvests are allowed. Evenage management shall be restricted to 500 acres per 5 year planning period on the Garcia River Forest, 300 acres per 5 year planning period on Big River and Gualala River Forests, and 100 acres per 5 year planning period on the Salmon Creek Forest.

The Garcia River Forest has a large acreage in the Conservation Easement known as the Ecological Reserve (ER) in which the ER silviculture is slightly different from the Standard Selection silviculture. The decision to enter the ER will be based on site specific factors such as stocking, disease or damage, or market conditions. These factors can be difficult to model therefore TCF shall be allowed to deviate freely between the ER silviculture and the standard selection silviculture as long as the total acres harvested per period do not change by more than 10%. TCF will maintain GIS records of all harvests to ensure that the harvest cycle restrictions respected. Catastrophic events such as fire, insect attack or floods may initiate changes in the proposed plan and those changes will be disclosed in THP's or Emergency Notices filed with CALFIRE.

8 Long Term Sustained Yield Tables and Charts

LTSY was calculated for each forest for a 100 year planning horizon. The calculation of LTSY considered for unconstrained timber stands and limited harvesting in riparian zones. Areas designated as "no harvest" due to wildlife or water quality constraints were omitted from the LTSY calculation. The following tables and charts display data related to the calculation of Maximum Sustained Production. All data displayed is the result of the 4C growth and yield model.

8.1 Salmon Creek Forest

The Salmon Creek Forest (4,389 acres) is primarily within the Big Salmon Creek watershed. The calculated LTSY over the one hundred year planning horizon is 2,766 MBF/year.

Table 7: LTSY Acres

Forest	Total Acres	Class I WLPZ No Harvest	Class I WLPZ Restricted Harvest	Class II WLPZ No Harvest	Class II WLPZ Restricted Harvest	NSO	Pygmy	LTSY Acres
Salmon Creek	4,389	124	123	66	238	731	7	3,100

Table 8: Growth and Yield Over 100 Year Planning Horizon.

	Salmon Creek All Acres MBF Totals						Salmon Creek Unconstrained MBF Totals					
Period	**Pre-Harvest Standing**	**Harvested**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**	**Pre-Harvest Standing**	**Harvest**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**
2014-2018	133,489	8,269	148,021	22,800	4,560	**36%**	81,918	7,726	90,193	16,000	3,200	**48%**
2019-2023	148,021	8,552	162,292	22,824	4,565	**37%**	90,193	8,322	97,911	16,041	3,208	**52%**
2024-2028	162,292	9,457	175,093	22,257	4,451	**42%**	97,911	8,945	104,460	15,494	3,099	**58%**
2029-2033	175,093	9,654	187,910	22,471	4,494	**43%**	104,460	9,636	110,306	15,482	3,096	**62%**
2034-2038	187,910	14,017	196,186	22,293	4,459	**63%**	110,306	13,975	111,452	15,121	3,024	**92%**
2039-2043	196,186	6,298	212,723	22,835	4,567	**28%**	111,452	6,288	120,683	15,519	3,104	**41%**
2044-2048	212,723	11,155	224,221	22,654	4,531	**49%**	120,683	11,067	124,845	15,229	3,046	**73%**
2049-2053	224,221	13,939	232,593	22,311	4,462	**62%**	124,845	13,938	125,697	14,790	2,958	**94%**
2054-2058	232,593	10,600	244,257	22,263	4,453	**48%**	125,697	10,551	129,831	14,685	2,937	**72%**
2059-2063	244,257	8,683	258,030	22,456	4,491	**39%**	129,831	8,609	136,052	14,830	2,966	**58%**
2064-2068	258,030	9,112	271,404	22,487	4,497	**41%**	136,052	9,065	141,842	14,855	2,971	**61%**
2069-2073	271,404	13,988	279,566	22,150	4,430	**63%**	141,842	13,984	142,373	14,516	2,903	**96%**
2074-2078	279,566	13,041	288,391	21,866	4,373	**60%**	142,373	13,014	143,615	14,256	2,851	**91%**
2079-2083	288,391	6,815	303,632	22,055	4,411	**31%**	143,615	6,811	151,282	14,477	2,895	**47%**
2084-2088	303,632	5,083	320,880	22,331	4,466	**23%**	151,282	4,985	161,106	14,809	2,962	**34%**
2089-2093	320,880	13,985	328,886	21,991	4,398	**64%**	161,106	13,975	161,652	14,521	2,904	**96%**
2094-2098	328,886	14,073	336,613	21,800	4,360	**65%**	161,652	13,987	162,066	14,401	2,880	**97%**
2099-2103	336,613	13,695	344,377	21,459	4,292	**64%**	162,066	13,692	162,491	14,118	2,824	**97%**
2104-2108	344,377	11,955	353,592	21,170	4,234	**56%**	162,491	11,929	164,464	13,903	2,781	**86%**
2109-2113	353,592	10,480	364,142	21,030	4,206	**50%**	164,464	10,478	167,818	13,832	2,766	**76%**

Table 9: Growth and yield/acre over 100 year planning horizon

Period	Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres
	Salmon Creek MBF/acre Results					
2014-2018	32.1	26.4	7.4	7.7	35.6	29.0
2019-2023	35.6	29.0	13.8	14.0	39.0	31.5
2024-2028	39.0	31.5	11.5	13.3	42.1	33.6
2029-2033	42.1	33.6	9.9	10.2	45.1	35.5
2034-2038	45.1	35.5	10.5	11.1	47.1	35.9
2039-2043	47.1	35.9	10.7	11.0	51.1	38.9
2044-2048	51.1	38.9	8.9	10.0	53.9	40.2
2049-2053	53.9	40.2	11.0	11.3	55.9	40.5
2054-2058	55.9	40.5	9.1	10.5	58.7	41.8
2059-2063	58.7	41.8	13.1	13.8	62.0	43.8
2064-2068	62.0	43.8	9.3	11.1	65.2	45.7
2069-2073	65.2	45.7	13.1	13.5	67.2	45.8
2074-2078	67.2	45.8	11.1	12.8	69.3	46.2
2079-2083	69.3	46.2	12.1	13.0	72.9	48.7
2084-2088	72.9	48.7	8.5	11.7	77.1	51.9
2089-2093	77.1	51.9	15.0	15.7	79.0	52.1
2094-2098	79.0	52.1	15.2	18.5	80.9	52.2
2099-2103	80.9	52.2	15.4	16.0	82.7	52.3
2104-2108	82.7	52.3	12.0	14.5	84.9	53.0
2109-2113	84.9	53.0	16.1	17.1	87.5	54.0

Table 10: Acres Harvested By Silviculture.

	Salmon Creek Silvicultural Acres by Period									
Year	WLPZ1	WLPZ2	Standard Selection	transition	VR40	VR60	Commercial Thin	Conifer Release	Rehab	Sum
2014-2018	9	18	594	0	0	0	0	0	0	**620**
2019-2023	19	132	660	0	13	0	0	0	0	**824**
2024-2028	13	12	945	0	0	0	0	0	0	**970**
2029-2033	1	82	1,258	0	0	0	0	0	0	**1,341**
2034-2038	1	18	571	0	0	0	0	0	0	**591**
2039-2043	17	125	1,110	0	0	0	0	0	0	**1,252**
2044-2048	9	25	1,232	0	0	0	0	0	0	**1,266**
2049-2053	26	133	1,003	0	0	0	0	0	0	**1,162**
2054-2058	12	26	623	0	0	0	0	0	0	**661**
2059-2063	28	133	819	0	0	0	0	0	0	**980**
2064-2068	13	25	1,033	0	0	0	0	0	0	**1,070**
2069-2073	30	135	1,014	0	0	0	0	0	0	**1,178**
2074-2078	13	25	524	0	0	0	0	0	0	**562**
2079-2083	37	134	426	0	0	0	0	0	0	**597**
2084-2088	13	26	891	0	0	0	0	0	0	**929**
2089-2093	37	134	757	0	0	0	0	0	0	**928**
2094-2098	13	25	853	0	0	0	0	0	0	**891**
2099-2103	40	135	821	0	0	0	0	0	0	**996**
2104-2108	13	25	612	0	0	0	0	0	0	**650**

8.2 Big River Forest

The Big River Forest (11,707 acres) is primarily within the Big River watershed adjacent to and south of Jackson State Forest and Hwy 20. The calculated LTSY over the 100 year planning horizon is 7,840 MBF/ Year.

Table 11: LTSY Acres

Forest	Total Acres	Class I WLPZ No Harvest	Class I WLPZ Restricted Harvest (including flood plain)	Class II WLPZ No Harvest	Class II WLPZ Restricted Harvest	NSO	CE No Harvest	LTSY Acres
Big River	11,707	295	420	141	487	870	113	9,381

Table 12: Growth and Yield Over 100 Year Planning Horizon.

	Big River All Acres MBF Totals						Big River Unconstrained MBF Totals					
Period	**Pre-Harvest Standing**	**Harvested**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**	**Pre-Harvest Standing**	**Harvest**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**
2014-2018	268,328	18,288	306,060	56,020	11,204	**33%**	201,068	18,008	227,958	44,898	8,980	**40%**
2019-2023	306,060	17,929	344,644	56,513	11,303	**32%**	227,958	17,362	255,647	45,051	9,010	**39%**
2024-2028	344,644	21,724	379,489	56,569	11,314	**38%**	255,647	20,860	279,794	45,007	9,001	**46%**
2029-2033	379,489	22,616	414,506	57,632	11,526	**39%**	279,794	22,488	302,962	45,656	9,131	**49%**
2034-2038	414,506	34,534	437,134	57,162	11,432	**60%**	302,962	34,277	313,520	44,835	8,967	**76%**
2039-2043	437,134	20,967	474,383	58,217	11,643	**36%**	313,520	20,759	338,356	45,595	9,119	**46%**
2044-2048	474,383	26,955	505,959	58,531	11,706	**46%**	338,356	26,831	357,176	45,652	9,130	**59%**
2049-2053	505,959	43,046	519,983	57,070	11,414	**75%**	357,176	42,834	358,342	44,000	8,800	**97%**
2054-2058	519,983	23,613	553,654	57,284	11,457	**41%**	358,342	23,544	378,849	44,050	8,810	**53%**
2059-2063	553,654	41,867	568,086	56,299	11,260	**74%**	378,849	41,820	379,968	42,939	8,588	**97%**
2064-2068	568,086	28,698	595,653	56,266	11,253	**51%**	379,968	28,643	394,157	42,832	8,566	**67%**
2069-2073	595,653	41,020	609,791	55,157	11,031	**74%**	394,157	40,937	394,895	41,675	8,335	**98%**
2074-2078	609,791	29,068	635,742	55,019	11,004	**53%**	394,895	28,857	407,579	41,541	8,308	**69%**
2079-2083	635,742	25,514	665,434	55,206	11,041	**46%**	407,579	25,478	423,841	41,739	8,348	**61%**
2084-2088	665,434	25,680	695,076	55,321	11,064	**46%**	423,841	25,633	440,102	41,894	8,379	**61%**
2089-2093	695,076	40,929	708,691	54,545	10,909	**75%**	440,102	40,900	440,373	41,171	8,234	**99%**

	Big River All Acres MBF Totals						Big River Unconstrained MBF Totals					
Period	Pre-Harvest Standing	Harvested	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth	Pre-Harvest Standing	Harvest	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth
2094-2098	708,691	39,023	723,283	53,614	10,723	**73%**	440,373	38,987	441,700	40,314	8,063	**97%**
2099-2103	723,283	35,066	741,195	52,978	10,596	**66%**	441,700	34,965	446,498	39,763	7,953	**88%**
2104-2108	741,195	23,856	770,409	53,070	10,614	**45%**	446,498	23,829	462,622	39,953	7,991	**60%**
2109-2113	770,409	38,796	783,834	52,221	10,444	**74%**	462,622	38,737	463,086	39,201	7,840	**99%**

Table 13: Growth and yield/acre over 100 year planning horizon

	Big River MBF/acre Results					
Period	Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres
2011-2013	21.2	19.2	NA	NA	NA	NA
2014-2018	24.5	22.8	7.2	7.3	28.0	25.8
2019-2023	28.0	25.8	9.4	9.7	31.5	28.9
2024-2028	31.5	28.9	10.9	11.5	34.7	31.7
2029-2033	34.7	31.7	8.9	9.3	37.9	34.3
2034-2038	37.9	34.3	9.8	10.1	40.0	35.5
2039-2043	40.0	35.5	10.1	10.4	43.4	38.3
2044-2048	43.4	38.3	9.8	10.5	46.3	40.4
2049-2053	46.3	40.4	10.7	11.1	47.5	40.6
2054-2058	47.5	40.6	9.9	10.8	50.6	42.9
2059-2063	50.6	42.9	12.8	13.4	51.9	43.0
2064-2068	51.9	43.0	11.7	12.8	54.5	44.6
2069-2073	54.5	44.6	11.9	12.5	55.8	44.7
2074-2078	55.8	44.7	11.3	12.6	58.1	46.1
2079-2083	58.1	46.1	12.4	13.6	60.9	48.0
2084-2088	60.9	48.0	12.1	13.7	63.6	49.8
2089-2093	63.6	49.8	14.5	15.7	64.8	49.8
2094-2098	64.8	49.8	13.0	14.2	66.1	50.0
2099-2103	66.1	50.0	13.6	14.6	67.8	50.5
2104-2108	67.8	50.5	12.0	14.0	70.4	52.4

	Big River MBF/acre Results					
Period	**Pre-Harvest Standing (All Acres)**	**Pre-Harvest Standing (Unconstrained Acres)**	**Harvest (All Harvested Acres)**	**Harvest (Unconstrained Acres)**	**Post-Harvest Standing (All Acres)**	**Post-Harvest Standing (Unconstrained Acres**
2109-2113	70.4	52.4	15.1	16.3	71.7	52.4

Table 14: Acres Harvested By Silviculture.

	Big River Silvicultural Acres by Period									
Year	**WLPZ1**	**WLPZ2**	**Standard Selection**	**transition**	**VR40**	**VR60**	**Commercial Thin**	**Conifer Release**	**Rehab**	**Sum**
2014-2018	8	65	2,371	109	0	0	0	0	0	**2,553**
2019-2023	20	90	1,736	55	0	0	0	0	0	**1,901**
2024-2028	26	150	1,781	40	0	0	0	0	0	**1,997**
2029-2033	41	61	2,427	0	0	0	0	0	0	**2,529**
2034-2038	38	122	3,379	0	0	0	0	0	0	**3,538**
2039-2043	8	77	1,988	0	0	0	0	0	0	**2,073**
2044-2048	63	138	2,544	17	0	0	0	0	0	**2,762**
2049-2053	21	122	3,853	15	0	0	0	0	0	**4,010**
2054-2058	46	159	2,183	0	0	0	0	0	0	**2,388**
2059-2063	39	105	3,132	0	0	0	0	0	0	**3,276**
2064-2068	68	159	2,234	0	0	0	0	0	0	**2,461**
2069-2073	45	116	3,287	0	0	0	0	0	0	**3,447**
2074-2078	119	156	2,290	0	0	0	0	0	0	**2,564**
2079-2083	59	124	1,874	0	0	0	0	0	0	**2,058**
2084-2088	80	160	1,876	0	0	0	0	0	0	**2,116**
2089-2093	107	121	2,600	0	0	0	0	0	0	**2,829**
2094-2098	91	159	2,750	0	0	0	0	0	0	**2,999**
2099-2103	56	126	2,400	0	0	0	0	0	0	**2,582**
2104-2108	136	156	1,703	0	0	0	0	0	0	**1,995**
2109-2113	65	124	2,382	0	0	0	0	0	0	**2,571**

8.3 Garcia River Forest

The Garcia River Forest (23,769 acres) is primarily within the Garcia River Watershed, bordered by Mountain View Road on the north and Fish Rock Road on the south. The calculated LTSY for Garcia is 7,175 MBF/year.

Table 15: LTSY Acres

Forest	Total Acres	Class I WLPZ No Harvest	Class I WLPZ Restricted Harvest	Class II WLPZ No Harvest	Class II WLPZ Restricted Harvest	NSO	Oak Woodlands	Grasslands	Ecological Reserve	LTSY Acres
Garcia River	23,769	260	636	303	1,132	1,034	613	369	6,257	13,165

Table 16: Growth and Yield Over 100 Year Planning Horizon.

	Garcia River All Acres MBF Totals						Garcia River Unconstrained MBF Totals					
Period	**Pre-Harvest Standing**	**Harvested**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**	**Pre-Harvest Standing**	**Harvest**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**
2014-2018	252,291	11,304	289,682	48,695	9,739	**23%**	147,904	7,964	168,495	28,555	5,711	**28%**
2019-2023	289,682	13,209	335,546	59,073	11,815	**22%**	168,495	9,232	193,862	34,598	6,920	**27%**
2024-2028	335,546	15,225	389,964	69,643	13,929	**22%**	193,862	10,702	224,045	40,886	8,177	**26%**
2029-2033	389,964	19,140	447,556	76,733	15,347	**25%**	224,045	12,407	257,201	45,563	9,113	**27%**
2034-2038	447,556	19,628	497,450	69,522	13,904	**28%**	257,201	14,382	283,845	41,026	8,205	**35%**
2039-2043	497,450	22,991	543,659	69,199	13,840	**33%**	283,845	16,674	307,886	40,716	8,143	**41%**
2044-2048	543,659	26,512	586,710	69,562	13,912	**38%**	307,886	19,329	329,423	40,865	8,173	**47%**
2049-2053	586,710	28,790	627,447	69,528	13,906	**41%**	329,423	22,408	347,499	40,485	8,097	**55%**
2054-2058	627,447	32,587	664,118	69,258	13,852	**47%**	347,499	25,977	361,483	39,961	7,992	**65%**
2059-2063	664,118	34,227	698,730	68,840	13,768	**50%**	361,483	30,114	370,509	39,140	7,828	**77%**
2064-2068	698,730	36,794	730,068	68,132	13,626	**54%**	370,509	34,911	373,489	37,892	7,578	**92%**
2069-2073	730,068	30,508	767,511	67,950	13,590	**45%**	373,489	29,504	381,093	37,108	7,422	**80%**
2074-2078	767,511	36,988	797,732	67,209	13,442	**55%**	381,093	35,282	381,744	35,934	7,187	**98%**
2079-2083	797,732	35,394	828,864	66,526	13,305	**53%**	381,744	34,481	382,063	34,800	6,960	**99%**
2084-2088	828,864	31,843	863,121	66,099	13,220	**48%**	382,063	31,627	384,349	33,913	6,783	**93%**

Period	Garcia River All Acres MBF Totals						Garcia River Unconstrained MBF Totals					
	Pre-Harvest Standing	Harvested	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth	Pre-Harvest Standing	Harvest	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth
2089-2093	863,121	26,051	902,967	65,897	13,179	**40%**	384,349	25,600	392,136	33,387	6,677	**77%**
2094-2098	902,967	10,910	958,866	66,809	13,362	**16%**	392,136	10,653	415,477	33,994	6,799	**31%**
2099-2103	958,866	7,981	1,018,770	67,885	13,577	**12%**	415,477	7,407	442,918	34,848	6,970	**21%**
2104-2108	1,018,770	11,933	1,075,452	68,615	13,723	**17%**	442,918	11,236	467,088	35,406	7,081	**32%**
2109-2113	1,075,452	11,810	1,132,902	69,260	13,852	**17%**	467,088	11,695	491,269	35,876	7,175	**33%**

Table 17: Growth and yield/acre over 100 year planning horizon

Period	Garcia River MBF/acre Results							
	Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres	Harvest/Year (All Acres)	Harvest/Year (Unconstrained Acres)
2014-2018	11.5	11.4	5.1	6.8	13.2	13.0	2,261	1,593
2019-2023	13.2	13.0	5.8	6.9	15.3	15.0	2,642	1,846
2024-2028	15.3	15.0	6.2	7.7	17.8	17.3	3,045	2,140
2029-2033	17.8	17.3	4.9	8.4	20.4	19.9	3,828	2,481
2034-2038	20.4	19.9	7.0	9.5	22.7	21.9	3,926	2,876
2039-2043	22.7	21.9	7.4	9.2	24.8	23.8	4,598	3,335
2044-2048	24.8	23.8	6.5	9.5	26.7	25.4	5,302	3,866
2049-2053	26.7	25.4	8.6	10.3	28.6	26.8	5,758	4,482
2054-2058	28.6	26.8	9.9	11.8	30.3	27.9	6,517	5,195
2059-2063	30.3	27.9	9.1	13.7	31.8	28.6	6,845	6,023
2064-2068	31.8	28.6	12.0	13.6	33.3	28.8	7,359	6,982
2069-2073	33.3	28.8	11.1	12.7	35.0	29.4	6,102	5,901
2074-2078	35.0	29.4	9.4	12.4	36.4	29.5	7,398	7,056
2079-2083	36.4	29.5	10.9	12.6	37.8	29.5	7,079	6,896

	Garcia River MBF/acre Results							
Period	Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres	Harvest/Year (All Acres)	Harvest/Year (Unconstrained Acres)
2084-2088	37.8	29.5	12.0	13.1	39.3	29.7	6,369	6,325
2089-2093	39.3	29.7	8.9	13.5	41.2	30.3	5,210	5,120
2094-2098	41.2	30.3	10.0	13.8	43.7	32.1	2,182	2,131
2099-2103	43.7	32.1	9.1	15.0	46.4	34.2	1,596	1,481
2104-2108	46.4	34.2	7.0	14.6	49.0	36.1	2,387	2,247
2109-2113	49.0	36.1	5.1	6.3	51.6	37.9	2,362	2,339

Table 18: Acres harvested by silviculture

	Garcia River Silvicultural Acres by Period										
Year	WLPZ1	WLPZ2	Conservation Easement Selection	Standard Selection	transition	VR40	VR60	Commercial Thin	Conifer Release	Rehab	Sum
2014-2018	0	534	516	1,152	22	0	0	0	0	0	**2,224**
2019-2023	0	0	934	1,345	2	0	0	0	0	0	**2,281**
2024-2028	2	73	1,000	1,393	0	0	0	0	0	0	**2,468**
2029-2033	800	604	999	1,483	1	0	0	0	0	0	**3,887**
2034-2038	248	46	1,000	1,508	0	0	0	0	0	0	**2,801**
2039-2043	297	0	1,000	1,817	0	0	0	0	0	0	**3,114**
2044-2048	625	440	1,000	2,041	0	0	0	0	0	0	**4,106**
2049-2053	90	69	1,000	2,172	1	0	0	0	0	0	**3,331**
2054-2058	42	50	1,000	2,196	0	0	0	0	0	0	**3,287**
2059-2063	578	359	622	2,198	0	0	0	0	0	0	**3,757**
2064-2068	127	87	302	2,560	0	0	0	0	0	0	**3,076**
2069-2073	280	9	149	2,293	25	0	0	0	0	0	**2,756**
2074-2078	464	395	243	2,850	0	0	0	0	0	0	**3,952**
2079-2083	340	54	138	2,729	0	0	0	0	0	0	**3,262**

	Garcia River Silvicultural Acres by Period										
Year	**WLPZ1**	**WLPZ2**	**Conservation Easement Selection**	**Standard Selection**	**transition**	**VR40**	**VR60**	**Commercial Thin**	**Conifer Release**	**Rehab**	**Sum**
2084-2088	150	46	36	2,417	0	0	0	0	0	0	**2,650**
2089-2093	622	359	43	1,894	0	0	0	0	0	0	**2,918**
2094-2098	196	88	29	773	0	0	0	0	0	0	**1,086**
2099-2103	306	9	65	493	0	0	0	0	0	0	**873**
2104-2108	473	395	60	768	0	0	0	0	0	0	**1,697**
2109-2113	371	52	7	1,869	0	0	0	0	0	0	**2,298**

8.4 Gualala River Forest

The Gualala River Forest (13,537 acres) is primarily within the Gualala River Watershed, bordered by Fish Rock Road on the north and extending to the Sonoma County line on the south. The calculated LTSY for Gualala is 7,984 MBF/year.

Table 19: LTSY Acres

Forest	Total Acres	Class I WLPZ No Harvest	Class I WLPZ Restricted Harvest	Class II WLPZ No Harvest	Class II WLPZ Restricted Harvest	NSO	Oak Woodlands	Grasslands	LTSY Acres
Gualala River	13,537	119	277	151	779	102	91	115	11,903

Table 20: Growth and Yield Over 100 Year Planning Horizon

	Gualala River All Acres MBF Totals						Gualala River Unconstrained MBF Totals					
Period	**Pre-Harvest Standing**	**Harvested**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**	**Pre-Harvest Standing**	**Harvest**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**
2014-2018	120,074	8,748	147,849	36,523	7,305	**24%**	109,034	7,998	134,372	33,336	6,667	**24%**
2019-2023	147,849	10,000	180,172	42,324	8,465	**24%**	134,372	10,000	162,861	38,489	7,698	**26%**
2024-2028	180,172	13,387	207,530	40,745	8,149	**33%**	162,861	11,999	188,235	37,373	7,475	**32%**
2029-2033	207,530	14,021	243,658	50,148	10,030	**28%**	188,235	13,999	220,217	45,982	9,196	**30%**
2034-2038	243,658	15,718	279,409	51,470	10,294	**31%**	220,217	14,999	252,377	47,158	9,432	**32%**
2039-2043	279,409	16,241	310,912	47,743	9,549	**34%**	252,377	15,990	280,052	43,665	8,733	**37%**
2044-2048	310,912	17,510	341,326	47,925	9,585	**37%**	280,052	16,995	306,987	43,930	8,786	**39%**
2049-2053	341,326	17,983	371,419	48,076	9,615	**37%**	306,987	17,966	333,000	43,979	8,796	**41%**
2054-2058	371,419	19,098	400,372	48,050	9,610	**40%**	333,000	18,989	357,907	43,896	8,779	**43%**

Period	Gualala River All Acres MBF Totals						Gualala River Unconstrained MBF Totals					
	Pre-Harvest Standing	Harvested	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth	Pre-Harvest Standing	Harvest	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth
2059-2063	400,372	19,977	428,415	48,019	9,604	**42%**	357,907	19,963	381,720	43,775	8,755	**46%**
2064-2068	428,415	22,100	454,467	48,152	9,630	**46%**	381,720	21,989	403,602	43,871	8,774	**50%**
2069-2073	454,467	22,971	479,383	47,888	9,578	**48%**	403,602	22,946	424,203	43,548	8,710	**53%**
2074-2078	479,383	24,115	502,621	47,352	9,470	**51%**	424,203	23,984	443,224	43,005	8,601	**56%**
2079-2083	502,621	26,004	523,263	46,646	9,329	**56%**	443,224	25,975	459,510	42,260	8,452	**61%**
2084-2088	523,263	28,097	541,155	45,989	9,198	**61%**	459,510	27,975	473,145	41,611	8,322	**67%**
2089-2093	541,155	30,009	556,379	45,234	9,047	**66%**	473,145	29,982	483,989	40,826	8,165	**73%**
2094-2098	556,379	32,106	568,689	44,416	8,883	**72%**	483,989	31,992	492,021	40,023	8,005	**80%**
2099-2103	568,689	29,405	583,695	44,411	8,882	**66%**	492,021	29,378	502,642	39,999	8,000	**73%**
2104-2108	583,695	18,482	609,783	44,570	8,914	**41%**	502,642	18,376	524,444	40,178	8,036	**46%**
2109-2113	609,783	24,865	629,241	44,323	8,865	**56%**	524,444	24,837	539,526	39,919	7,984	**62%**

Table 21: Growth and yield/acre over 100 year planning horizon

Period	Gualala River MBF/acre Results							
	Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres	Harvest/Year (All Acres)	Harvest/Year (Unconstrained Acres)
2013	8.6	8.6	NA	NA	NA	NA	0	0
2014-2018	9.4	9.4	4.5	4.9	11.6	11.6	1,750	1,600
2019-2023	11.6	11.6	5.4	5.4	14.2	14.1	2,000	2,000
2024-2028	14.2	14.1	5.3	6.3	16.3	16.2	2,677	2,400
2029-2033	16.3	16.2	6.4	6.6	19.1	19.0	2,804	2,800
2034-2038	19.1	19.0	6.5	8.3	21.9	21.8	3,144	3,000
2039-2043	21.9	21.8	7.9	8.4	24.4	24.2	3,248	3,198
2044-2048	24.4	24.2	6.9	8.9	26.8	26.5	3,502	3,399
2049-2053	26.8	26.5	8.8	9.6	29.2	28.7	3,597	3,593
2054-2058	29.2	28.7	8.2	11.0	31.4	30.9	3,820	3,798

Period	Gualala River MBF/acre Results Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres	Harvest/Year (All Acres)	Harvest/Year (Unconstrained Acres)
2059-2063	31.4	30.9	11.3	12.3	33.6	33.0	3,995	3,993
2064-2068	33.6	33.0	11.1	16.0	35.7	34.8	4,420	4,398
2069-2073	35.7	34.8	13.2	14.5	37.6	36.6	4,594	4,589
2074-2078	37.6	36.6	10.0	13.5	39.5	38.3	4,823	4,797
2079-2083	39.5	38.3	13.1	14.2	41.1	39.7	5,201	5,195
2084-2088	41.1	39.7	11.9	16.1	42.5	40.8	5,619	5,595
2089-2093	42.5	40.8	15.4	16.7	43.7	41.8	6,002	5,996
2094-2098	43.7	41.8	13.4	18.1	44.7	42.5	6,421	6,398
2099-2103	44.7	42.5	21.9	24.8	45.8	43.4	5,881	5,876
2104-2108	45.8	43.4	10.9	17.4	47.9	45.3	3,696	3,675
2109-2113	47.9	45.3	16.2	18.0	49.4	46.6	4,973	4,967

Table 22: Acres harvested by silviculture

Year	Gualala River Silvicultural Acres by Period WLPZ1	WLPZ2	Standard selection	transition	VR40	VR60	Commercial Thinning	Conifer Release	Rehab	Sum
2014-2018	15	290	892	743	0	0	0	0	0	**1,940**
2019-2023	0	0	1,834	1	0	0	0	0	0	**1,835**
2024-2028	142	470	1,913	0	0	0	0	0	0	**2,525**
2029-2033	78	4	2,107	3	0	0	0	0	0	**2,192**
2034-2038	204	421	1,808	2	0	0	0	0	0	**2,435**
2039-2043	90	52	1,910	0	0	0	0	0	0	**2,052**
2044-2048	218	400	1,904	0	0	0	0	0	0	**2,522**
2049-2053	95	61	1,881	0	0	0	0	0	0	**2,037**
2054-2058	189	412	1,729	0	0	0	0	0	0	**2,330**
2059-2063	86	62	1,617	0	0	0	0	0	0	**1,764**
2064-2068	204	412	1,374	0	0	0	0	0	0	**1,990**
2069-2073	95	62	1,582	0	0	0	0	0	0	**1,738**

	Gualala River Silvicultural Acres by Period									
Year	**WLPZ1**	**WLPZ2**	**Standard selection**	**transition**	**VR40**	**VR60**	**Commercial Thinning**	**Conifer Release**	**Rehab**	**Sum**
2074-2078	218	412	1,771	0	0	0	0	0	0	**2,401**
2079-2083	97	62	1,828	0	0	0	0	0	0	**1,986**
2084-2088	219	412	1,734	0	0	0	0	0	0	**2,366**
2089-2093	97	62	1,794	0	0	0	0	0	0	**1,953**
2094-2098	221	412	1,769	0	0	0	0	0	0	**2,402**
2099-2103	97	62	1,184	0	0	0	0	0	0	**1,342**
2104-2108	221	412	1,056	0	0	0	0	0	0	**1,689**
2109-2113	97	62	1,377	0	0	0	0	0	0	**1,535**

8.5 Cumulative LTSY

The Calculated LTSY for The Conservation Fund Mendocino County Ownership is 25,766 MBF/year

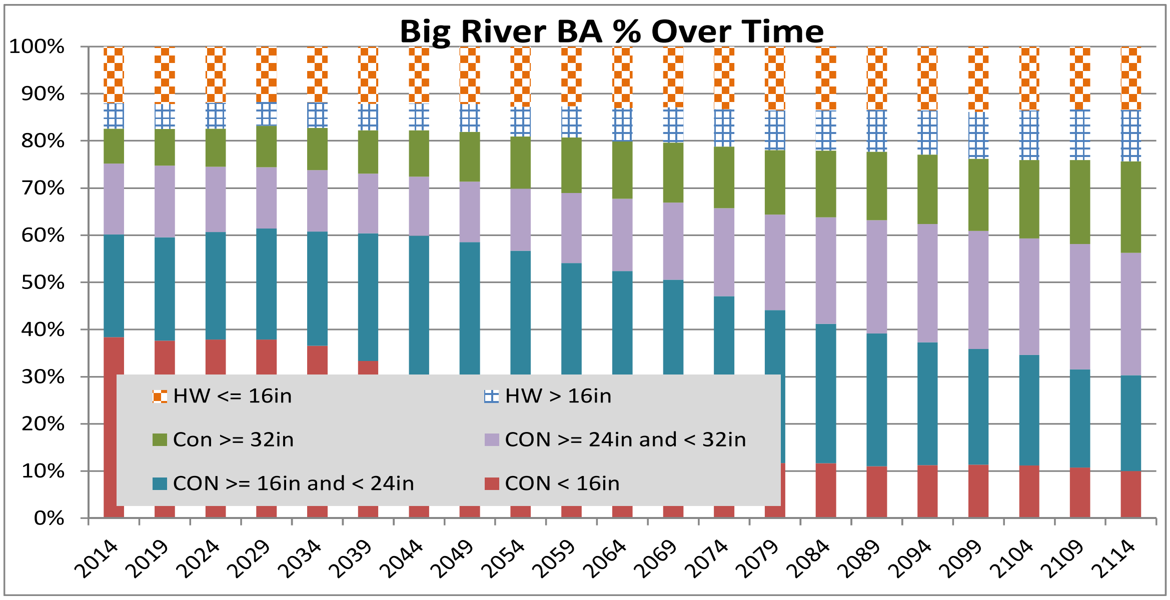
Table 23: Cumulative LTSY for all tracts combined.

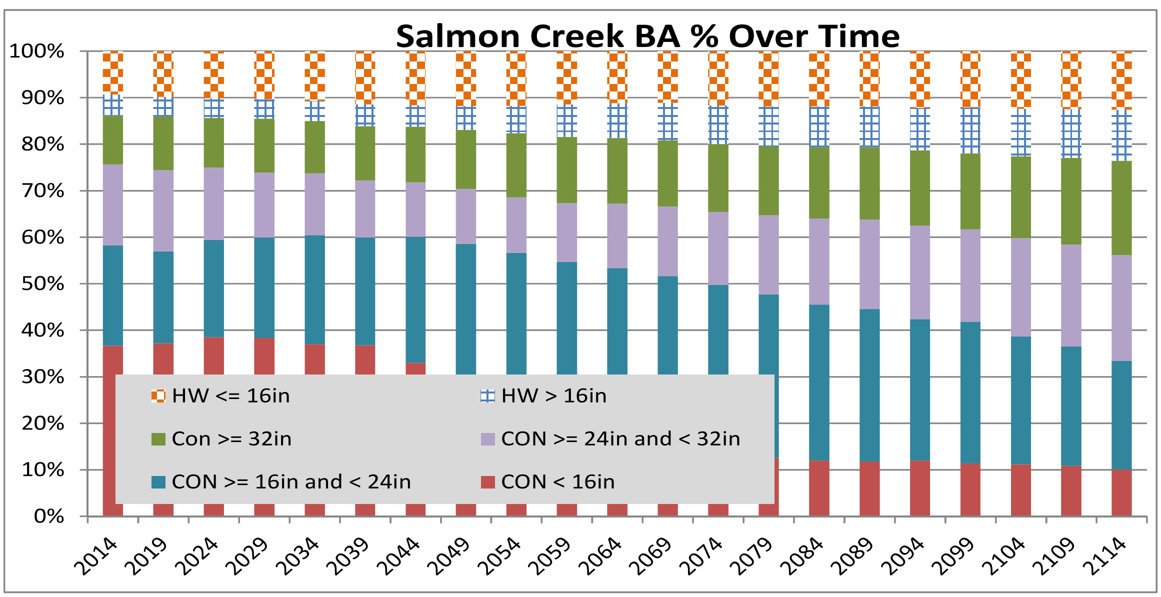
All Tracts All Acres MBF Totals							All Tracts Unconstrained MBF Totals					
Period	Pre-Harvest Standing	Harvested	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth	Pre-Harvest Standing	Harvest	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth
2014-2018	774,183	46,610	891,611	164,038	32,808	28	539,924	41,695	621,018	122,789	24,558	34
2019-2023	891,611	49,690	1,022,655	180,734	36,147	27	621,018	44,916	710,280	134,178	26,836	33
2024-2028	1,022,655	59,793	1,152,076	189,214	37,843	32	710,280	52,506	796,534	138,759	27,752	38
2029-2033	1,152,076	65,430	1,293,630	206,984	41,397	32	796,534	58,530	890,686	152,682	30,536	38
2034-2038	1,293,630	83,898	1,410,179	200,447	40,089	42	890,686	77,633	961,193	148,141	29,628	52
2039-2043	1,410,179	66,496	1,541,677	197,994	39,599	34	961,193	59,710	1,046,978	145,495	29,099	41
2044-2048	1,541,677	82,132	1,658,217	198,672	39,734	41	1,046,978	74,223	1,118,431	145,676	29,135	51
2049-2053	1,658,217	103,759	1,751,442	196,984	39,397	53	1,118,431	97,147	1,164,538	143,254	28,651	68
2054-2058	1,751,442	85,898	1,862,400	196,855	39,371	44	1,164,538	79,061	1,228,070	142,593	28,519	55
2059-2063	1,862,400	104,754	1,953,260	195,615	39,123	54	1,228,070	100,506	1,268,249	140,685	28,137	71
2064-2068	1,953,260	96,704	2,051,592	195,036	39,007	50	1,268,249	94,608	1,313,090	139,449	27,890	68
2069-2073	2,051,592	108,487	2,136,251	193,145	38,629	56	1,313,090	107,372	1,342,565	136,847	27,369	78
2074-2078	2,136,251	103,211	2,224,486	191,447	38,289	54	1,342,565	101,137	1,376,163	134,736	26,947	75
2079-2083	2,224,486	93,726	2,321,193	190,434	38,087	49	1,376,163	92,745	1,416,695	133,276	26,655	70

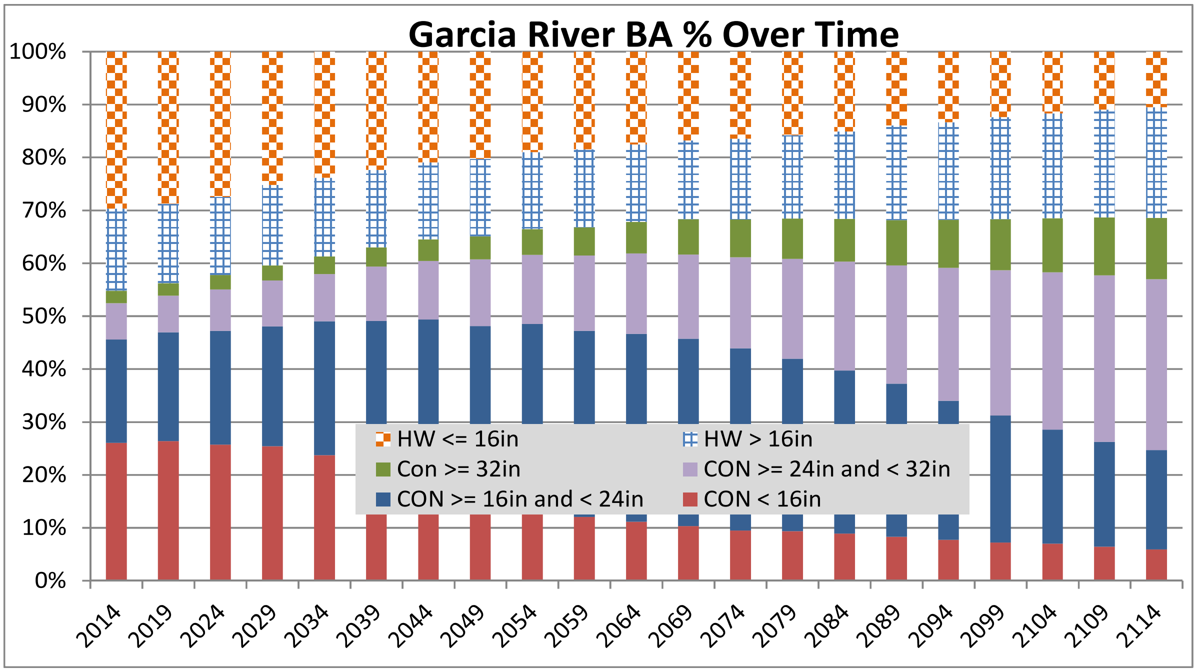
All Tracts All Acres MBF Totals							All Tracts Unconstrained MBF Totals					
Period	Pre-Harvest Standing	Harvested	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth	Pre-Harvest Standing	Harvest	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth
2084-2088	2,321,193	90,702	2,420,232	189,741	37,948	48	1,416,695	90,219	1,458,702	132,227	26,445	68
2089-2093	2,420,232	110,974	2,496,923	187,666	37,533	59	1,458,702	110,457	1,478,150	129,905	25,981	85
2094-2098	2,496,923	96,112	2,587,451	186,639	37,328	51	1,478,150	95,620	1,511,263	128,732	25,746	74
2099-2103	2,587,451	86,148	2,688,036	186,733	37,347	46	1,511,263	85,442	1,554,549	128,728	25,746	66
2104-2108	2,688,036	66,226	2,809,236	187,426	37,485	35	1,554,549	65,370	1,618,619	129,440	25,888	51
2109-2113	2,809,236	85,951	2,910,119	186,834	37,367	46	1,618,619	85,748	1,661,700	128,829	25,766	67

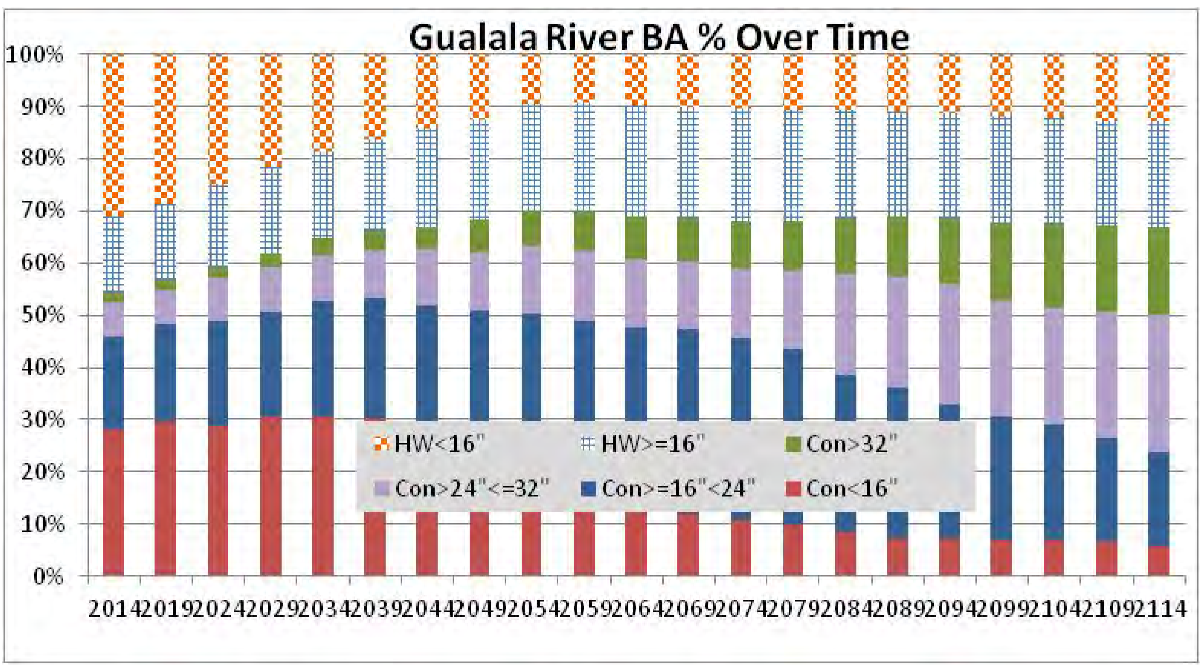
The following tables show the change in diameter class distribution over time for the unconstrained acres on Big River and Salmon Creek, in particular the increase in large conifers.

Table 23: Change in BA distribution over time






Garcia River BA % Over Time
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
HW <= 16in
HW > 16in
Con >= 32in
CON >= 24in and < 32in
CON >= 16in and < 24in
CON < 16in
2014
2019
2024
2029
2034
2039
2044
2049
2054
2059
2064
2069
2074
2079
2084
2089
2094
2099
2104
2109
2114


Gualala River BA % Over Time
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
HW<16"
HW>=16"
Con>32"
Con>24"<=32"
Con>=16"<24"
Con<16"
2014
2019
2024
2029
2034
2039
2044
2049
2054
2059
2064
2069
2074
2079
2084
2089
2094
2099
2104
2109
2114

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9 Appendices

- **Appendix A:** BRSC Forest Stratification
- **Appendix B:** Garcia River and Gualala River Forest Stratification
- **Appendix C:** Modeling Plan
- **Appendix D:** Inventory Collection Summary
- **Appendix E:** Property Maps

Appendix A: Big River and Salmon Creek Forest Stratification

1. 2011 Remote Sensing Data

In August 2011, GeoDigital flew the Big River and Salmon Creek Forests to acquire high-resolution color-infrared (CIR) imagery as well as LiDAR (Light Detection and Ranging) data. The CIR data was acquired at .5m^2 resolution. The LiDAR data was collected with at least 5 points per square meter. The LiDAR data was used to generate a 1 m^2 resolution Digital Elevation Map (DEM) and Canopy Height Model (CHM).

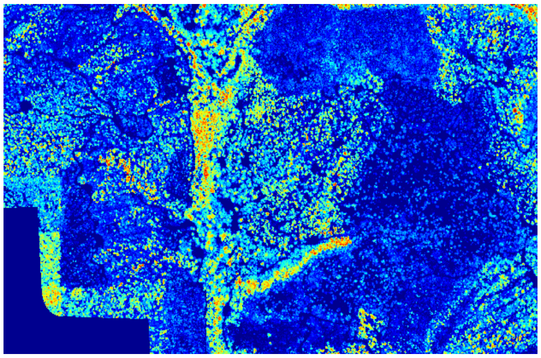
2. 2012 Stand Delineation and Stratification Method

A new stand layer was created for the Big River and Salmon Creek Forests using the LiDAR and CIR remote sensing data. The stand delineations are based on the CHM but several processing steps are required before stands of the appropriate size are made. The basic outline of the steps required to create the new stand layer is:

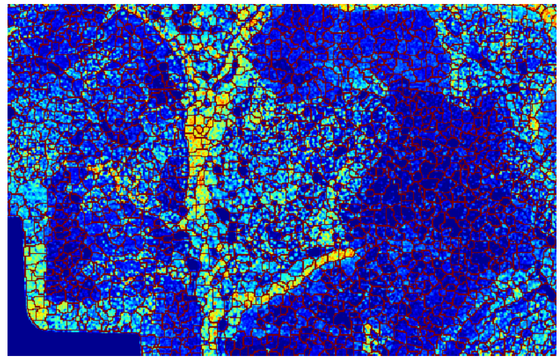
Create micro stands less than 1 acre by identifying timber with similar height and density attributes. (Figure a)
Merge micro stands by combining micro stands with similar attributes that are adjacent to one another. There is some tolerance built into the merging routine which allows dissimilar stands to be merged together to form stands which meet the minimum acreage criteria desired. (Figure b)
Once the microstand polygons were created, each polygon was placed into a strata based on 3 criteria. Polygons were classified based on the percent crown cover of canopy over 25 feet tall, the mean of the maximum heights found within tree crowns (i.e. – mean tree height), and the variability of the height of the trees within the stand polygon. The table below details the stratification system. All metrics are calculated on trees greater than or equal to 25 feet tall. A summary of the stratification can be seen below in table 4.[2]

[2] See Golinkoff, J. S. 2013. Area Dependent Region Merging: A Novel, User-Customizable Method to Create Forest Stands and Strata. European Journal of Remote Sensing 46:511–533.

a) Original CHM (1m^2 resolution)



b) Final Watershed Microstand over CHM



c) Final Stand Delineation over CHM

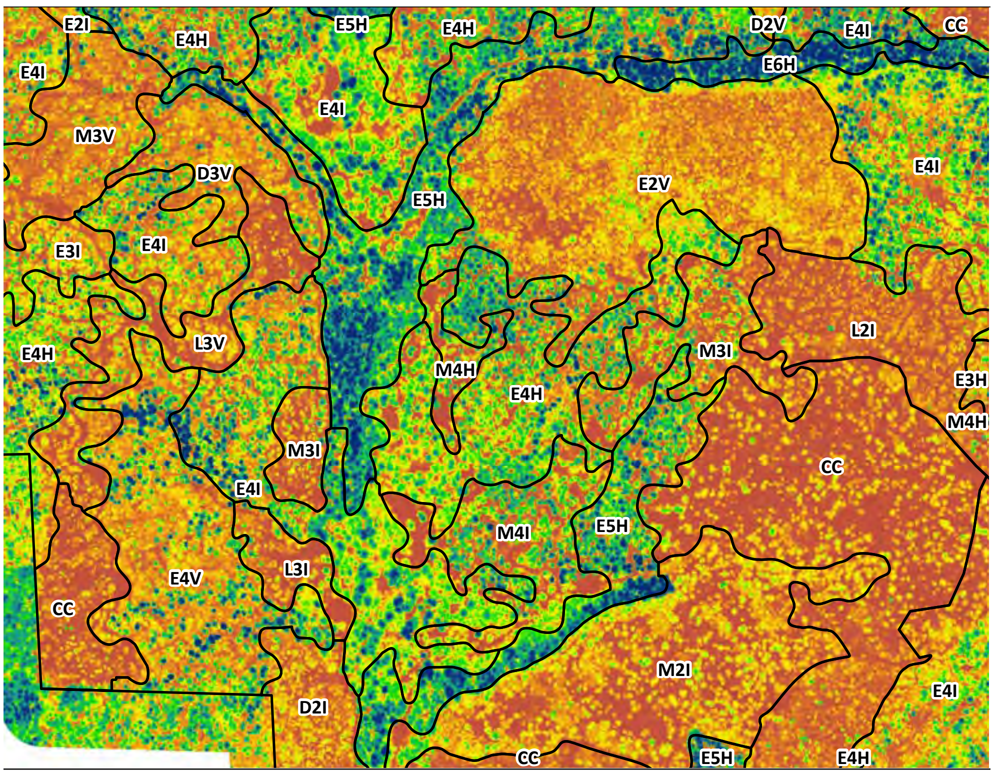


Table 1: Big River / Salmon Creek Statification Categories

Category	Class Names	Class Breaks
Percent Canopy Cover over 25ft	O (Open) L (Low) M (Medium) D (Dense) E (Extremely Dense)	20% canopy cover bins where % cover is defined as crown elements above 25ft
Mean Tree Height	1, 2, 3, 4, 5, 6, 7	25 foot height bins of mean tree heights

Tree Height Variability (Coefficient of Variation of Tree Height)	H (Homogeneous) I (Intermediate) V (Variable)	Homogeneous stands are any stand with CV < .23 Intermediate: .24< CV < .33 Variable: CV > .34

Table 2: Big River / Salmon Creek Stratification Results.

Strata	Sampled Area	Total Acres	Sampled Stands	Total Stands	Plots	Area Weight
CC	210	1,301	9	59	36	0.0876
D2H	68	93	2	5	8	0.0063
D2I	626	803	4	12	44	0.0541
D2V	65	148	2	5	9	0.0100
D3H	78	239	2	9	8	0.0161
D3I	316	476	5	14	35	0.0321
D3V	35	142	2	10	8	0.0096
D4H	82	209	1	8	9	0.0141
D4I	17	45	1	2	4	0.0031
D4V	13	13	1	1	4	0.0009
D5H	3	30	1	3	4	0.0021
E2H	83	192	3	9	15	0.0129
E2I	297	880	4	19	36	0.0592
E2V	62	120	2	5	9	0.0081
E3H	864	1,381	6	30	44	0.0930
E3I	883	2,303	8	45	75	0.1551
E3V	177	365	4	12	20	0.0246
E4H	446	1,186	6	43	51	0.0799
E4I	307	1,355	5	55	32	0.0912
E4V	20	86	2	5	8	0.0058
E5H	135	504	4	34	26	0.0339
E5I	115	182	3	9	15	0.0123
E5V	4	16	1	2	4	0.0011
E6H	85	197	3	12	16	0.0133
E6I	17	17	1	1	4	0.0012
E7H	5	16	1	2	4	0.0011
ES12	189	189	1	1	22	0.0127
L2H	54	111	2	9	8	0.0075
L2I	145	378	4	17	18	0.0255
L2V	71	143	1	3	8	0.0096
L3H	8	47	1	6	4	0.0032
L3I	28	162	2	13	8	0.0109
L3V	55	89	2	5	9	0.0060
L4H	9	21	1	2	4	0.0014
L4I	47	50	2	3	8	0.0033
LP12	121	121	1	1	10	0.0081
M2H	49	76	1	3	5	0.0051
M2I	55	97	2	3	8	0.0065

M2V	116	217	2	6	15	0.0146
M3H	12	42	1	3	4	0.0028
M3I	121	249	3	12	18	0.0168
M3V	38	49	2	3	12	0.0033
M4H	21	74	1	7	4	0.0050
M4I	19	63	1	4	8	0.0043
M4V	2	2	1	1	4	0.0001
PC12	372	372	1	1	41	0.0250

3. Inventory Design and Methodology Details

The 2012 Big River and Salmon Creek (BRSC) inventory used a multi-stage probability proportional to size sample.[3] The cruise was completed in the June, 2012. There were 43 forested strata sampled using a total of 677 plots. The sampled stands were randomly selected with replacement with probability proportional to their area. All plots were installed on a 5 by 5 chain grid. Stands that were selected more than once had plots installed on grids that were offset by 2.5 chains. Sampled stands received 1 plot per 10 acres with all stands getting at least 4 and at most 8 plots per random selection. If a sampled stand was selected more than once, this same sampling intensity was used.

The 2012 inventory plots used exactly the same design as in past cruises. A basal area factor (BAF) prism was established in each stand to select 5 to 10 trees per plot greater than 5.5 inches DBH. Trees less than 5.5in DBH were measured in a 1/100 acre regeneration plot. Standing dead trees and snags were measured if they were counted in the variable radius prism plot. Old growth stumps were measured in 1/10th acre fixed area plots. Down dead material was measured using two 50ft long transects.

The 2012 BRSC inventory proceeded in 2 stages. In the first stage, the first randomly selected stand within each stratum was sampled. Based on this first stage, the coefficient of variation of all strata was used to estimate the number of plots needed in the second stage. There were 231 plots sampled in the first stage and 446 plots sampled in the second stage.

4. Post-Harvest Cruising

Areas subject to timber harvest or other disturbance such as fire or insect attack are inventoried each year utilizing the cruise specifications and design mentioned here. THP areas are delineated as new stands with new, unique strata calls. Each new stratum was then cruised using a systematic 10 by 10 chain grid with a random start. In this way, the inventory is updated with new strata and plot data information and the inventory recalculated to reflect yearly harvests.

[3] See Borders, B. E., B. D. Shiver, and M. L. Clutter. 2005. Tmber Inventory of Large Acreages Using Stratified Two-Stage List Sampling. Southern Journal of Applied Forestry 29:152–157.
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Appendix B: Garcia and Gualala Forest Stratification

The following sections describe the stand delineation process and sampling design for the Garcia River and Gualala River Forests. The sampling design used LiDAR and high-resolution color infrared imagery to create a cell based stratified inventory. These initial cells were then combined to create forest management units. This is similar in concept to the mirostand combination process described for Big River and Salmon Creek (BR/SC) except that cells size was predefined. The process described below is the precursor to the BR/SC stratification process.

1. 2010 Garcia River Forest Stratification and Sampling Design

A full-property wide inventory of the GRF was completed in 2010 using a pixel-based (cell) stratification. This inventory broke the GRF into 1 square chain (1/10 acre) grid cells and used high-resolution color-infrared and LIDAR data collected in 2009 to characterize each cell. The 2009 remote sensing data, correlated with 199 new inventory plots, was used to create a set of strata across the property that optimally partition the variability of conditions found in the forest. The 199 plots were then supplemented with 611 plots and all of these 810 plots were used to describe the forest conditions across the GRF.

The 2010 inventory classified each cell into a forest stratum. There were 43 different strata identified as a result of this methodology and each stratum had about 20 plots measured in it. Plots were randomly placed within strata with the number of plots allocated in each strata based on the variability of the strata. The plot data collected across the property was compiled and expanded into cells that had not been inventoried (similar to how a traditional stand-based stratified forest inventory works). Using the plot data paired with the remote sensing data, forest attributes for any individual cell or any region within the ownership can be estimated and used for management purposes. [4]

The 2010 inventory used a simple stratified random sample. Plots were randomly located within each strata and were not located on a grid. All plots were cruised using a 20 Basal Area Factor (BAF) prism for trees larger than 5.5 inches DBH. Regeneration was measured in 1/100th acre plots.

2. 2014 Gualala River Forest Stratification and Sampling Design

A full-property wide inventory of the Gualala River Forest was completed in 2014 using a pixel-based (cell) stratification. This inventory broke the Gualala Forest into 1/2 acre grid cells and used the high-resolution color-infrared and LIDAR data to characterize/stratify each cell. A total of 339 plots were installed on the property.

3. 2013 Stand Delineation

Using the remote sensing data, the individual cells were combined into forest management units using the same approach as was described in Appendix A for the Big River and Salmon Creek forests. Forest inventory data was assigned to the stands by using the tree lists from the cell based inventory data. In this way, each stand received a unique tree list based on recent inventory data. These stands

[4] See Golinkoff, J., M. Hanus, and J. Carah. 2011. The use of airborne laser scanning to develop a pixel-based stratification for a verified carbon offset project. Carbon Balance and Management 6:9.

were all classified based on the remote sensing data and assigned strata calls using the same method as was used on the BRSC property. The same strata categories as were used on the Big River and Salmon Creek Forests were used for the Garcia and Gualala forest (see table above).

4. Results

The 2010 sample of the GRF used 43 strata (42 forested and 1 non-forest) across the property. Each strata is at least 10 acres in size composed of at least 100 cells of similar characteristics recognized in the remote sensing data. The final sample had better than 10% accuracy at the 90% confidence level. The 2013 stand delineation using this data resulted in 870 stands that averaged about 25 acres per stand.

5. Post-Harvest Cruising

Areas subject to timber harvest or other disturbance such as fire or insect attack are inventoried each year utilizing the cruise specifications mentioned above. THP areas are delineated as new stands with new, unique strata calls. Each new stratum is then cruised using a systematic 10 by 10 chain or 5 by 5 chain grid with a random start such that at least 4 plots per stand are installed and there are on average 1 plot per every 10 acres. In this way, the inventory is updated with new strata and plot data information and the inventory recalculated to reflect yearly disturbance.

Appendix C: Modeling Plan

The FORSEE (4C) growth and simulation model was used to project changes in forest conditions over time. 4C was developed by the California Growth and Yield Model Cooperative and runs the CRYPTOS model developed by the Cooperative Redwood Yield Project Timber Output Simulator. 4C grows each tree in a tree list based on the tree species, crown canopy and competition, as well as the site conditions in each stand. This model also accounts for tree mortality over time and forest regeneration after disturbance. Growth estimates of the forest include user provided assumptions on regeneration after harvest. Harvest is simulated in the model based upon user defined harvest routines. TCF has developed a set of stand level targets and constraints that guide the choice of silviculture and timing of harvests within each stand. As a result of this, 4C will only initiate harvest provided that the set of management constraints are met for each individual stand. All stands have minimum BA removal constraints to control entry and minimum residual stocking constraints to control final stand conditions. Subsequent entries into the same stand cannot occur until the stand has increased in BA sufficiently to allow for another harvest. This ensures long term site occupancy and a continual increase in standing inventory.

Before modeling the management activities on in a given area, an accurate representation of the size of buffers based on the laws governing forest management is needed. The California Forest Practice Rules define the buffer area (linear distance from objects) requirements in terms of silvicultural limitations, which may be based on retention standards defined by either basal area or canopy cover retention, or disallowing any harvest. The CA FPR mandates that streams, certain rare and endangered species, and areas that are highly sensitive to erosion be buffered so as to reduce the potential impact of forest management activities on riparian areas and sensitive species. These areas constrain harvest and are mapped in GIS to capture the stands constrained from harvest by other forest resources.

1. Management Buffers

The first calculation applied to the gross property acreage is to remove non-forest areas. This involves removing rock pits, bare ground, grassland, and shrub-land areas that do not support forest. The next step is to remove all road surfaces from the forest land area using an 18 foot linear buffer on each side of all mapped truck roads. The forest area is then the basis for all future modeling steps.

1.1. No Harvest Area

No harvest areas are defined in the California Forest Practice Rules (CA FPR) for certain sensitive species and to provide watershed protection for anadromous fisheries. The primary species of concern which have mandated protection zones in the coastal northern California region are Northern Spotted Owls (14 CCR 919.9) and Coho Salmon (14 CCR 916). The forest non-harvestable area is calculated next by removing non-harvestable Northern Spotted Owl (NSO) areas, non-harvestable stream areas.

1.2. Constrained Harvest Area

Some degree of harvesting is allowed outside of the inner stream zones according to the CA FPR. The CA FPR requires that class 1 watercourses have a 30 ft inner no harvest area but allowed limited harvest to occur in an outer 70 foot buffer area on class 1 and large class 2 streams. Similarly, no harvest is allowed within an inner 15 foot area on class 2 streams but limited harvest is allowed in an outer buffer area. For a standard class II an outer buffer of 60 feet on average was used to capture the variable width allowed by the FPR's. Class 1 and large class 2 streams (WLPZ1) require that harvest within the constrained area retain at least 80% canopy cover and the largest 13 trees per acre (TPA). Class 2 streams (WLPZ2) require that at least 50% canopy cover is retained at all times. These two separate classes of constrained acres (WLPZ1 and WLPZ2) were then modeled and tracked separately for the full 100 year assessment period.

The tables below summarize the acres of constrained areas for each forest.

Table 1: Watercourse Buffers

WLPZ Management Buffers				
Salmon Creek Forest		Acres		
Forest Management Consideration	**Description**	**No Harvest**	**High Retention Selection**	**Medium Retention Selection**
Class I stream Buffer	*Management buffers along fish-bearing watercourses and watercourses used for domestic water supply.* TCF 's management plan requires a 50 foot no harvest buffer and an additional 50 foot buffer in which 80% of the overstory canopy is retained. For Modeling; Stream Buffers are measured from the centerline of the mapped Cass I watercourse or from the watercourse or lake transition zone (WLTZ) if it is discernible on the map layer, per CCR 916.9.	124	123	NA
Large Class II Watercourse Buffers	*Watercourses that support non- fish aquatic life with a watershed area equal to 100 acres or mapped on a current USGS quad as a blue line stream.* The FPR require a 30 foot no harvest buffer and an additional 70 foot buffer in which 80% of the overstory is retained per 916.9. Stream buffers are measured from the centerline of the mapped Cass II watercourse	20	50	NA
Standard Class II stream buffer	*Small class II watercourses that support aquatic life that are non-fish-bearing and have watershed area less than 100 acres in size.* The FPR require a variable buffer width depending on side slope. TCF has determined that the average buffer width implemented on Salmon Creek is a 15 foot no harvest buffer and an additional 60 foot buffer in which 50% of the overstory canopy is retained. The actual buffer widths implemented in the field will vary based on stream side slopes.	46	NA	188

Big River Forest		Acres		
Forest Management Consideration	**Description**	**No Harvest**	**High Retention Selection**	**Medium Retention Selection**
Class I stream Buffer	*Management buffers along fish-bearing watercourses and watercourses used for domestic water supply.* TCF 's management plan requires a 50 foot no harvest buffer and an additional 50 foot buffer in which 80% of the overstory canopy is retained. For Modeling; Stream Buffers are measured from the centerline of the mapped Cass I watercourse or from the watercourse or lake transition zone (WLTZ) if it is discernible on the map layer, per CCR 916.9.	295	289	NA
Class I flood zone	*Management buffers along fish-bearing watercourses and watercourses used for domestic water supply in unconfined class I channels*. For Modeling the Option A TCF delineated the flood prone zone from a digital elevation model developed from LiDAR imagery.	NA	131	NA
Large Class II Watercourse Buffers	*Watercourses that support non- fish aquatic life with a watershed area equal to 100 acres or mapped on a current USGS quad as a blue line stream.* The FPR require a 30 foot no harvest buffer and an additional 70 foot buffer in which 80% of the overstory is retained per 916.9. Stream buffers are measured from the centerline of the mapped Cass II watercourse	60	151	NA
Standard Class II stream buffer	*Small class II watercourses that support aquatic life that are non-fish-bearing and have watershed area less than 100 acres in size.* The FPR require a variable buffer width depending on side slope. TCF has determined that the average buffer width implemented on Big River is a 15 foot no harvest buffer and an additional 60 foot buffer in which 50% of the overstory canopy is retained. The actual buffer widths implemented in the field will vary based on stream side slopes.	81	NA	336

Gualala River Forest		Acres		
Forest Management Consideration	**Description**	**No Harvest**	**High Retention Selection**	**Medium Retention Selection**
Class I stream Buffer - including main stem	*Management buffers along fish-bearing watercourses and watercourses used for domestic water supply*. The FPR require a 30 foot no harvest buffer and an additional 70 foot buffer in which 80% of the overstory canopy is retained. For Modeling; Stream Buffers are measured from the centerline of the mapped Cass I watercourse or from the watercourse or lake transition zone (WLTZ) if it is discernible on the map layer, per CCR 916.9.	119	277	NA
Large Class II Watercourse Buffers	*Watercourses that support non- fish aquatic life with a watershed area that is equal to 100 acres or more or is mapped on a current USGS quad as a blue line stream*. The FPR require a 30 foot no harvest buffer and an additional 70 foot buffer in which 80% of the overstory canopy is retained. Stream Buffers are measured from the centerline of the mapped Cass I watercourse or per CCR 916.9.	27	68	NA
Standard Class II stream buffer	*Small class II watercourses that support aquatic life that are non-fish-bearing and have watershed area less than 100 acres in size.* The FPR require a variable buffer width depending on side slope. TCF has determined that the average buffer width implemented on the Gualala River Forest is a 15 foot no harvest buffer and an additional 60 foot buffer in which 50% of the overstory canopy is retained. The actual buffer widths implemented in the field will vary based on stream side slopes.	124	NA	502

	Garcia River Forest			
Forest Management Consideration	**Description**	**No Harvest**	**High Retention Selection**	**Medium Retention Selection**
Class I stream	*Management buffers along fish-bearing watercourses and watercourses used for domestic water supply*. The FPR require a 30 foot no harvest buffer adjacent to Class I streams and an additional 70 foot buffer in which 80% of the overstory canopy is retained. The Garcia Forest Management requires an additional 100' RMZ adjacent to class I stream zones and an addition 200' RMZ adjacent to the mainstem Garcia River. For Modeling; Stream Buffers are measured from the centerline of the mapped Cass I watercourse or from the watercourse or lake transition zone (WLTZ) if it is discernible on the map layer, per CCR 916.9. The RMZ' are modeled with the ER Selection silviculture.	260	602	NA
Class I flood zone	*Management buffers along fish-bearing watercourses and watercourses used for domestic water supply in unconfined class I channels*. For Modeling the Option A TCF delineated the flood prone zone from a digital elevation model developed from LiDAR imagery	NA	35	NA
Large Class II Watercourse	*Watercourses that support non- fish aquatic life with a watershed area that is equal to 100 acres or more or is mapped on a current USGS quad as a blue line stream*. The FPR require a 30 foot no harvest buffer and an additional 70 foot buffer in which 80% of the overstory canopy is retained. Stream Buffers are measured from the centerline of the mapped Cass I watercourse or per CCR 916.9.	66	166	NA
Standard Class II stream	*Description: Small class II watercourses that support aquatic life that are non-fish-bearing and have watershed area less than 100 acres in size*. TCF's management plan requires a 25 foot no harvest buffer and an additional buffer of 50 feet in which 50% of the overstory canopy shall remain after harvest. The actual buffer widths implemented in the field will vary based on stream side slopes.	237	NA	966

Table 2 Non Timber Resources

Non Timber Resources		Acres			
Resource	**Description**	**Big River**	**Salmon Creek**	**Gualala River**	**Garcia River**
Northern Spotted Owl	Northern Spotted Owl habitat retention and maintenance is required wherever a valid NSO activity center is known to occur. Protection measures consist of maintaining a 100 acre core habitat area as well as 200 acres of nesting and roosting habitat within .7 miles of the activity center. This table shows core habitat acres only.	7 Territories 870 acres	7 Territories 731 acres	1 Territory 102 acres	9 Territories 1,034 acres
Pygmy Forest	Pygmy forests are rare and unique ecosystems that exist close to the Pacific Ocean shore. There are many rare plants which are found only in these vegetation communities, including dwarfed pines (bolander pine). No harvest will occur in the pygmy forest. The pygmy forest occurs only on TCF's Salmon Creek Forest.	0	7	0	0
Oak Woodlands	Description: Forested areas consisting largely of true oaks.	0	0	91	613
Grasslands	Description: Areas dominated by grass either native or converted	0	0	115	369

Table 3: Conservation Easements

Conservation Easement		Acres	
Forest	**Description**	**No Harvest**	**High or Moderate Retention Selection Harvest**
Big River	The Big River Conservation Easement extends from the northwest corner to the southwest corner for the property and extends from the western property line east for approximately 300 feet parallel to the property line and adjacent to The Mendocino Headlands State Park. No Harvest is allowed with the Easement area, the remainder of the property is restricted from development or conversion by a recorded Offer to Dedicate, allowed uses include wildlife management, sustainable timber harvesting, recreation and education.	113	NA
Salmon Creek	The property is restricted from development or conversion by a recorded Offer to Dedicate; allowed uses include wildlife management, sustainable timber harvesting, recreation and education.	NA	NA
Gualala River	The property is restricted from development or conversion by a recorded conservation easement; allowed uses include wildlife management, sustainable timber harvesting, recreation and education.	NA	NA
Garcia River	Approximately one third of the forest is within The Ecological Reserve which is dedicated to the development of late seral stage forest. The remainder of the property is restricted from development or conversion by a recorded conservation easement; allowed uses include wildlife management, sustainable timber harvesting, recreation and education.	NA	8,321

2. Tree List Inputs

A tree list for each cruised stand was generated by combining the plots measured in each cruised stand of similar strata and expanding the plot estimates to per acre values. Uncruised stands were given the tree list of the averaged cruised stands in the same strata. All stands' tree lists were the basis for all future growth and yield modeling.

3. Regeneration Assumptions

The FORESEE model only applies regeneration after harvest events. The regeneration tree counts are defined as the number of viable trees surviving to at least five years after the harvest event.

Table 4: Regeneration by harvest type.

Prescription	Description	Conifer Regen (TPA)	HW Regen (TPA)
Single Tree Selection	Natural regeneration only	25	10
Transition	Natural regeneration only	50	10
Variable retention 40	Natural regeneration and planted seedlings are used for this treatment.	270	10
Commercial Thin	Natural regeneration only.	30	10
Rehabilitation	Natural regeneration and planted seedlings are used for this treatment.	270	10

4. Management Description

The forest model considers four distinct management areas when modeling forest growth and yield. As described in the management buffer section above, the modeling separately projects no-harvest forest areas, class 1 and large class 2 (WLPZ1) forest areas, class 2 forest areas (WLPZ2), and unconstrained forest areas. The management of unconstrained areas uses primarily uneven-aged forest management approaches to harvest timber. The growth and yield modeling is done using 5 year planning periods and stand re-entry occurs no more frequently than once every 10 years for site class I and II and 15 years for site class III and IV.

The Garcia River Forest Reserve Area is designated for the development of a late seral stage forest. Therefore silviculture has been restricted to long rotation thin from below harvesting. The model uses as 20 year reentry period on all stands. TCF expects that harvesting will cease in the reserve after two or three entries, this Option A models 2 full entries into the reserve area.

4.1. No Harvest Acres

The non-harvestable acres were grown forward with no harvest for the full 100 year planning period.

4.2. WLPZ Constrained Harvestable Acres

The WLPZ acres were harvested according to the CA FPR which state that for class 1 and large class 2 streams at least 80% canopy cover and the largest 13 trees per acre (TPA) are retained. For class 2 streams at least 50% canopy cover is retained at all times. To model these constraints, a FORESEE batch script was developed to leave the 13 largest TPA for WLPZ1 areas and to calculate the canopy cover for all WLPZ areas so as to meet the canopy cover constraints. The canopy cover was calculated using a modified version Beer-Lambert law that scales the overlapping individual tree crown area to non-overlapping canopy cover. The individual tree crown area is calculated by

FORESEE based on equations from the literature. The non-overlapping canopy is then calculated using the following formula[5]:

Equation 1: Non-Overlapping Canopy Cover

$$CCnon = (1 - Exp(CCoverlapping))$$

In this formula, CCoverlapping is the overlapping canopy cover as a percentage of the ground area based on FORESEE's crown width models.

4.3. Unconstrained Harvestable Acres

After removing the non-forest acres, the non-harvestable acres, and the constrained harvested acres from the gross project acreage the remaining area is then available to be modeled without constraints.

The forest area unconstrained by streams or owls is managed using a tiered system of stand structure metrics. There were six different management approaches used when modeling. Single tree selection and transition silviculture are uneven-aged approaches. Variable Retention, commercial thinning, rehabilitation, are considered even-aged silvicultural approaches. Stands which contain more than 30% of the total basal area in tanoak pre harvest are also managed for tanoak reduction during the initial conifer harvest. Tanoak is removed to make growing space for conifer seedlings and saplings. Only tanoak is modeled for harvest all other true oaks and hardwood species are retained for wildlife habitat. Each harvesting approach is briefly described in the table below. The next table outlines the decision framework used to determine which silviculture to apply when entering a stand.

Table 5: Silvicultural systems descriptions.

Silviculture	Description
Single Tree Selection and Group selection	The goal of this prescription is to create and maintain multistoried, uneven-aged stands with varied ages classes, diameter distribution and tree heights. Trees are harvested individually, or in small groups up to 1 acre in size.
Ecological reserve Selection	The Garcia River Forest Reserve Area is designated for the development of a late seral stage forest. Silviculture has been restricted to longer rotations and thinning from below. The model uses as 20 year reentry period on all stands. TCF expects that harvesting will cease in the reserve after two or three entries, this Option A models 2 full entries into the reserve area.

[5] The Beer-Lambert law can be seen in Waring, R. H., and S. W. Running. 2007. Forest Ecosystems: Analysis at Multiple Scales. Elsevier Academic Press, San Francisco, CA. The conversion of this relationship to calculate non-overlapping canopy can be seen in Crookston, N. L., and A. R. Stage. 1999. Percent Canopy Cover and Stand Structure Statistics from the Forest Vegetation Simulator. Pages 16. General Technical Report, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Rocky Mountain Research Station.

Silviculture	Description
Transition	The goal of this prescription is to develop uneven-aged stands from stands that currently have an even-aged or irregular stand structure. Trees are harvested individually, or in small groups up to 1 acre in size.
Variable Retention	Variable retention is a harvesting approach based on the retention of structural elements or biological legacies (trees, snags, logs, etc.) from the pre-harvest stand for integration into the post-harvest stand to achieve various ecological, social and geomorphic objectives. Retained trees may be intended to become part of future stands managed by the Selection regeneration method. Retained trees are often designated as decadent tree or snag recruitment and therefore not ever intended for harvest.
Commercial Thinning	Commercial thinning is the removal of trees in a young-growth stands to maintain or increase average stand diameter and height of the residual crop trees, promote timber growth, and/or improve forest health. The residual stand shall consist primarily of healthy and vigorous dominant and co-dominant trees from the pre-harvest stand.[10]
Rehabilitation	The goal of this prescription is to regenerate stands that do not meet minimum stocking standards. Successive harvests will utilize uneven-aged silviculture.
Conifer Release	The goal of this prescription is to improve growth in stands that are primarily experiencing excessive hardwood competition, and that are also well stocked with conifer seedlings. Successive harvests will utilize uneven-aged silviculture.

The following table is the basic decision matrix table used in modeling the Option A

Table 6: Decision Matrix Table

			First Entry Triggers						General Targets	
Type	**Prescription**	**Miscellaneous**	**Con BA Lower Limit**	**Con BA Upper Limit**	**Con TPA (0 to 6in)**	**Minimum Con BA available for Harv (ft2/acre)**	**Min BA-Harv TO**	**Acreage Limit**	**Con BA Retention (ft2/acre)**	**TO BA Retention (ft2/acre)**
WLPZ Mngmt	**Class I and Large Class II**	From 30-100 feet from the WLTL retain 13 largest trees and 80% canopy	No triggers for WLPZ management as these stands are entered as neighboring non-WLPZ stands are entered. No HW harvest occurs in WLPZ areas.						75	NA
	Standard Class II	From 15-75 feet use Single tree selection silviculture only							75	NA
CE Mngmt	**GRF Ecological Reserve**	Each successive entry increases the Con BA target by 25ft2.	125	None	NA	25	NA	NA	3/4 starting ConBA	NA
Uneven Age Mngmt	**Single Tree Selection**	Final Target BA depends on the stands starting BA. Stands over 225 have a target of 250. Stands under 225 have a target of 200 ft2 BA. The min ConBA for entry increases by 25 ft2 BA until the target BA is reached.	125	None	NA	25	30% of Total BA	NA	2/3 of starting ConBA	30
	Transition	This only occurs once per stand.	75	125	NA	25	30% of Total BA	NA	50	30
Even Age Mngmt	**Variable retention 40**	Greater than 50% of conifer basal area in trees larger than 18" DBH (this is a surrogate for tree age >60 yrs)	30	125	< 125	25	30%	40	7.5	15
	Variable retention 60	same as VR40	30	125	< 125	25	30%	60	10	15
	Variable retention 80	same as VR40	30	125	< 125	25	30%	80	12.5	15
	Variable retention 120	same as VR40	30	125	< 125	25	30%	120	15	15
	Commercial Thin	50% of conBA < 14in DBH.	15	75	NA	25	30%	NA	8.72	15
	Conifer Release (HW treatment)	NA	0	50	>= 125	NA	30%	NA	No Con Harv	15
	Rehabilitation	NA	25	50	NA	25	NA	NA	8	15
	Just Grow	if none of the above, just grow.	NA	NA	NA	NA	NA	NA	NA	NA

		Conifer Tree Level Targets				Regeneration		Harvesting Approach				
Type	**Prescription**	**% Canopy Cover**	**TPA to Leave**	**BA to Leave (ft2/acre**	**BA or TPA constraints**	**Con (TPA)**	**TO (TPA)**	**Conifer Harvesting Approach**	**Conifer DBH range (in)**	**TO Harvesting Approach**	**TO DBH range (in)**	**Time to Next Treatment**
WLPZ Mngmt	**Class I and Large Class II**	80%	13	NA	largest	15	5	from below DBH	8 to 48	None	NA	At Least 10 Years
	Standard Class II	50%	NA	NA	NA	15	5	from below DBH	8 to 48	None	NA	At Least 10 Years
CE Mngmt	**GRF Ecological Reserve**	NA	NA	15	in trees >= 18in DBH	15	5	from below DBH	14 to 48	None	NA	At Least 20 Years
Uneven Age Mngmt	**Single Tree Selection**	NA	NA	15	in trees >= 18in DBH	25	10	Uniform across DBH	8 to 48	from above tallest	2 to 20	At Least 10 Years
	Transition	NA	NA	15	in trees >= 12in DBH	50	10	Uniform across DBH	8 to 48	from above tallest	2 to 20	Selection after at least 10 years
Even Age Mngmt	**Variable retention 40**	NA	NA	NA	NA	270	10	from above tallest	8 to 48	from above tallest	2 to 20	Selection after at least 30 years
	Variable retention 60	NA	NA	NA	NA	270	10	from above tallest	8 to 48	from above tallest	2 to 20	Selection after at least 30 years
	Variable retention 80	NA	NA	NA	NA	270	10	from above tallest	8 to 48	from above tallest	2 to 20	Selection after at least 30 years
	Variable retention 120	NA	NA	NA	NA	270	10	from above tallest	8 to 48	from above tallest	2 to 20	Selection after at least 30 years
	Commercial Thin	NA	100	NA	in trees >= 4in	30	10	from below DBH	8 to 14	from above tallest	2 to 20	Selection when BA >= 125
	Conifer Release (HW treatment)	NA	NA	NA	NA	20	5	from above tallest	NA	from above tallest	2 to 20	Commercial Thin after 30 years
	Rehabilitation	NA	300 POINT COUNT	NA	NA	270	10	from above tallest	8 to 48	from above tallest	2 to 20	Selection after at least 30 years

Appendix D: Timber Inventory procedures

1. Sampling Design

1.1. Plot Location

Stands to be sampled will be chosen with probability proportional to size within each stratum. Chosen stands will have a random set of plots chosen such that there is at least 1 plot per every 10 acres with a minimum of 4 plots per stand. Every 4th plot, starting with the first plot, will have heights measured on all trees.

Cruisers received a list of the randomly chosen plots within each stand in the order these plots should be cruised. This will aid in plot relocation for check-cruising and future audits.

1.2. Plot Design

The plot design consists of a variable radius plot for trees over 5.5 inches, a 1/100 acre regeneration plot for small trees. A 1/10 fixed radius plots for brush and old growth stumps, and a 100 ft transect for down dead material. On all properties, the basal area should be chosen such that most plots count 4 to 8 trees. Once a BAF is chosen for a stratum, all plots must have the same BAF within that stratum.

Variable Radius Plot Measurements (<u>standing live and dead trees</u> >=5.5 inches DBH):

species
diameter at breast height (DBH)
height to the nearest foot (on every 4th plot starting with the first plot)
and height to crown base (on every 4th plot starting with the first plot)
Crown Position (Dominant or Co-dominant, Intermediate, or Suppressed)

Fixed Radius <u>Regeneration</u> Plot Measurements (1/100th of an acre = 11.8 ft radius):

Species
Count of Trees < 5.5 inches DBH within 2 size classes by species (0 to 3 inches Diameter, and 3 to 5.4 inches diameter)

Fixed Radius <u>Shrub and Old Growth Stump</u> Plot Measurements (1/10th of an acre = 37.2 ft radius):

Dominant Shrub Type and Total Shrub % Cover
DBH and Height for Stumps between 6ft and 12ft tall, stump ht is calculated as the average of the uphill side and downhill side of the stump.

<u>Down Dead</u> Transect Measurements (Two 50ft Transects starting at Plot Center):

Length of Pieces (pieces must be greater than 6ft long)
Average Diameter of piece
Soundness of Piece (Hard or Soft)

1.3 Plots Falling on Roads:

Plots that fall on unmapped roads are sampled. Plots that fall on mapped truck roads shall be offset 1 chain to the west, and if still on truck road offset 1 chain north. The offset shall be in a cardinal direction moving clockwise on the compass until a bearing is found that will lead to a vegetated plot. Landings are included as part of the truck road and not sampled. New plot centers will be mapped and the GPS coordinates provided to TCF.

1.4 Site Class Sampling:

A minimum of **3 redwood or Douglas-fir** trees per strata should be selected and measured for species, DBH (to the nearest 10^{th} inch), height to nearest 1 foot, HTCB (height to crown base), and age. Each plot should be evaluated for the presence of potential site trees.

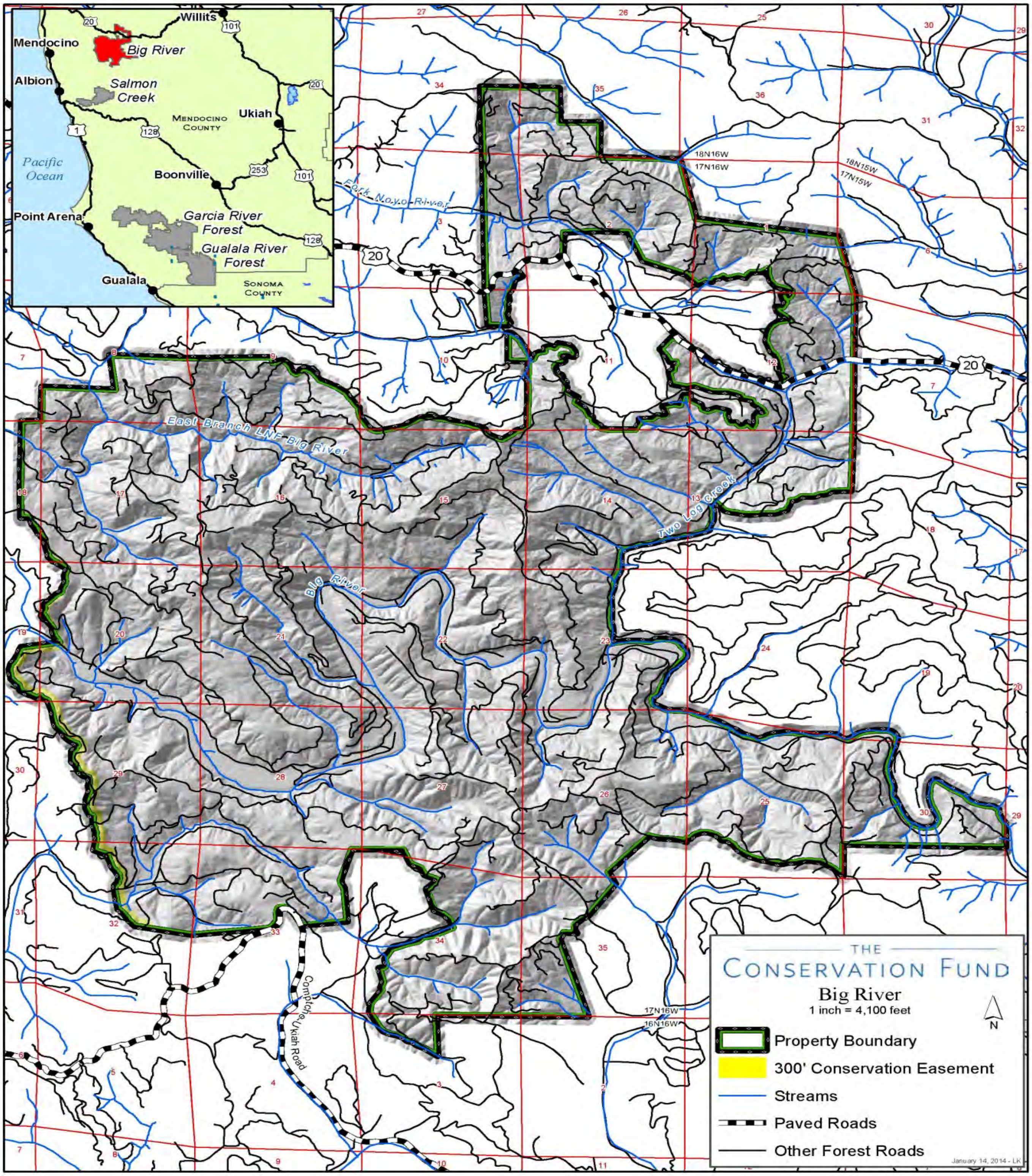
To be considered eligible for site tree measurement, a tree must have the following qualities:

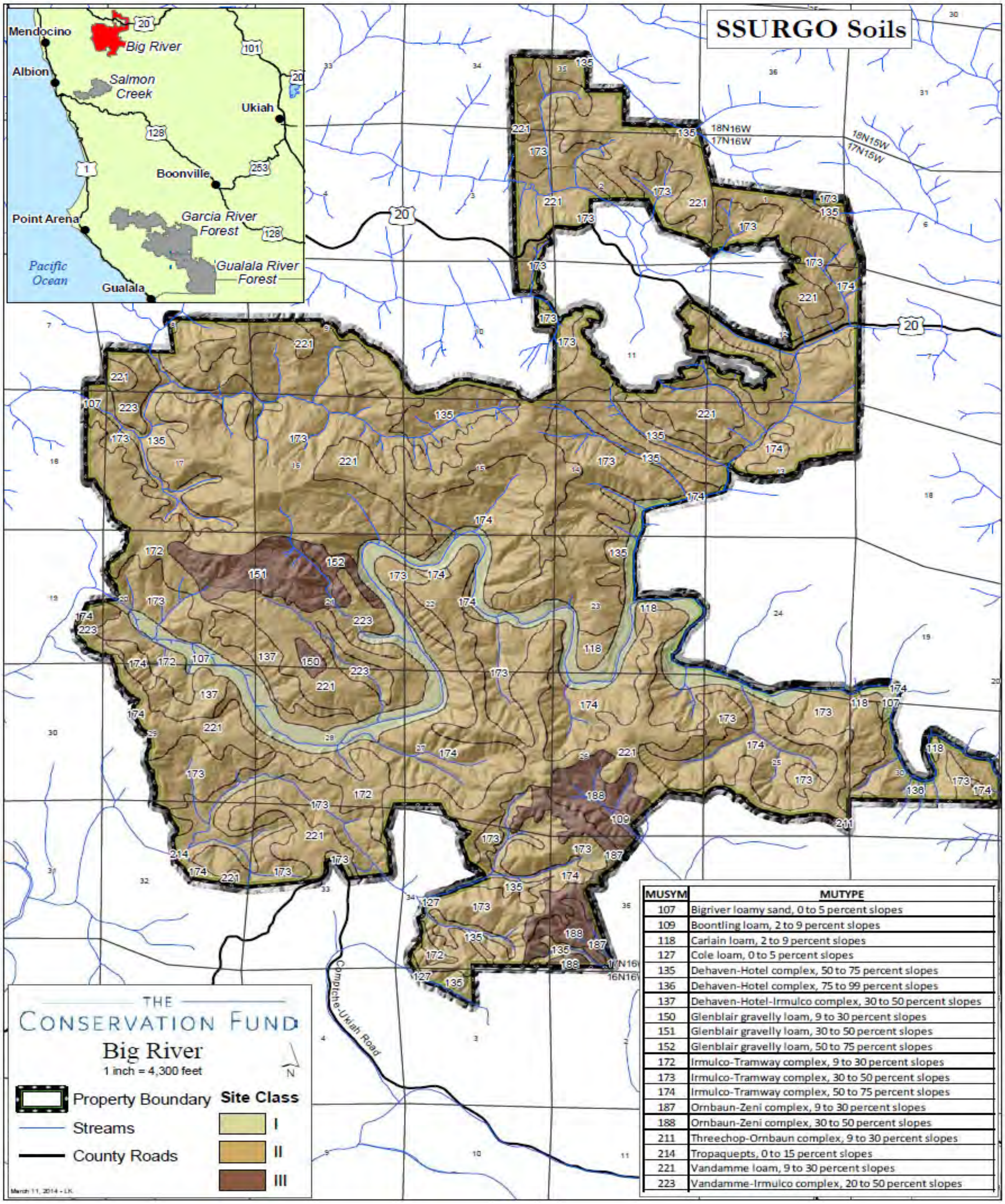
Be a conifer located within or near the plot (preferably within).
Have a dominant or co-dominant crown class.
Free of defect and disease and demonstrate good phenotype and vigor.

Final selection should be made on the basis of determining which of the eligible trees is the most vigorous. Relative vigor should be assessed by evaluating the crown condition, foliage complement, and bole condition of the trees present on the plot. Trees with full, healthy crowns, and no apparent disease or damage should be considered more vigorous than trees lacking these qualities. In many stands it may be difficult to find trees meeting these criteria; thus, it is important to look for such trees at each plot (until the minimum number have been identified and measured within a given stand). Tree selected for site tree measurement shall be marked with orange flagging with writing on the flag stating that it is selected as a site tree.

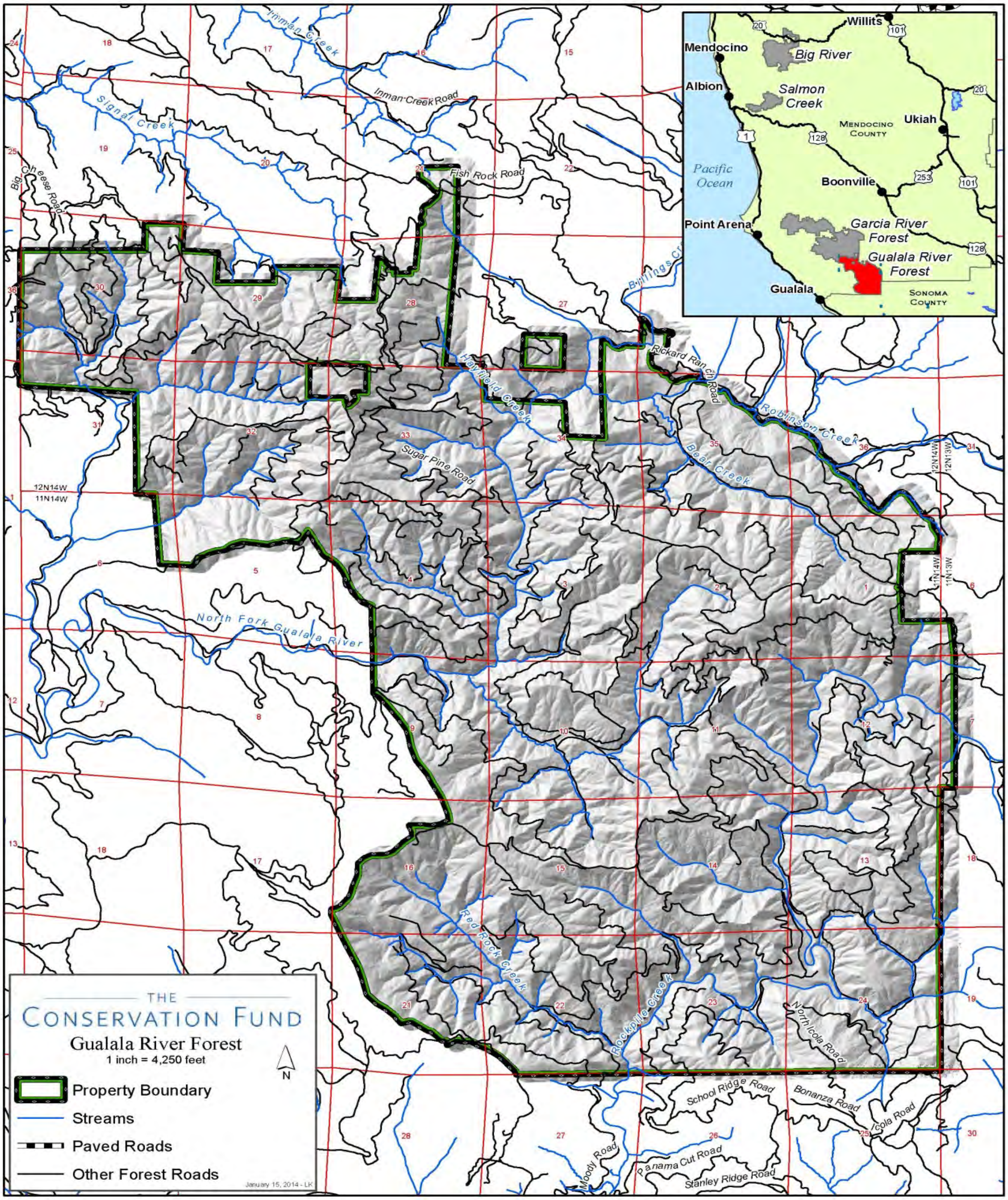
If no site trees are found meeting the criteria mentioned above, the cruiser shall find an appropriate site tree by seeking a tree off of the plot. In this case the cruise notes shall clearly indicate that the measurement occurred off plot.

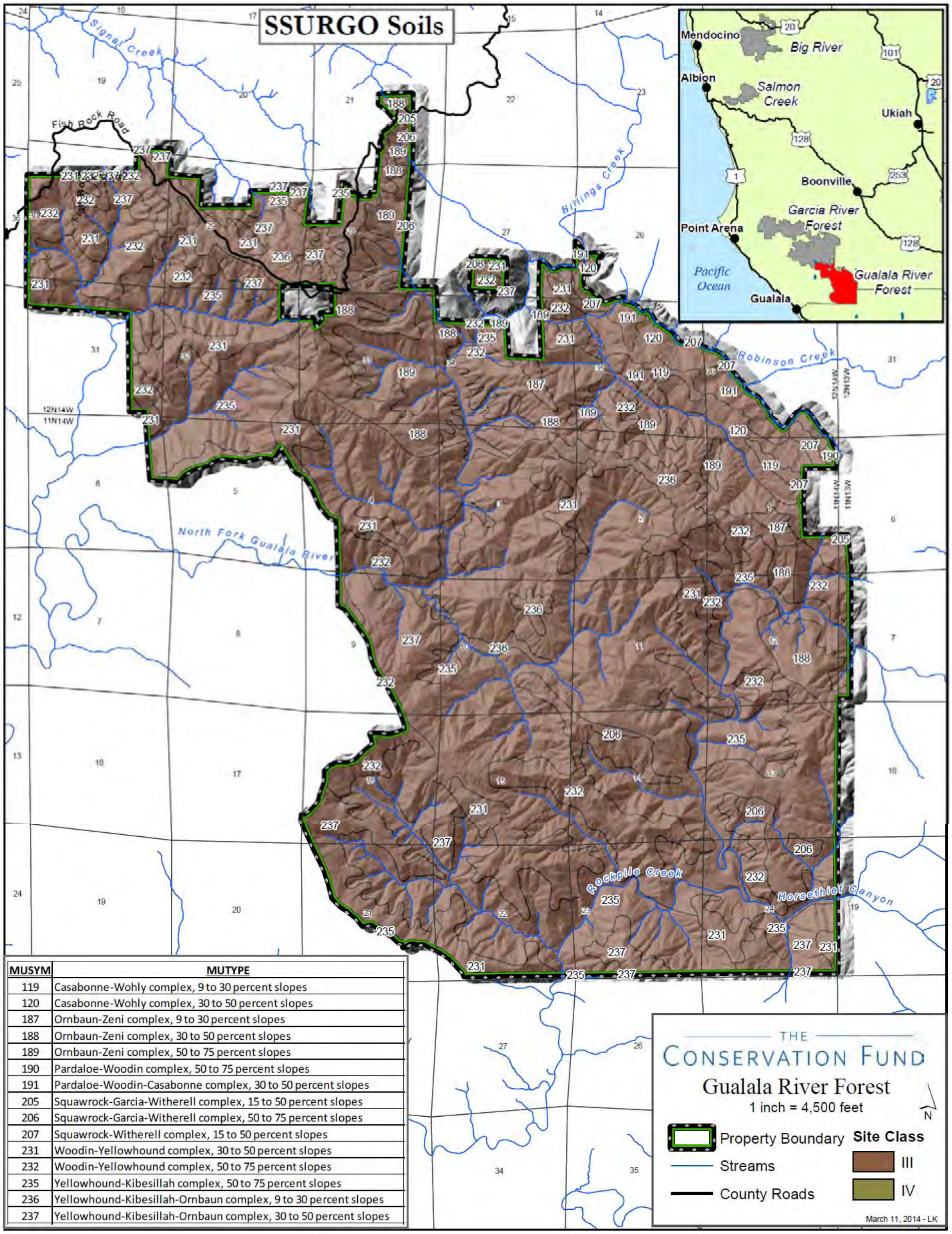
Appendix E: Maps



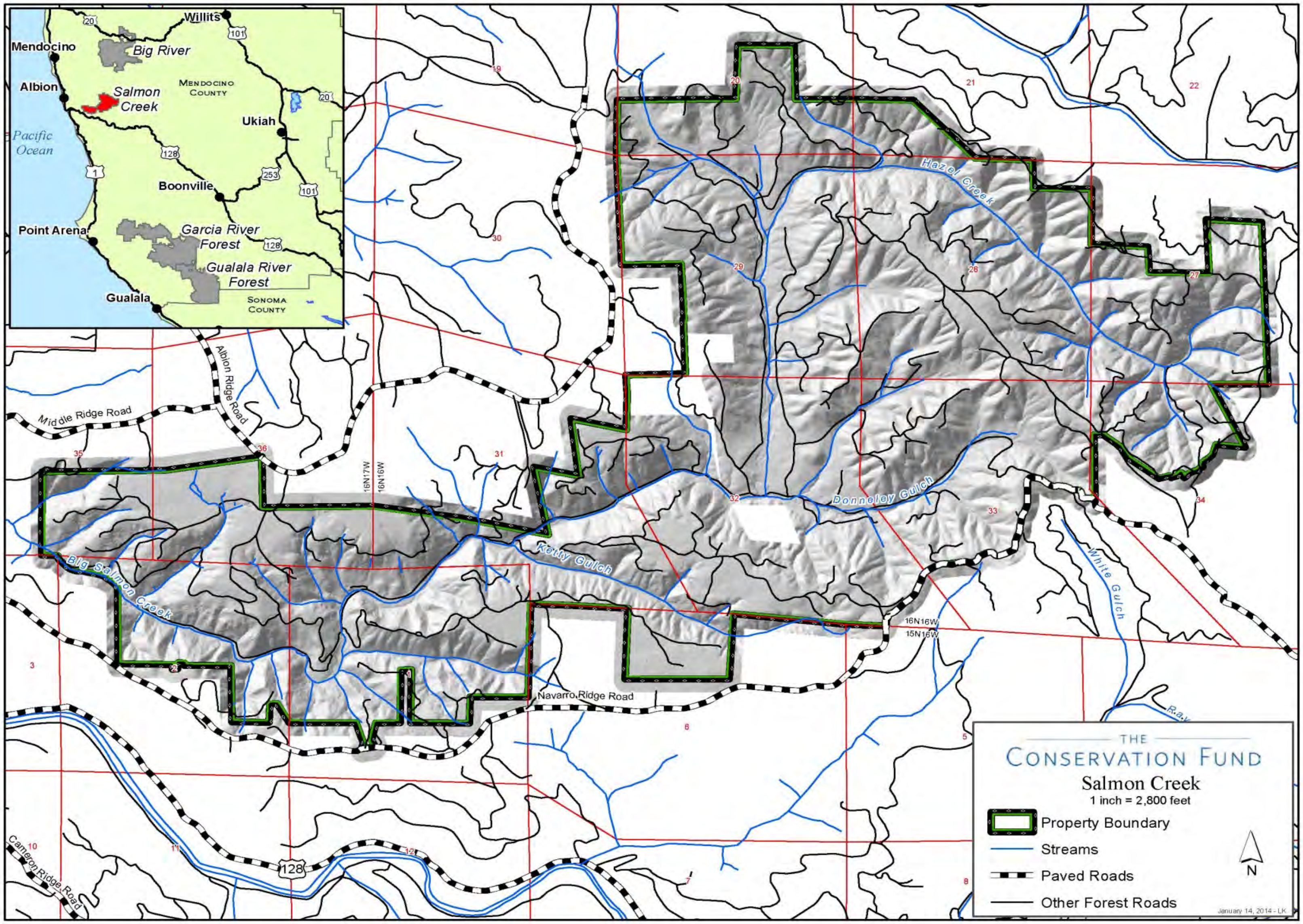


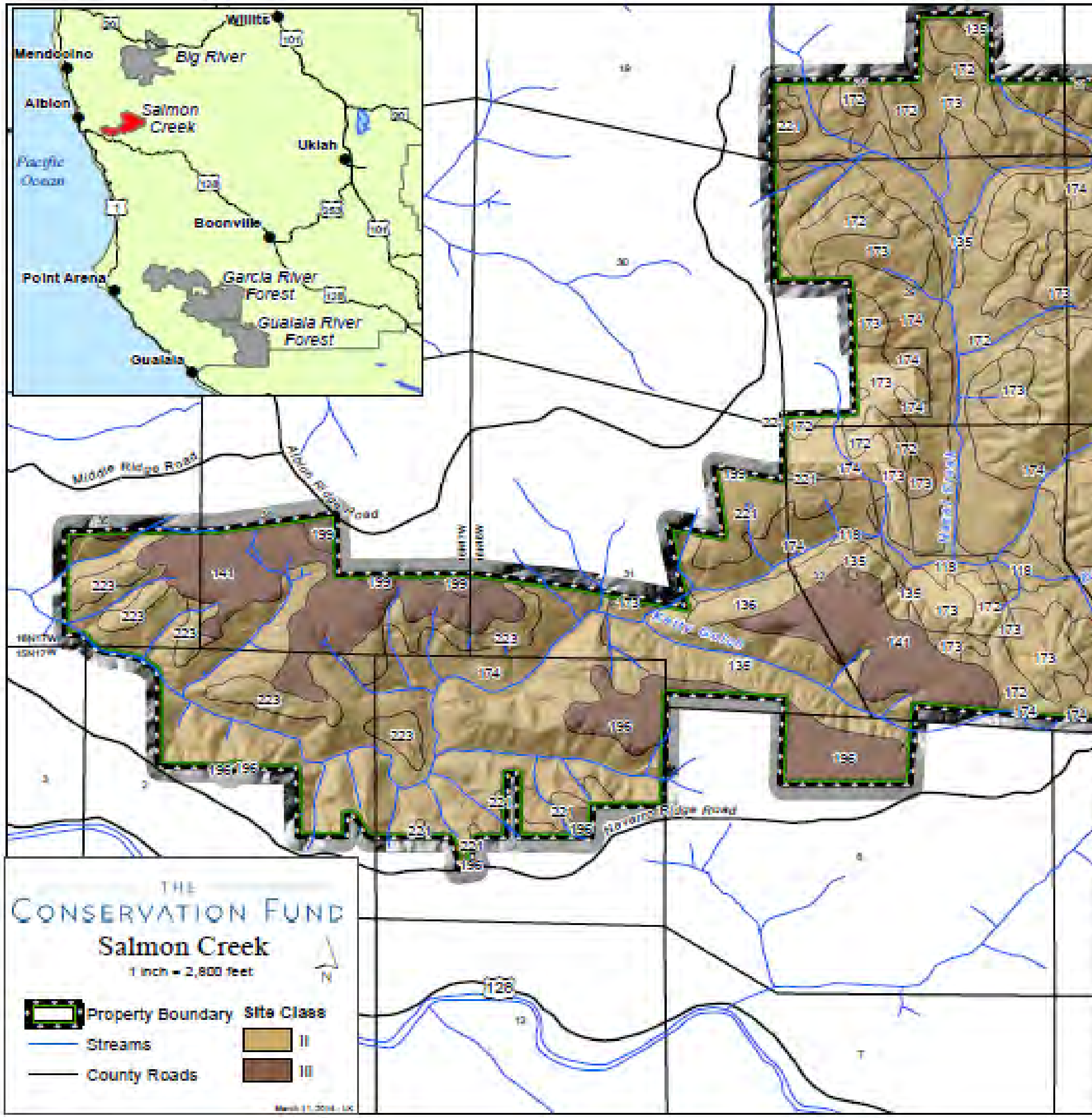
MUSYM	MUTYPE
107	Bigriver loamy sand, 0 to 5 percent slopes
109	Boontling loam, 2 to 9 percent slopes
118	Carlain loam, 2 to 9 percent slopes
127	Cole loam, 0 to 5 percent slopes
135	Dehaven-Hotel complex, 50 to 75 percent slopes
136	Dehaven-Hotel complex, 75 to 99 percent slopes
137	Dehaven-Hotel-Irmulco complex, 30 to 50 percent slopes
150	Glenblair gravelly loam, 9 to 30 percent slopes
151	Glenblair gravelly loam, 30 to 50 percent slopes
152	Glenblair gravelly loam, 50 to 75 percent slopes
172	Irmulco-Tramway complex, 9 to 30 percent slopes
173	Irmulco-Tramway complex, 30 to 50 percent slopes
174	Irmulco-Tramway complex, 50 to 75 percent slopes
187	Ornbaun-Zeni complex, 9 to 30 percent slopes
188	Ornbaun-Zeni complex, 30 to 50 percent slopes
211	Threechop-Ornbaun complex, 9 to 30 percent slopes
214	Tropaquepts, 0 to 15 percent slopes
221	Vandamme loam, 9 to 30 percent slopes
223	Vandamme-Irmulco complex, 20 to 50 percent slopes


THE CONSERVATION FUND
Gualala River Forest
1 inch = 4,250 feet
N
Property Boundary
Streams
Paved Roads
Other Forest Roads
January 15, 2014 - LK
Willits
Mendocino
Big River
Albion
Salmon Creek
Mendocino County
Ukiah
Pacific Ocean
Boonville
Point Arena
Garcia River Forest
Gualala River Forest
Gualala
Sonoma County
Inman Creek
Inman Creek Road
Signal Creek
Big Cheese Road
Fish Rock Road
Billings Creek
Rickard Ranch Road
Robinson Creek
Hayfield Creek
Bear Creek
Sugar Pine Road
North Fork Gualala River
Red Rock Creek
Rockpile Creek
North Icola Road
School Ridge Road
Bonanza Road
Icola Road
Moody Road
Panama Cut Road
Stanley Ridge Road
12N14W
11N14W
12N13W
11N13W

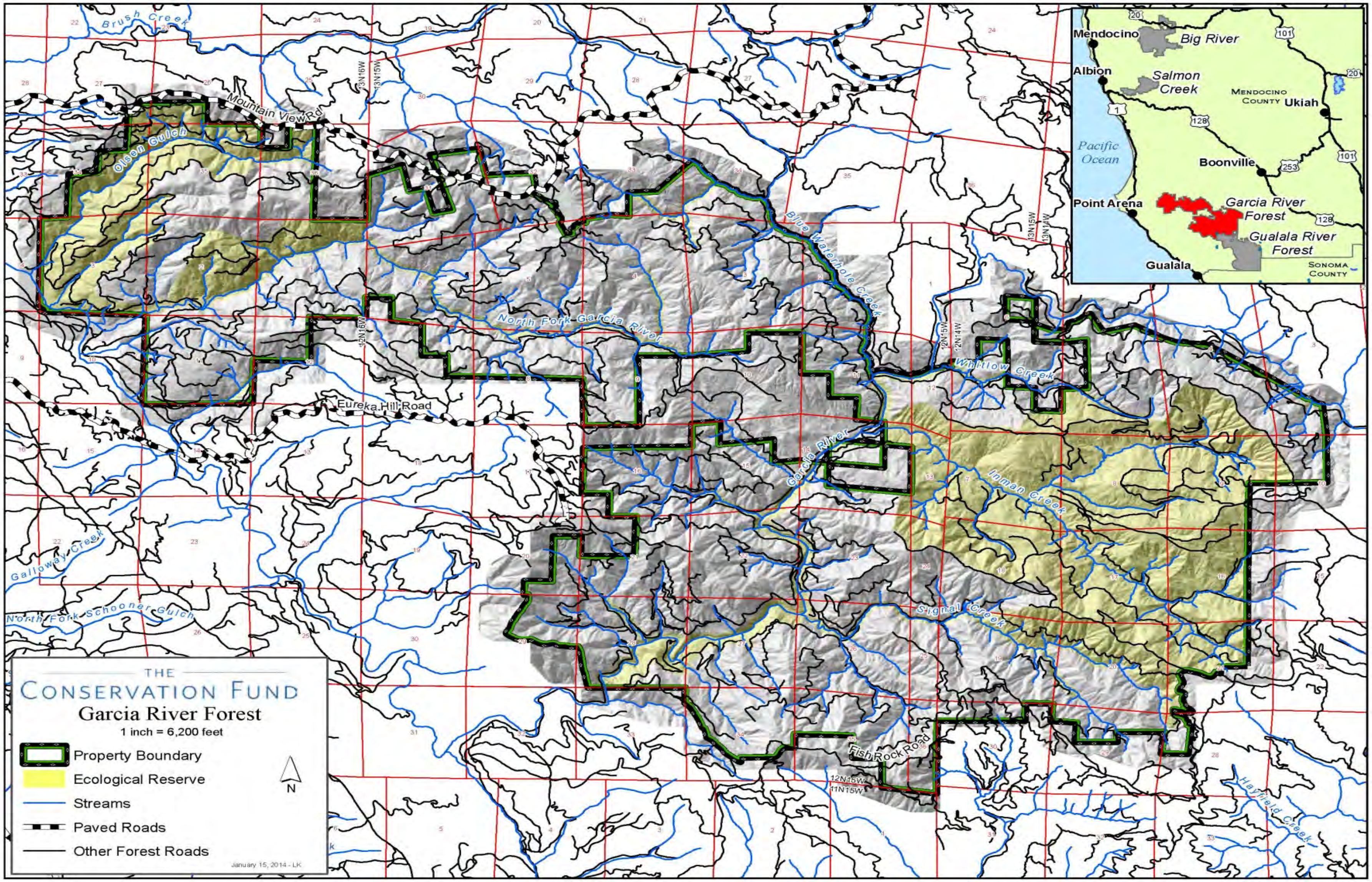


MUSYM	MUTYPE
119	Casabonne-Wohly complex, 9 to 30 percent slopes
120	Casabonne-Wohly complex, 30 to 50 percent slopes
187	Ornbaun-Zeni complex, 9 to 30 percent slopes
188	Ornbaun-Zeni complex, 30 to 50 percent slopes
189	Ornbaun-Zeni complex, 50 to 75 percent slopes
190	Pardaloe-Woodin complex, 50 to 75 percent slopes
191	Pardaloe-Woodin-Casabonne complex, 30 to 50 percent slopes
205	Squawrock-Garcia-Witherell complex, 15 to 50 percent slopes
206	Squawrock-Garcia-Witherell complex, 50 to 75 percent slopes
207	Squawrock-Witherell complex, 15 to 50 percent slopes
231	Woodin-Yellowhound complex, 30 to 50 percent slopes
232	Woodin-Yellowhound complex, 50 to 75 percent slopes
235	Yellowhound-Kibesillah complex, 50 to 75 percent slopes
236	Yellowhound-Kibesillah-Ornbaun complex, 9 to 30 percent slopes
237	Yellowhound-Kibesillah-Ornbaun complex, 30 to 50 percent slopes

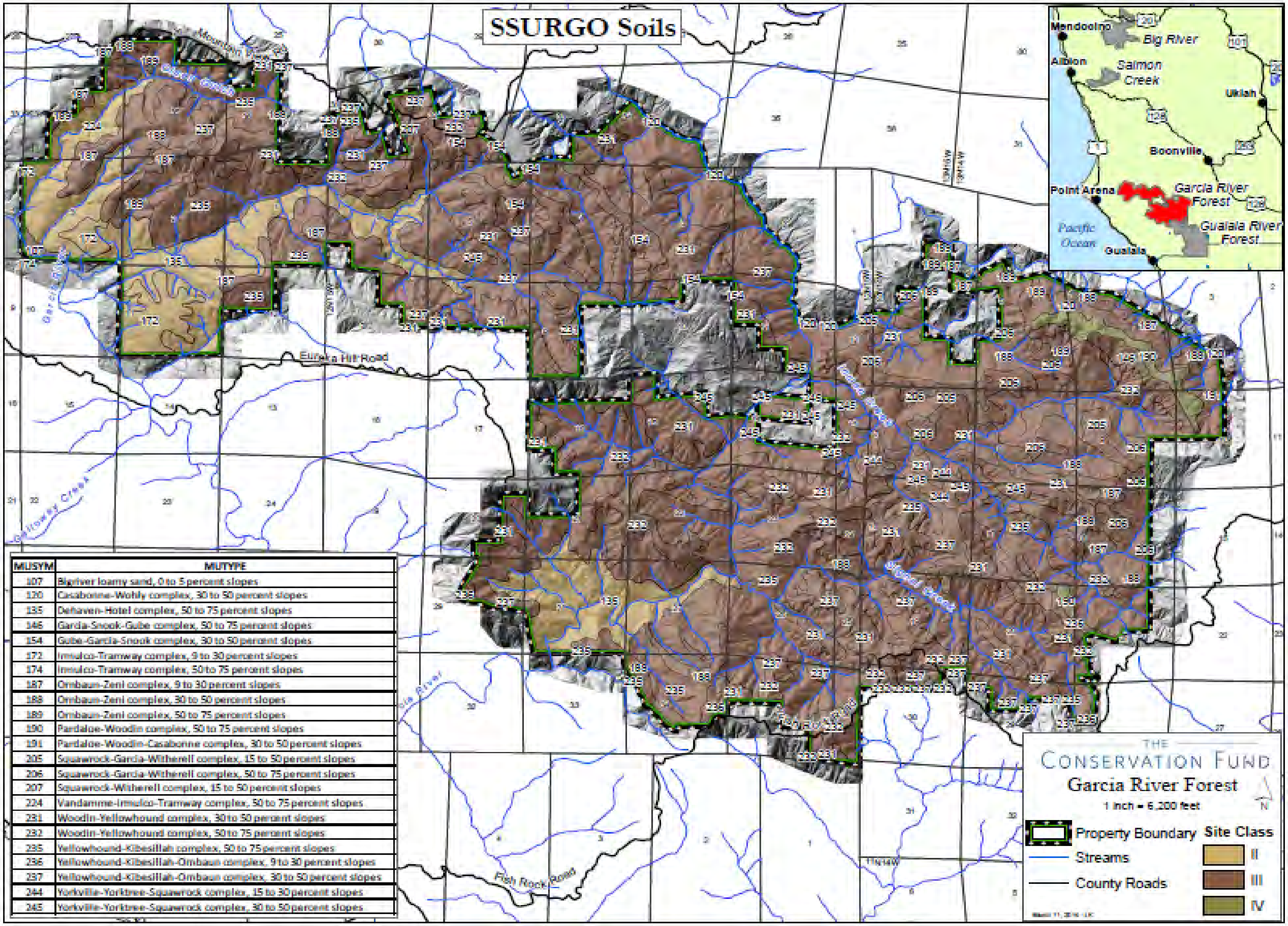

Willits
Mendocino
Big River
Albion
Salmon Creek
Mendocino County
Ukiah
Pacific Ocean
Boonville
Point Arena
Garcia River Forest
Gualala River Forest
Gualala
Sonoma County
Albion Ridge Road
Middle Ridge Road
Hazel Creek
Donnelley Gulch
Kelly Gulch
Big Salmon Creek
White Gulch
Navarro Ridge Road
Cameron Ridge Road
16N17W
16N16W
15N16W
128
THE CONSERVATION FUND
Salmon Creek
1 inch = 2,800 feet
Property Boundary
Streams
Paved Roads
Other Forest Roads
N
January 14, 2014 - LK



MUSYM	MUTYPE
118	Carlain loam, 2 to 9 percent slopes
135	Dehaven-Hotel complex, 50 to 75 percent slopes
136	Dehaven-Hotel complex, 75 to 99 percent slopes
141	Ferncreek sandy loam, 2 to 9 percent slopes
172	Irmulco-Tramway complex, 9 to 30 percent slopes
173	Irmulco-Tramway complex, 30 to 50 percent slopes
174	Irmulco-Tramway complex, 50 to 75 percent slopes
188	Ornbaun-Zeni complex, 30 to 50 percent slopes
189	Ornbaun-Zeni complex, 50 to 75 percent slopes
196	Quinliven-Ferncreek complex, 2 to 15 percent slopes
199	Shinglemill-Gibney complex, 2 to 9 percent slopes
211	Threechop-Ornbaun complex, 9 to 30 percent slopes
221	Vandamme loam, 9 to 30 percent slopes
223	Vandamme-Irmulco complex, 20 to 50 percent slopes



Version 3/26/14



MUSYM	MUTYPE
107	Bigriver loamy sand, 0 to 5 percent slopes
120	Casabonne-Wohly complex, 30 to 50 percent slopes
135	Dehaven-Hotel complex, 50 to 75 percent slopes
146	Garcia-Snook-Gube complex, 50 to 75 percent slopes
154	Gube-Garcia-Snook complex, 30 to 50 percent slopes
172	Irmulco-Tramway complex, 9 to 30 percent slopes
174	Irmulco-Tramway complex, 50 to 75 percent slopes
187	Ornbaun-Zeni complex, 9 to 30 percent slopes
188	Ornbaun-Zeni complex, 30 to 50 percent slopes
189	Ornbaun-Zeni complex, 50 to 75 percent slopes
190	Pardaloe-Woodin complex, 50 to 75 percent slopes
191	Pardaloe-Woodin-Casabonne complex, 30 to 50 percent slopes
205	Squawrock-Garcia-Witherell complex, 15 to 50 percent slopes
206	Squawrock-Garcia-Witherell complex, 50 to 75 percent slopes
207	Squawrock-Witherell complex, 15 to 50 percent slopes
224	Vandamme-Irmulco-Tramway complex, 50 to 75 percent slopes
231	Woodin-Yellowhound complex, 30 to 50 percent slopes
232	Woodin-Yellowhound complex, 50 to 75 percent slopes
235	Yellowhound-Kibesillah complex, 50 to 75 percent slopes
236	Yellowhound-Kibesillah-Ornbaun complex, 9 to 30 percent slopes
237	Yellowhound-Kibesillah-Ornbaun complex, 30 to 50 percent slopes
244	Yorkville-Yorktree-Squawrock complex, 15 to 30 percent slopes
245	Yorkville-Yorktree-Squawrock complex, 30 to 50 percent slopes

APPENDIX J

The Conservation Fund
North Coast Forest Conservation Program
2017 Fire Plan

This Fire Suppression Resource Inventory is being submitted to comply with 14CCR 918.1. Specific rule requirements cited in the plan are to be followed by contractors working in the woods at all times. This plan should not be construed to mean that untrained contractors or their personnel are required to actively fight wildland fires that occur on The Conservation Fund property.

The plan is to be kept with each employee or their assigned vehicle at all times. Copies to be provided to all Conservation Fund (TCF) employees and logging/road maintenance contractors operating on company managed lands. Copies provided to California Department of Forestry and Fire Protection (CAL FIRE) Northern region headquarters in Santa Rosa and on a CD to Mendocino ranger unit office in Willits (Howard Forest).

INTRODUCTION

The Conservation Fund owns and manages approximately 74,000 acres of timberland in five tracts on the Big River, Salmon Creek, Garcia River, Gualala River and Buckeye watersheds. Due to the risk that uncontrolled fire poses to its assets, The Conservation Fund manages its properties with careful and thorough consideration toward fire prevention, planning, and control. This Fire Plan is provided to acquaint all personnel with the policies and procedures for the current fire season. The policies and details listed in the following Plan apply across the entire TCF ownership and are not specific to any tract or area. Tract and area specific issues are conveyed through the maps attached at the end of the document. These maps display specific fire prevention and mitigation infrastructure, such as access points, roads, drafting sites, and helicopter landing sites.

POLICY STATEMENT

The Conservation Fund will respond within its capacity to all fires occurring within its ownership, as well as any uncontrolled fires which may threaten its ownership. TCF response will commence upon notification of a fire on or near TCF property, and with utmost concern for the safety of everyone involved.

TCF employees will take the immediate action necessary to contact appropriate fire control agencies once a fire is identified.

TCF employees will not place themselves or contractors at unreasonable risk during any response to a fire or during the course of fighting a fire. Safety is our first priority.

Appropriately-trained TCF employees and contractors may work at their discretion to contain and extinguish fires until the fire is taken over by the California Department of Forestry and Fire Protection (CAL FIRE) or some other responsible party.

TCF will cooperate with, and follow the direction of CAL FIRE or local fire protection departments responsible for fire protection on private lands.

To the extent information is available; relative humidity, temperature, wind direction and speed, overall fire season trends, and availability of resources shall be considered when determining appropriate action should an ignition occur.

TCF shall strictly enforce all laws, rules, and regulations governing logging operations during Fire Season.

TCF shall attend an Annual Fire Meeting at the beginning of the Fire Season, with representatives from CAL FIRE, logging contractors, and major adjacent forest landowners.

EMERGENCY TELEPHONE NUMBERS

TO REPORT A FIRE:

1. Call CAL FIRE Dispatch Howard Forest (707) 459-5336 or 459-7404 or Dial 911

   a) Give CAL FIRE the legal description (Township, Range & Section no. to the nearest ¼ section) and the approximate size of fire.

   b) Name of person reporting fire.

   c) Best access route(s) to the fire.

2. Call TCF emergency contact personnel in the order delineated below until a TCF representative is contacted in person:

   a) The TCF Office (707) 962-0712

   b) Scott Kelly, Timberland Manager (707) 272-4497

   c) Madison Thomson, Forester (707) 357-3919

   d) Don Miller, Security Patrol (707) 489-0315

   e) Mark Taylor, Security Patrol (707) 367-8366

   f) Holly Newberger, Program Coordinator (707) 357-3391

FIRE PREVENTION PROCEDURES

General Responsibilities for Logging Contractors, Road Crews and Consultants, herein after referred to as "Contractor".

All persons working on or traveling through TCF property must strictly adhere to the following Fire Prevention Procedures:

918.3 Roads to be Kept Passable.
Contractors shall keep all logging truck roads in a passable condition at all times for fire truck and emergency vehicle traffic.

918.4 Smoking and Matches
Subject to any law or ordinance prohibiting or otherwise regulating smoking, smoking by persons engaged in timber operations shall be limited to cleared log landing areas. Burning material shall be extinguished in such areas of bare soil before discarding. Contractors shall specify procedures to guide actions of his employees or other persons in his employment consistent with this subsection.

918.5 Lunch and Warming Fires
Subject to any law or ordinance regulating or prohibiting fires, warming fires or other fires used for the comfort or convenience of employees or other persons engaged in timber operations shall be limited to the following condition:
1. There shall be a clearance of 10 feet (3.05 m) or more from the perimeter of such fires and flammable vegetation or other substances conducive to the spread of fire.
2. Warming fire shall be built in a depression in the soil to hold the ash created by such fires.
3. The Contractor shall establish procedures to guide actions of his employees or other persons in their employment regarding the setting, maintenance, or use of such fires that are consistent with (a) and (b) of this subsection.
Under no conditions will warming fires be permitted on TCF property during the declared fire season. The Fire season is determined by CAL FIRE and it generally extends until sufficient rain has fallen to reduce the chance of accidental ignition.

918.6 Posting Procedures
Contractors shall post notices which set forth lists of procedures that they have established consistent with this Fire Plan. Such notices shall be posted in sufficient quantity and location throughout their logging areas so that all employees, or other persons employed by them to work, shall be informed of such procedures. Contractors shall provide for diligent supervision of such procedures throughout their operations.

918.7 Blasting and Welding
Contractors shall provide for a diligent fire watch service at the scene of any blasting or welding operations conducted on their logging areas to prevent and extinguish fires resulting from such operations.

918.8 Inspection for Fire
The Contractor or his/her agent shall conduct a diligent aerial or ground inspection within the first two hours after cessation of felling, yarding, or loading operations each day during the dry period when fire is likely to spread. The person conducting the inspection shall have adequate communication available for prompt reporting of any fire that may be detected.

918.10 Cable Blocks
During the period when burning permits are required, all tail and side blocks on a cable setting shall be located in the center of an area that is either cleared to mineral soil or covered with a fireproof blanket that is at least 15 ft. in diameter. A shovel and an operational full five-gallon back pump or a fire extinguisher bearing a label showing at least a 4A rating must be located within 25 feet of each such block before yarding commences.

Fire Boxes
A sealed fire box shall be present on every active landing during the course of logging operations. It shall contain at least 2 shovels, 2 axes or Pulaski's, a chainsaw serviced with gas and oil and 1 five gallon back pack pump full of water. Fire equipment shall only be used in case of fire.

Heavy Equipment
All tracked or rubber tired equipment over 5,000 lbs GVW shall be equipped with one serviceable shovel and one serviceable chemical fire extinguisher of at least a 2A:10B:C rating (5 lb. capacity) or water stored pressure fire extinguisher with at least a 2A rating (2½ lb. capacity). Equipment shall have and maintain the factory exhaust system or equivalent.

Vehicles
Shall keep a serviceable shovel at least 46 inch total length, an ax or Pulaski, and a fully charged fire extinguisher with at least a 1A:10B:C rating (2½ lb. capacity) in their vehicle and must be equipped with the factory exhaust system or equivalent.

Chainsaws
Chainsaws shall be equipped with the original factory exhaust system or equivalent. A serviceable fire extinguisher must be located within 25 feet of the point of operation.

Firearms
The discharging of firearms is not permitted on TCF property

TCF Responsibilities

~~a)~~ Monitor fire weather daily during periods of extreme fire danger
b) All active operations may be required to be shut down when the relative humidity reaches 20% or lower, or when excessively high air temperatures are present.
c) All logging and road maintenance contractors shall be inspected for fire protection preparedness during the declared fire season. **Failure to comply will cause the job to be shut down until all fire protection measures are in place.**
d) Maintain and have ready fire equipment for immediate mobilization.
e) Use fire equipment only for fire related activities such as fire suppression and planned burning activities.
f) Each passenger vehicle shall be equipped with a fire extinguisher rated 1A:10B:C (2½ lb. capacity), shovel (46 inches in total length) and an ax.
g) TCF shall be a paid subscriber to the Mendocino County Cooperative Aerial Fire Patrol. Aerial flights are scheduled by CAL FIRE.
h) In the event that CAL FIRE announces "very high" fire danger or a "red flag warning" (extreme fire weather conditions), TCF shall determine whether any specific fire prevention measures need to be implemented and if so, shall transmit such measures to contractors for implementation.

INITIAL ACTION INSTRUCTIONS

Any action taken will be done in the safest manner possible. Your personal safety and the safety of other individuals working in the area is the highest priority.

a) Contractor will report the fire to CAL FIRE and TCF personnel as described above.
b) Provide a precise location (general area, ¼ Section, Township and Range) and size of the fire if possible.
c) Describe best access route(s) to the fire. Where possible, open gate(s) or have a TCF employee wait for CAL FIRE/local volunteer fire department at the specified gate, to lead them to the fire.
d) Determine escape routes from the fire and be prepared to evacuate nearby personnel. If no escape route exists evacuate personnel from the area to a safe location, generally a large open area.
e) An appropriately-trained TCF employee responding to a fire on TCF lands, or a fire that is posing an immediate threat to TCF lands may at his or her own discretion assist in coordinating initial fire suppression actions. Take the lead to designate duties and remain in communication with all resources. As soon as CAL FIRE arrives, TCF personnel shall brief them and turn control of the fire over to CAL FIRE personnel.
f) Place available equipment on standby or route to the fire area.
g) Request additional appropriate equipment needs.
h) Direct all water tenders to fill up with water.
i) Place fire locator signs to mark route to the fire.
j) Leave gates on access roads to fire open until the fire is out.
k) Stop all operations that are on or will use the access road to the fire. In extreme fire weather all active logging on the property shall be shut down.

RECOGNIZING FIRE DANGER BUILD-UP

There are many environmental factors affecting the probability of fire ignition and the rate of fire spread, including low relative humidity, high wind speeds, high atmospheric instability, and others. The Burning Index, which indicates severe fuel and atmospheric conditions for logging operations, takes these different factors into account in order to assess the potential for hazardous fire behavior. It is derived from a calculation involving the drying rate of fuels, the humidity, temperature, wind, and the state of curing of the growing plants. It cannot pinpoint the exact conditions in any one particular place. This leaves the Contractor with the responsibility of policing his own area and using good judgment in operating procedures. The Burning Index for coastal Mendocino County is available each day during Fire Season at (707)-459-7404.

OPERATIONAL FIRE SUPPRESSION RULES

Any action taken will be done in the safest manner possible. Your personal safety and the safety of other individuals working in the area is the highest priority. There is no requirement for untrained or unwilling personnel to fight fire on TCF property. The following rules apply to persons who find themselves actively fighting fires.

FIRE SAFETY

a) Personal Safety: The safety of yourself and crew is your highest priority if you find yourself or your crew in an unsafe situation all persons should leave the scene immediately. If you or your crew are directed by anyone including CAL FIRE to do something which you feel is unsafe you may decline to do so. Report any such incidence to the CAL FIRE incident commander and TCF.
b) Working alone on a fire shall not be permitted.
c) Only experienced and capable operators shall be placed on or operate power equipment such as bulldozers, water trucks and chain saws.
d) Hand tools will be carried and used in a safe manner. Protect yourself and the person working next to you by maintaining safe working separation. Watch your footing at all times.
e) Be alert as to what is going on around you (e.g. burning snags, rolling rocks, and logs). Rolling debris comes from above, but don’t forget, burning snags do sometimes fall up the hill.
f) Snag fallers must be exceptionally thorough and accurate in their “Timber” call and must allow ample time for an answer before starting their saw for the final cut. Close correlation between hand trail crews and snag fallers is most important.
g) The Fire Boss is responsible for his/her personnel. Missing personnel is cause for alarm and an immediate investigation.
h) Tractors must be provided with lights when working at night.

OPERATION OF TRACTORS

a) Avoid carrying fire outside the lines.
b) Push hot material away from the line and into the fire.
c) Don’t bury fire. Buried fire may burn undetected for weeks and break out later when thought to be under control.
d) Work the tractors in pairs on steep terrain so that one can get the other out of “jackpots”.

OPERATION OF WATER TRUCKS AND PORTABLE PUMPS

a) Operate pumps at the recommended speed. Exceed this only temporarily when the emergency justifies.
b) When pumping downhill, use only the pressure needed; often times gravity is enough. Excessive pressure will burst a hose and cause dangerous and costly delays.
c) When filling water trucks or pumping directly from streams, utilize a hose with a screened inlet. Keep the intake hose in clean water. Sand and gravel will easily go through the volume pump and will foul the pressure pump.

d) Always keep a grease gun, screwdriver, pliers, and a crescent wrench with the water truck or water pump to facilitate minor pump adjustments. Good service is important with the portable pumps, which in most cases, must be carried to their place of operation.

USE OF HAND TOOLS

a) Keep hand tools sharp and ready for use at all times.
b) All hand tools must be securely handled. Axes and Pulaskis tend to dry out during the summer months. They should be checked regularly and tightened with wedges if necessary.
c) Tools rendered ineffective due to damage or use shall be removed from active use and repaired or replaced as soon as possible.

ENVIRONMENTAL PROTECTION

a) When drafting water, screens will be used to prevent the entrapment of aquatic vertebrates. Drafting sites will be located to minimize damage to the watercourse.
b) When possible, firebreaks shall be placed outside of watercourse and lake protection zones (WLPZs) and other riparian areas.
c) When possible, firebreaks shall avoid unstable areas.
d) Water bars shall be installed on tractor constructed firebreaks as a part of the final "mop-up" operation. Mulching with slash or straw shall be conducted in WLPZ's where necessary to prevent erosion.

TCF CONTACTS

Contact Order	Name	Cell Phone #
1.	Scott Kelly	(707) 272-4497
2.	Madison Thomson	(707) 357-3919
3.	*Holly Newberger	(707) 357-3391

*Office and administrative support only/Fire dispatcher

TCF FIRE SUPPRESSION ORGANIZATION AND DUTIES

In the event that The Conservation Fund has to maintain fire suppression activities without the aid of CAL FIRE. The following is a list of individual fire suppression roles with their associated duties. In this hierarchical system, with fire fighter as the lowest rank and dispatcher as the highest, individuals report directly to the rank above them. Roles will be distributed between staff and contractors on the basis of experience and physical capacity.

Dispatcher/Fire Operations Manager (Holly Newberger)
Duties and Responsibilities: Maintains radio contact with TCF Fire Boss(es). Arranges for and dispatches equipment, personnel and supplies ordered by the Fire Boss. Maintains the following log/records:

• Daily log of contract equipment and personnel dispatched to each fire including numbers of personnel, supervisor, numbers and type of equipment, hours worked by shift.

• Daily log of all conversations, phone calls with CAL FIRE and others including the time, person talked to, fire command job title/function or other, and substance of the discussion. (Use the Incident Report Form).

Fire Boss (Scott Kelly or designee)
Duties and Responsibilities: Overall organization and supervision of suppression operations on each fire until relieved by CAL FIRE. Develops suppression strategy. Determines and manages manpower, equipment and supplies needs. Maintains personnel roster. Directly supervises crew bosses or fire fighters on small fires. Maintains radio/cellular contact with main office. Maintains contact with Crew Bosses as conditions dictate (intervals not to exceed two hours). Interacts with CAL FIRE hierarchy when present. Completes or directs other TCF personnel to complete the Wildfire Information Report Form. Ensures that the access route to the fire location is adequately signed.

Crew Boss (Scott Kelly or designee)
Duties and Responsibilities: Responsible for direct supervision of fire fighters engaged in suppression operations (e.g. tool complement, fire line location, width and construction; hose lays, mop-up operations). Follows directions and implements strategy developed by the Fire Boss. Monitors fire suppression progress and fire behavior and reports said information to Fire Boss at intervals not to exceed two hours. Coordinates with water truck pump operators. Directs location and construction of tractor firelines. Ensures replacement of worn-out or unusable tools/equipment. Knows the location of, and ensures the safety of each fire fighter on the crew at all times.

Fire Fighters
Duties and Responsibilities: Follows directions of Crew Boss and Fire Boss. Responsible for wearing protective clothing and gear (i.e. long-sleeve shirt, pants, boots, safety glasses, gloves, handkerchief, and hard hat). Wears ear protection and chaps when operating chainsaws; only operates power saws if trained and capable. Uses the proper tool for the specific task at hand. Reports unsafe conditions to Crew Boss. Reports broken or unusable tools to Crew Boss. Paces their work to forestall fatigue. Maintains a supply of personal drinking water. Keeps alert at all times and in contact with other crew members.

TCF EQUIPMENT RESOURCES

McClouds	3
Pulaskis	2
Shovels	4
Backpack pumps	2
Nomex shirts	2
BK radios	2
Fire shelters	2
Pick-ups	2

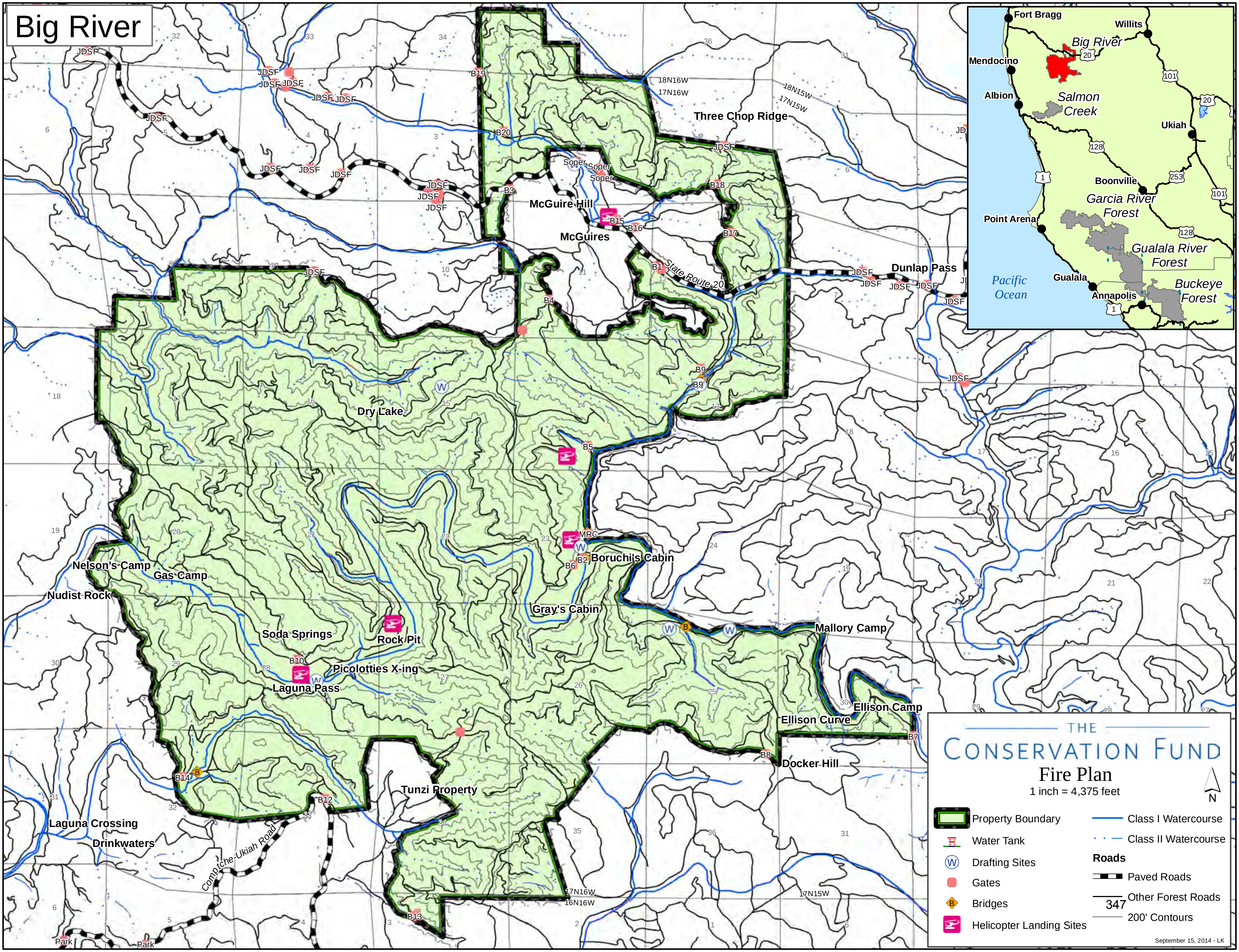
CONTRACTOR CONTACT LIST

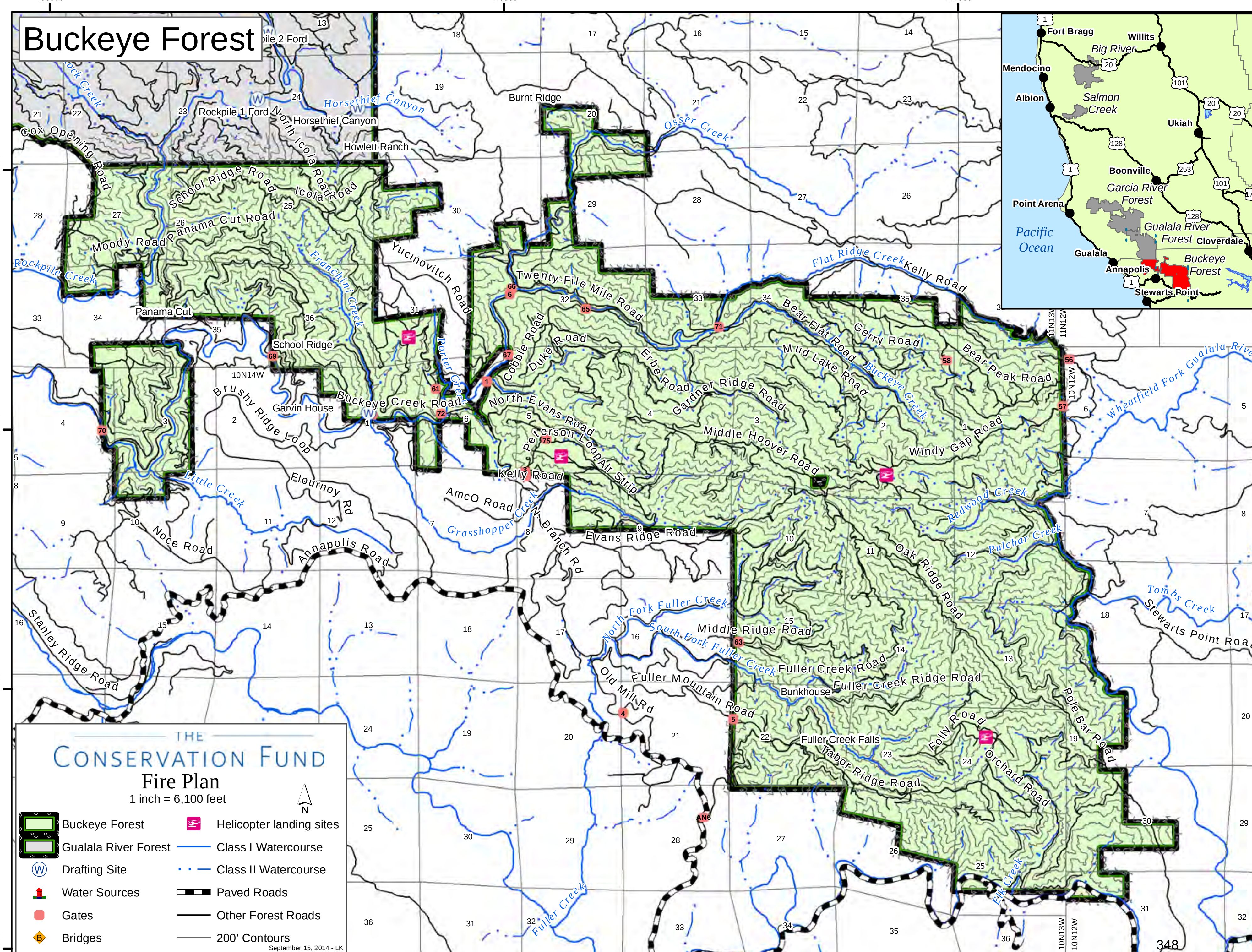
This is a partial list of potential contractors. TCF office will know which contractors are on site and who to contact, additional manpower and equipment may be ordered by the TCF office as deemed necessary by the Fire Boss.

Contractor	LTO#	Contact Persons	Home/mobile (707)
Anderson Logging, Inc.	A-7124	Mike Anderson	964-0303/489-0837
P.O. Box 1266		Myles Anderson	964-2690/489-5805
Fort Bragg, CA 95437		Don Sallinen	961-0305/489-1625
(707)964-2770		Mark LeRoy	964-0592/272-3706
		Woods Office	964-4037
Barnett Logging	A-10343	Eddy Barnett	964-2542/357-1285
31651 Pudding Creek Road			
Fort Bragg, CA 95437			
Bob Baker Trucking		Bob Baker	884-3318
P.O. Box 655			
Gualala, CA 95445			
Christopher Blencowe		Chris Blencowe	964-1409/972-6768
116 N Sanderson Way			
Fort Bragg, CA 95437			
Hautala & Mills Logging	A-9276	Richard Hautala	964-2340/489-9556
27937 Highway #20		Parker Mills	877-3250/489-4587
Fort Bragg, CA 95437			
Darcie Mahoney		Darcie Mahoney	877-3435/489-4865
30995 Greenwood Rd.			
Elk, CA 95432			
Philbrick, Inc.	A-5697	Jerry Philbrick	937-5919/489-0923
P.O. Box 1288		John Starkey	964-8809/489-2514
Fort Bragg, CA 95437			
(707) 964-2277			
William T. Piper Logging		Bill Piper	489-5150
P.O. Box 295		Robert Piper	489-7923
Manchester, CA 95459			
(707) 882-2561			
Redwood Resources			
P.O. Box 1477		Jesse Feidler	357-2677
Fort Bragg, CA 95437			
(707) 961-0347			

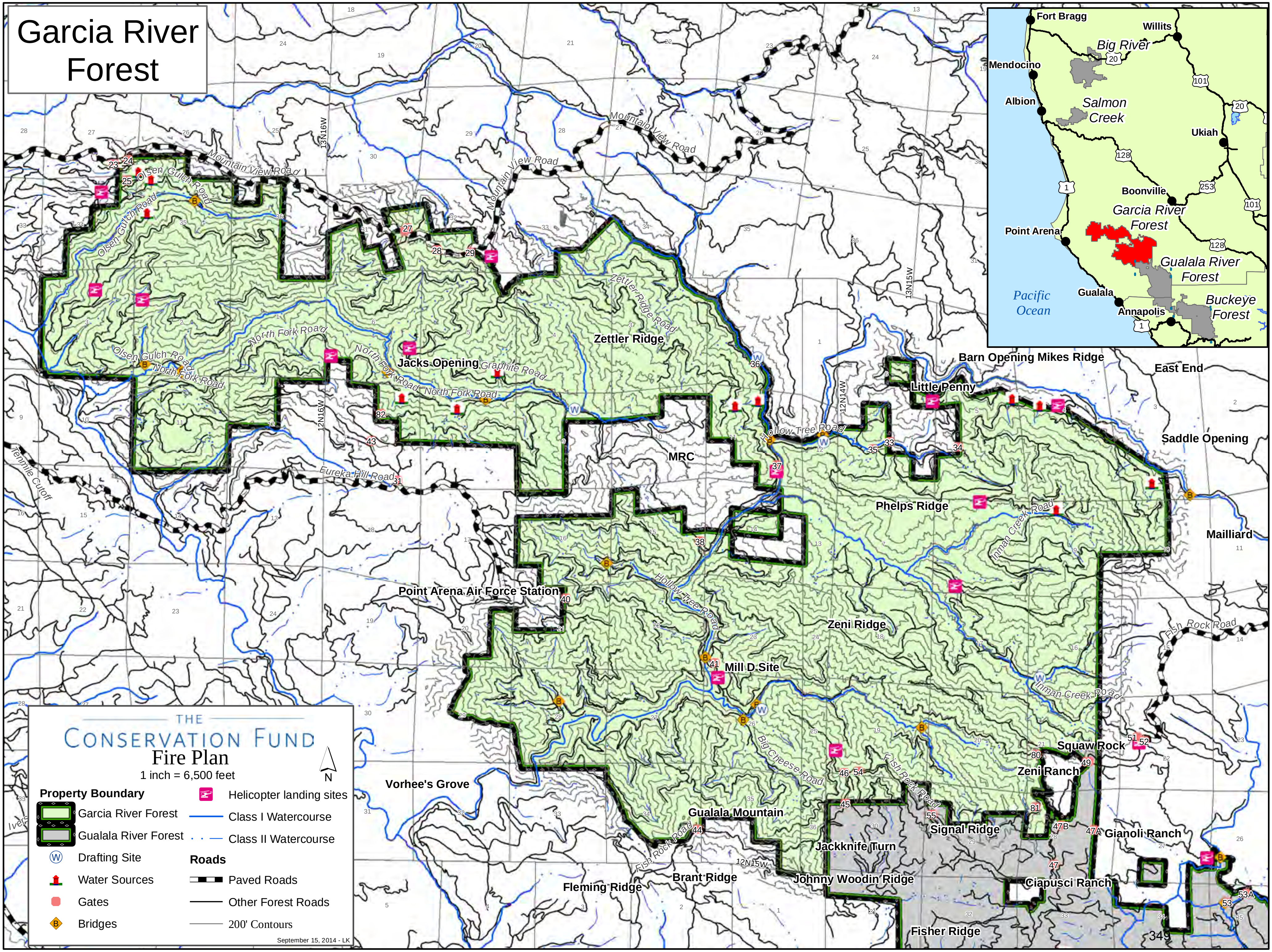
Shuster's Logging Inc. 550 East Valley Street Willits, CA 95490 (707) 459-4131	A-8080	Steve Shuster Randy Yanez	456-9475/272-7120 964-7369/489-0237
Stornetta Excavating P.O. Box 225 Point Arena, CA 95468		Stan Stornetta	884-9628/357-1654
Summit Forestry 16575 Franklin Road Fort Bragg, CA 95437		Lee Susan	964-4566/357-0906
Gary Swanson 31651 Cedar Street (707) 964-3519	C-762	Gary Swanson	964-3519/489-0152
T&S Logging Inc. P.O. Box 31 Philo, CA 95466 (707) 895-3751		Ed Slotte	489-1948
Wylatti Resource Mngmnt. PO Box 575 Covelo, CA 95428	A-851	Brian Hurt	(707) 983-6633 (707) 983-8184 (707) 489-1463

MAPS OF TCF OWNERSHIPS
Helicopter suitable landings
Water drafting sites
Environmentally sensitive areas

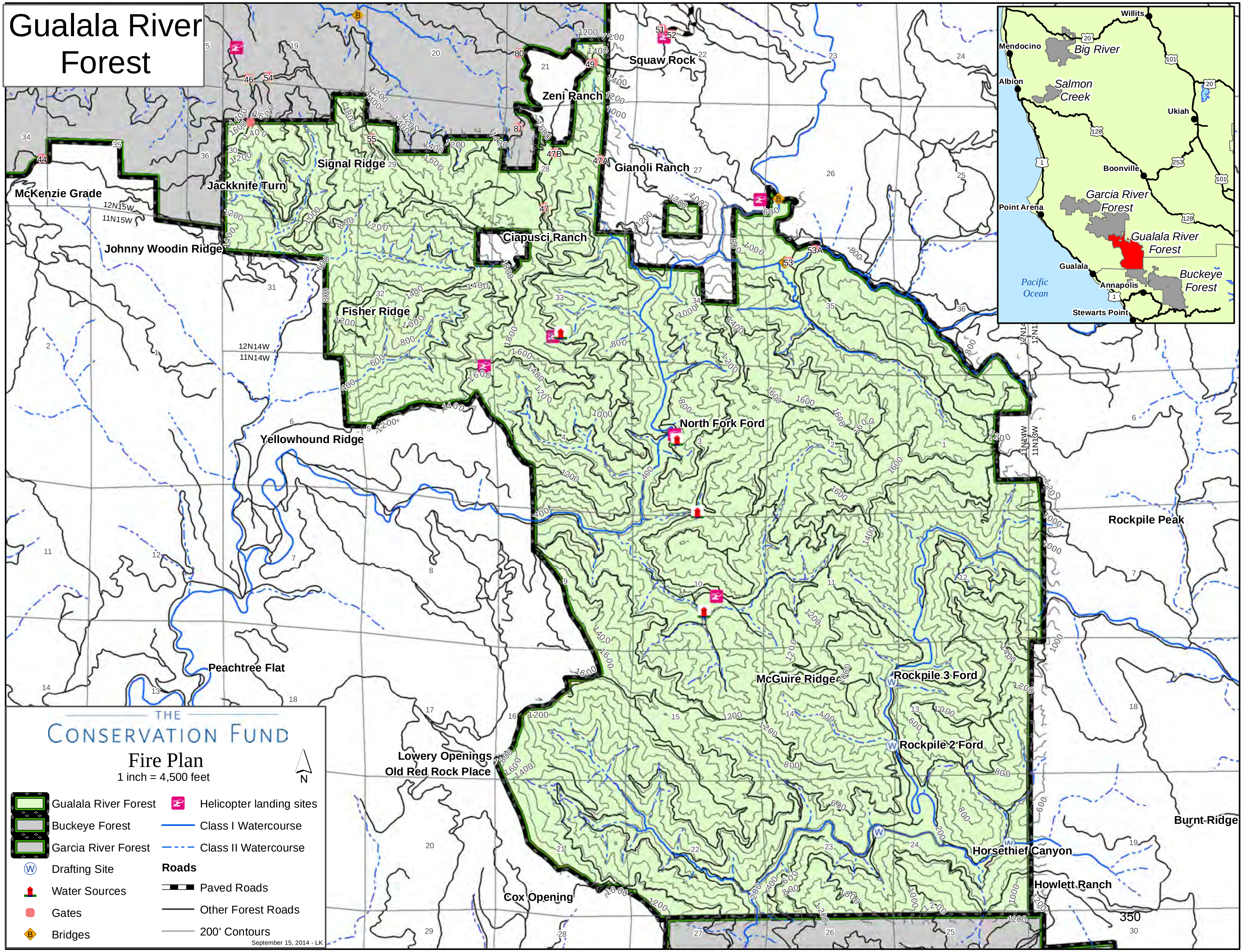

Big River
THE CONSERVATION FUND
Fire Plan
1 inch = 4,375 feet
N
Property Boundary
Water Tank
Drafting Sites
Gates
Bridges
Helicopter Landing Sites
Class I Watercourse
Class II Watercourse
Roads
Paved Roads
Other Forest Roads
347
200' Contours
September 15, 2014 - LK
Fort Bragg
Willits
Big River
Mendocino
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
Three Chop Ridge
McGuire Hill
McGuires
State Route 20
Dunlap Pass
Dry Lake
Boruchi's Cabin
Gray's Cabin
Nelson's Camp
Gas Camp
Nudist Rock
Soda Springs
Rock Pit
Picolotties X-ing
Laguna Pass
Mallory Camp
Ellison Camp
Ellison Curve
Docker Hill
Tunzi Property
Laguna Crossing
Drinkwaters
Comptche-Ukiah Road
Soper
MRC
JDSF
18N16W
17N16W
18N15W
17N15W
16N16W
Park



Buckeye Forest
THE CONSERVATION FUND
Fire Plan
1 inch = 6,100 feet
N
Buckeye Forest
Gualala River Forest
Drafting Site
Water Sources
Gates
Bridges
Helicopter landing sites
Class I Watercourse
Class II Watercourse
Paved Roads
Other Forest Roads
200' Contours
September 15, 2014 - LK
Fort Bragg
Willits
Big River
Mendocino
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Pacific Ocean
Gualala River Forest
Cloverdale
Gualala
Annapolis
Buckeye Forest
Stewarts Point
Horsethief Canyon
Burnt Ridge
Osser Creek
Rockpile 1 Ford
Howlett Ranch
Cox Opening Road
School Ridge Road
Icola Road
North Icola Road
Panama Cut Road
Moody Road
Rockpile Creek
Franchini Creek
Yucinovitch Road
Twenty File Mile Road
Flat Ridge Creek
Kelly Road
Bear Flat Road
Gerry Road
Bear Peak Road
Mud Lake Road
Buckeye Creek
Wheatfield Fork Gualala River
Panama Cut
School Ridge
Porter Creek
Cobble Road
Duke Road
Erbe Road
Gardner Ridge Road
Brushy Ridge Loop
Garvin House
Buckeye Creek Road
North Evans Road
Middle Hoover Road
Windy Gap Road
Peterson Loop
Air Strip
Kelly Road
Little Creek
Flournoy Rd
AmcO Road
Grasshopper Creek
N. Branch Rd
Evans Ridge Road
Redwood Creek
Pulchar Creek
Oak Ridge Road
Noce Road
Annapolis Road
Tombs Creek
Stewarts Point Road
Stanley Ridge Road
North Fork Fuller Creek
South Fork Fuller Creek
Middle Ridge Road
Fuller Creek Road
Fuller Creek Ridge Road
Bunkhouse
Old Mill Rd
Fuller Mountain Road
Pole Bar Road
Folly Road
Orchard Road
Fuller Creek Falls
Tabor Ridge Road
Fuller Creek
Elk Creek
463000
470000
477000
4292000
4288000
4284000
4280000
10N14W
10N13W
10N12W
11N13W
11N12W



Garcia River Forest
Fort Bragg
Willits
Big River
Mendocino
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Gualala
Annapolis
Buckeye Forest
Pacific Ocean
Mountain View Road
Olsen Gulch Road
North Fork Road
Graphite Road
Jacks Opening
Zettler Ridge Road
Zettler Ridge
Barn Opening Mikes Ridge
East End
Little Penny
Hollow Tree Road
Saddle Opening
MRC
Eureka Hill Road
Tenmile Cutoff
Phelps Ridge
Inman Creek Road
Maillard
Point Arena Air Force Station
Zeni Ridge
Fish Rock Road
Mill D Site
Squaw Rock
Zeni Ranch
Vorhee's Grove
Big Cheese Road
Gualala Mountain
Signal Ridge
Jackknife Turn
Gianoli Ranch
Fleming Ridge
Brant Ridge
Johnny Woodin Ridge
Ciapusci Ranch
Fisher Ridge
13N16W
12N16W
12N14W
13N15W
12N15W
THE CONSERVATION FUND
Fire Plan
1 inch = 6,500 feet
N
Property Boundary
Garcia River Forest
Gualala River Forest
Drafting Site
Water Sources
Gates
Bridges
Helicopter landing sites
Class I Watercourse
Class II Watercourse
Roads
Paved Roads
Other Forest Roads
200' Contours
September 15, 2014 - LK


Gualala River Forest
Squaw Rock
Zeni Ranch
Gianoli Ranch
Signal Ridge
Jackknife Turn
McKenzie Grade
Johnny Woodin Ridge
Ciapusci Ranch
Fisher Ridge
North Fork Ford
Yellowhound Ridge
Rockpile Peak
Peachtree Flat
McGuire Ridge
Rockpile 3 Ford
Rockpile 2 Ford
Lowery Openings
Old Red Rock Place
Burnt Ridge
Horsethief Canyon
Howlett Ranch
Cox Opening
12N15W
11N15W
12N14W
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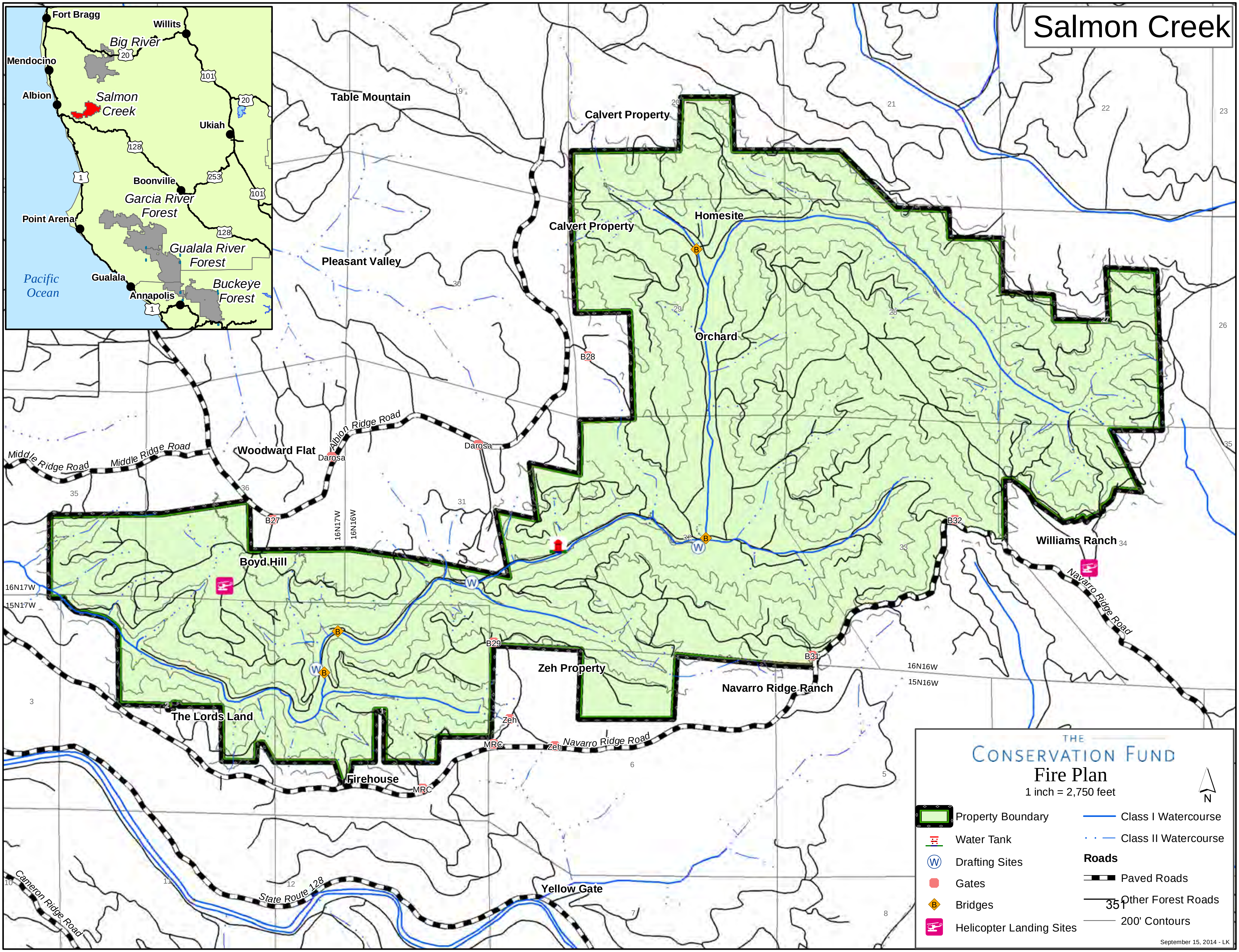
200' Contours
September 15, 2014 - LK


Salmon Creek
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Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
20
101
128
253
1
Table Mountain
Calvert Property
Calvert Property
Homesite
Pleasant Valley
Orchard
Woodward Flat
Albion Ridge Road
Darosa
Darosa
Middle Ridge Road
Middle Ridge Road
B27
B28
16N17W
16N16W
Boyd Hill
Williams Ranch
Navarro Ridge Road
B32
B29
B31
Zeh Property
Navarro Ridge Ranch
16N16W
15N16W
16N17W
15N17W
The Lords Land
Zeh
MRC
Zeh
Navarro Ridge Road
Firehouse
MRC
Yellow Gate
State Route 128
Cameron Ridge Road
THE CONSERVATION FUND
Fire Plan
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APPENDIX K:

Garcia River Monitoring Program, Monitoring the Status and Trends of a Watershed Recovery Effort

To be added when compete.

APPENDIX L

Fixed Radius Plots Inventory Procedure Buckeye, Garcia, and Big River/Salmon Creek Forests

Revised November 29, 2016

1.1. Plot Location – How are plots located across the property

Continuous Forest Inventory (CFI) is an inventory system in which a portion of a property is sampled annually. In a CFI, new plot data replaces old plot data continuously and the inventory is completely refreshed every 10 years or so. The advantage of this system is that cruising costs are averaged over a period of years. Additionally, disturbed or harvested plots are remeasured annually so the forest mensurationist does not have to estimate the effect of harvest on the forest inventory. The set of plots to sample in any given year is a combination of disturbed plots or old plots that should be retired from the population of sample plots in favor of more accurate data.

The original strata, plot centers and plot numbering system will be reused wherever possible, plot selection for the inventory update will be a systematic sample from the original population of plots until all of the plots have been re-measured. Plots that were not initially measured for height will be preferentially chosen until all plots have height measurement data and plots shall be measured in logical groups to facilitate cruiser production and reduce transportation time between plots.

1.2. Plot Design – Summary of Measurements

The plot design consists of a circular 1/10th acre plot (37.2 ft radius) for all conifer tree species, a circular 1/20th acre (26.3 ft radius) plot for all hardwood tree species, and a 1/100th acre circular fixed radius plot for regeneration (11.8 ft radius). All plots are concentric with the same plot center (PC).

1.2.1. Circular 1/10th Acre (37.2 ft radius) Fixed-Area Plot Measurements Standing live and dead *conifer* trees >=5.0 " DBH.

- species
- diameter at breast height (DBH) measured to the nearest 1/10 inch.
- height to the nearest foot
- height to crown base
- % defect, % missing height, and defect code where needed
- height and decay class for all conifer snags 10.5 inches DBH or greater and at least 15 feet tall

1.2.2. Circular 1/20th Acre (26.3 ft radius) Fixed-Area Plot Measurements Standing live and dead *hardwood* trees >=5.0 " DBH.

- species
- diameter at breast height (DBH) measured to the nearest 1/10 inch.
- height to nearest foot
- % defect, % missing height, and defect code where needed
    - the only defect that is recorded for hardwoods is missing volume, such as missing height and large cavities. Other defects often noted in timber cruises– such as a sweep in the bole – are not applicable to hardwoods

- height and decay class for all hardwood snags greater than 5.0” DBH and 15 feet tall.

1.2.3. Circular 1/100 acre Regeneration Plot Measurements (11.8 ft radius): Standing live conifer or hardwood trees between 2.5-5.0 “ DBH (BRSC & GRF) and 1.0-5.0”DBH (Buckeye) and greater than 7 feet tall.

- species
- diameter at breast height (DBH) measured to nearest 1/10”
- Trees *7 feet* tall and above
- height to crown base

1.3. Plot Access and Road Point Procedures

Each plot will be accessed from the nearest road entry point or the prior plot. The cruiser will navigate via GPS to the plot center. A map will be provided to cruisers which shows where plots have been placed and their corresponding GPS locations will be provided on a separate spreadsheet; shapefiles will also be provided to the cruisers as requested.

1.4 Plots on Truck Roads

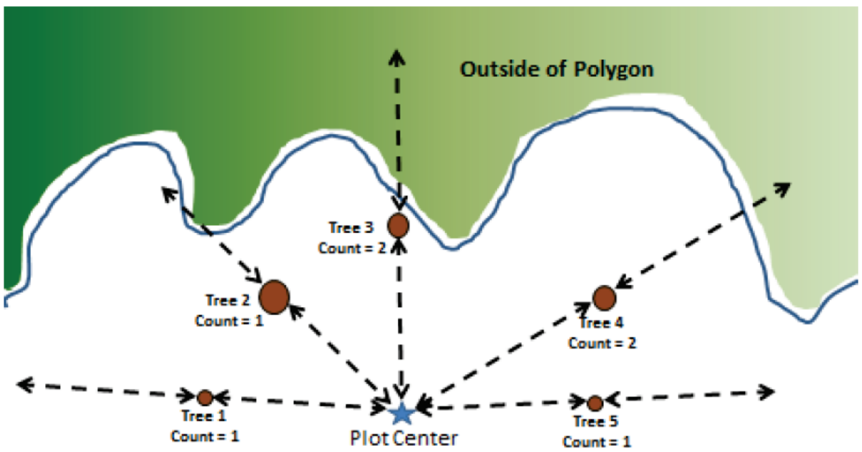
Plots are located throughout the project area and may fall on a truck road or property edge. Plots that fall on unmapped truck roads are sampled. Plots that have *any portion* of the 37.2 ft radius land on mapped truck roads are offset 1 chain to the west, and if still on truck road the cruiser returns to the original point and offsets 1 chain north. The offset shall be in a cardinal direction moving 90 degrees clockwise on the compass until a bearing is found that will lead to a vegetated plot. Landings are treated as part of the truck road and not sampled. New plot centers will be mapped and the GPS coordinates will be provided to the data manager. If after offsetting the cruiser cannot get the plot off of the truck road the cruiser shall offset 2 chains from PC starting from the west and moving in a clockwise direction until the plot can be established with no interference from the roads.

1.5 Edge Plots

If a plot is near a property boundary according to GPS coordinates, but the cruiser cannot find a clear delineation of ownership change such as a boundary line or noticeable change in timber management then the plot is established and measured normally. However, if a portion of the plot, but not the plot center, is off property and the ownership boundary is very clear (e.g., fence, blaze line, obvious land management difference like a clearcut), the Walkthrough Method[1] is used. The Walkthrough Method

[1] Ducey, M.J,, J.H. Gove, and H.T. Valentine. 2004. A Walkthough Solution to the Boundary Overlap Problem. Forest Science 50: 427-435.

(Figure 1) is a proven method to eliminate bias in boundary overlap situations. If a plot center is clearly



1. Is the tallied tree closer to the boundary, than to the plot center point?
   NO – Tree count = 1
   YES – Proceed to 2
2. Move to the point that is the same distance from the plot center to the tallied tree on the same bearing on the other side of the tree. Is this point outside of the polygon?
   NO – Tree Count = 1
   YES – Tree Count = 2

beyond the property boundary, then the plot is thrown out and the cruiser navigates to the next plot.

Figure 1. Decision Key and Diagram for Walkthrough Method. If a portion of a plot is beyond a clear boundary, the Walkthrough Method is used to collected data in a boundary overlap situation. Further explanation is available in Ducey et al (2004).

1.6 Plot Monumenting and Plot Navigation Procedures

The following monumenting procedure should occur at all plots:

1. The plot center should be monumented with a plastic stake painted orange. The stake should extend at least 18 inches above the ground and be driven securely into the soil.

2. For CFI plots the cruiser shall ensure that the PC is secure in the ground and repaint the stake and all trees as necessary. The cruiser shall carry extra stakes and orange paint at all times. The plot number should be clearly written on an aluminum tag affixed to the plot center stake along with the date cruised and the cruiser's initials. Solid pink and solid white flagging is tied to the stake and also hung in the trees above the plot center.

3. GPS coordinates taken at plot centers and should be recorded on the plot sheet. **The GPS coordinates for plot center should be recorded 2 times for each plot:**
   a. When the plot center is established
   b. When the plot is completed

4. All trees measured on the plot should have a line spray painted **at the location they were measured for DBH** on the uphill side of the tree and facing plot center where possible. "Out Trees" – Trees whose center is just outside of the plot boundary should be spray painted with and "X" at DBH.

5. Trees in the 1/20th and 1/10th acre plots are numbered consecutively starting from the north and moving in a clockwise direction until the plots are completed.

6. Trees shall be numbered consecutively starting from '1' on each plot. As trees grow into the 1/10th and 1/20th acre plots new trees shall be numbered in sequence starting with the next number on the tree list for the plot.

7. Trees within the 1/100th acre regeneration plot are marked with a painted dot at DBH facing PC.

1.7 Bearing Trees

One to three bearing trees at least 6 inches DBH and in good health shall be established on each plot. The distance (in feet) and bearing (in degrees) from the face of each tree at ground level to the plot center at ground level shall be measured and recorded. The face of each tree shall be marked with a dot of orange paint denoting the location where the distance and bearing were taken. Reported distances shall be slope distance at ground level. Bearing trees will grow therefore it will be necessary to re-measure the bearing trees each time a plot is visited to ensure that the distance and bearing are accurate. If a bearing tree falls down or is harvested a new bearing tree shall be selected. Since the measurement has to be accurate, trees with an unobstructed path to the PC shall be chosen. There shall be a minimum of 1 and maximum of 3 bearing trees per plot. Bearing trees will be recorded in the data collection system on the iPad or datasheets. The distance and bearing for each bearing tree shall be verified each time the plot is measured.

2. Sampling Procedure and Data Collection at Plots

2.1. 1/10th Acre (37.2 ft Radius) Plot for conifer trees and 1/20th Acre (26.3 ft Radius) plot for hardwood trees

2.1.1. Borderline Trees

Any tree (live or dead) near the plot border shall be measured using a tape to check for in and out trees. A laser is not recommended to determine in and out trees. When checking borderline trees, the loggers tape shall be affixed to the face of the tree at DBH and then pulled to plot center. Once at plot center, the measured slope distance should be corrected to horizontal distance. The radius of the tree should be added to the horizontal distance to plot center when calculating whether or not the tree is located within the plot—the center of the tree needs to be within the plot radius to be considered "in". **When checking in and out trees be mindful of your units, plot radius is measured in feet and 1/10 of feet whereas DBH is measured and recorded in inches. To covert diameter in inches to the radius in 1/10 of feet divide the diameter by 24. For example, a 12 in DBH tree has a radius of .5 feet (12/24). In the field a 12" DBH tree which is 37 feet horizontal distance from plot center to the face would be measured as 37.5 feet to the center of the tree or "out".**

2.1.2. Live Trees

All live conifer trees greater than or equal to inches 5.0" DBH are measured if the **CENTER** (pith) of the stem at DBH is within 37.2 horizontal feet of plot center. All live hardwood trees greater than or equal to 5.0" DBH are measured if the **CENTER** of the stem at DBH is within 26.3 horizontal feet of plot center. Trees will be tallied and measured in a clockwise direction beginning in the north. **All trees should be marked and numbered with a line painted <u>at DBH and the tree number shall be recorded by the cruiser.</u>** The following data shall be collected for each tree measured:

- **Species** – The species and species codes of trees can be found in Table 1 below.
- **Group** – Each tree in the plot has a group assigned to it. Trees can be live (..) or snags (SN). See Table 2 below for a complete description of the group codes. **All snags (SN) must have a decay class from 1 to 5 assigned**. Decay class descriptions for snags are in table 3 below.
- **Diameter at Breast Height (DBH) see figure below** – Diameters are measured at a point 4.5 feet above the ground level or root collar on the uphill side of the tree.
  - **Measurement accuracy**: Diameter tapes should be read to the nearest 1/10 inch.
  - **Irregularities in DBH**: in case of swelling, bumps, depressions, branches or swollen knots that effect normal stem form, diameters are measured immediately ***above*** the irregularity at the place where it ceases to affect the normal stem form. For redwood stump sprouts the ground level should be considered to be the point where the tree no longer contacts the parent stump. Note the "ground level" and corresponding DBH could change so the original DBH line shall be used for all future measurements.
  - **Stem irregularities due to forked tress**: If a tree forks above DBH the tree is measured as one tree at a point 4.5 feet above the ground and no adjustment is made for swollen stems or bole irregularities.
  - **DBH for Forked trees** – Forked trees are measured as two separate trees if the fork originates below DBH. When the fork originates below DBH but has subsequently grown together the tree is cruised as two trees and the DBH for each is estimated by the cruiser. If the fork originates above DBH then the tree is measured and counted as a single tree. In either case. The "pith rule" shall be used in the case where the fork has grown together or when the cruiser is uncertain of the fork location. When using the pith rule the center of each fork, or pith, of the tree is projected downward to the point where they converge. If the convergence is above DBH then the tree is cruised as one tree if the projected pith is below DBH then the tree is cruised as two trees.
  - **DBH for Extreme Lean Trees** – Trees with lean in excess of 45 degrees should be measured 4.5 feet from the point where they leave the ground. When a portion or all of the stem is in contact with the ground DBH shall be measured 4.5 feet above the root collar on the underside of the tree. See the diagrams below for the methodology for measuring leaning trees.

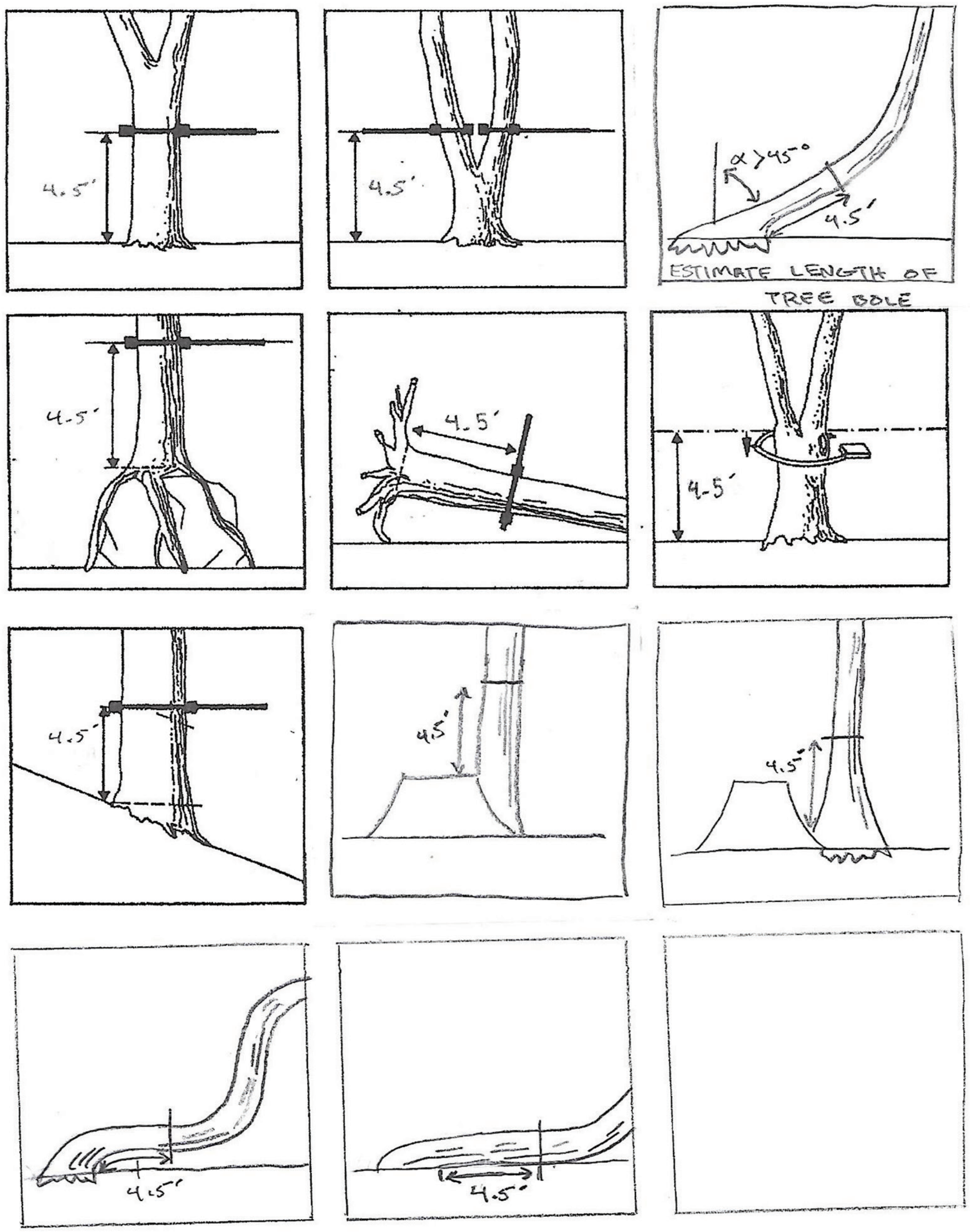


Figure 2. Point of measurement of diameter at breast height (from Pancel, 1993)[2]

[2] Pancel, L., ed. 1993. Tropical forestry handbook. Berlin, Germany, Springer-Verlag. Volume 1, 738 pp

- **<u>Height</u>** – Total height, measured to the nearest foot of the terminal leader on conifers and the highest point on hardwoods is recorded for all live tree trees >= 5 " DBH and for all **snags greater than 5.0"DBH and 15 feet tall**.[3] o
  - **<u>Leaning Trees</u>** – All conifers and tanoak with lean are measured for total vertical height from the ground at stump height to the tree top. If the lean is more than 45^{o} (100% slope), the total length of the primary bole is estimated and defect code 930 shall be recorded in the defect column of the IPAD or data sheet.
  - **<u>Height to broken top</u>**: Height to broken top is measured for trees that are broken at 4 inches in diameter or larger and defect code 91 is entered on the IPAD or data sheet.
  - **<u>Reiterated top</u>**: The height of trees with reiterated tops is recorded as the height to the break as described above or the height to the reiterated top using the following guidelines: If the reiterated top is at least 10% of the height of the tree as measured to the break then the reiterated top is considered the "top" and the tree is coded as "live". If the reiterated top is less than 10% of the height of the tree as measured to the break, then the height to the break is recorded and the tree coded as 91.
- **<u>Height to Crown Base (HTCB)</u>** – This measurement provides an estimate of the total vertical crown area. The measurement is taken on every height measure tree. The measurement is taken from the base of the tree on the uphill slope to the visually balanced base of the crown, since tree crowns are often irregular. Figure 2 below provides examples of how the height to crown base measurement is acquired.

[3] Every 3rd plot has height and height to crown based measured starting with the first plot measured in a stand.

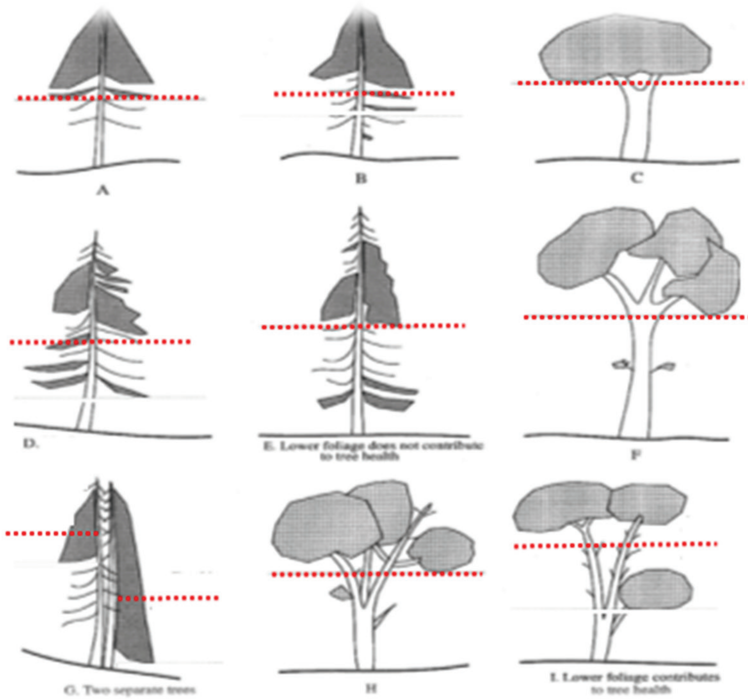


Figure 3. Height to Crown Base Measurement Examples (use the dotted line)

- **<u>Damage/Defect/Missing Volume</u> –** A damage code is assigned to damaged trees. See codes in Table 4 below for descriptions of these codes. Damaged trees should have a defect % recorded. Cruisers shall deduct for defect and missing volume as a percent of the total tree volume. The percent missing volume should be recorded on trees with large hollows that impact the gross volume of the tree the missing volume must be at least 10% to be recorded. Defect deductions and missing volume is only recorded for visible defect in trees ≥ 8 inches DBH. Missing volume due to broken tops is assumed to be captured in the section on measuring trees with broken tops.

2.1.3.Snags (Standing Dead Trees[4]) > 15ft Tall

All snags over 5.0" DBH and 15ft tall should be measured for **DBH** and **height** and should have their species noted. All conifer snags and Hardwood snags with the 1/10 and 1/20th acres plot respectively are recorded. All snags must have their **decay class** noted in the defect column (see Table 3 for Decay Classes). All snags should have a line painted where they were measured for DBH and their tree number painted above this line. They should be given a number in sequence with the live trees. Residual (old growth) stumps are not measured as snags unless they are at least 15' high as measured from the uphill side of the tree.

[4] Standing dead trees and snags are synonyms, and are used interchangeably in this document.

Table 1: List of Tree Species and their Species Codes

Species Code	Scientific Name	Common Name
AS	*Fraxinus sp.*	Ash species
BM	*Acer macrophyllum*	Big Leaf Maple
BO	*Quercus kellogii*	Black Oak
BP	*Pinus muricata*	Bishop Pine
CB	*Umbellularia californica*	California Bay
CO	*Quercus chrysolepis*	Canyon Live Oak
CU	*Aesculus californica*	California Buckeye
DF	*Pseusostugsa mensziesii*	Douglas-fir
EF	*Ficus carica*	Edible Fig
GC	*Chrysolepis chrysophylla*	Giant Chinquapin
GF	*Abies grandis*	Grand Fir
LO	*Quercus wislizenii and Quercus Parvula var. shrevei*	Interior Live Oak & Shreve's Oak
MD	*Cornus nuttallii*	Mountain Dogwood
MP	*Pinus radiata*	Monterey Pine
NM	*Torreya californica*	California Nutmeg
OL	*Olea europa*	Olive
PM	*Arbutus mensziesii*	Madrone
PP	*Pinus ponderosa*	Ponderosa Pine
PY	*Taxus brevifolia*	Pacific Yew
RA	*Alnus rubra*	Red Alder
RW	*Sequoia sempervirens*	Redwood
SP	*Pinus lambatiana*	Sugar Pine
TO	*Lithocarpus densiflorus*	Tanoak
TY	*Heteromeles arbutifolia*	Toyon
UK	N/A	Unknown
WA	*Alnus rhombifolia*	White Alder
WH	*Tsuga heterophylla*	Western hemlock
WI	*Salix sp.*	Willow species
WM	*Myrica californica*	Wax Myrtle
WO	*Quercus garryana*	Oregon White Oak

Table 2: Group Code Descriptions

Status Code	Code Definition	Description
..	Live	Default code for all trees with normal form including regeneration.
SN	Snag	Standing trees that are dead. Snags have no branches or leaves and are greater than 15 ft tall.

Table 3: [5]. Snag Decay Class Descriptions

Decay class	Limbs and branches	Top	% Bark Remaining	Sapwood presence and condition *	Heartwood condition *
1	All present	Pointed	100	Intact; sound, incipient decay, hard, original color	Sound, hard, original color
2	Few limbs, no fine branches	May be broken	Variable	Sloughing; advanced decay, fibrous, firm to soft, light brown	Sound at base, incipient decay in outer edge of upper bole, hard, light to reddish brown
3	Limb stubs only	Broken	Variable	Sloughing; fibrous, soft, light to reddish brown	Incipient decay at base, advanced decay throughout upper bole, fibrous, hard to firm, reddish brown
4	Few or no stubs	Broken	Variable	Sloughing; cubical, soft, reddish to dark brown	Advanced decay at base, sloughing from upper bole, fibrous to cubical, soft, dark reddish brown
5	None	Broken	Less than 20	Gone	Sloughing, cubical, soft, dark brown, OR fibrous, very soft, dark reddish brown, encased in hardened shell
***Characteristics are for Douglas-fir. Dead trees of other species may vary somewhat. Use this only as a guide.**					

[5] Forest Service. 2012. Forest Inventory and Analysis National Core Field Data Collection Procedures for Phase 2 Plots. Version 6.0. Page 427. National Core Field Guide, U.S. Department of Agriculture, Forest Service

Table 4: Damage Codes

3 - Chemical	1 - Foliar (broadcast)	0 - Unspecified		
	2 - Stem (spot	1 - Light Damage		
		2 - Moderate Damage		
		3 - Severe Damage		
		4 - Fatal Damage		
4 - Disease	1 - Mistletoe	1 - Light Damage		
	2 - Needle Rusts	2 - Moderate Damage		
	3 - Stem Decay	3 - Severe Damage		
	4 - Stem Rusts	4 - Fatal Damage		
	5 - Stem Cankers			
	6 - Root Disease			
5 - Insects	2 - Bark Beetles	1 - Light Damage		
		2 - Moderate Damage		
		3 - Severe Damage		
		4 - Fatal Damage		
6 - Animal	1 - Deer & Elk			
	2 - Bear	1 - Light Damage		
	3 - Livestock	2 - Moderate Damage		
	4 - Porcupine	3 - Severe Damage		
	6 - Small Mammals	4 - Fatal Damage		
9 – Physical and Mechanical	1 - Broken top	Fork codes	Lean Codes	Codes For
	2 - Dead Top	1 - Below	1 - <25	0 – height
	3 - Multiple Tops	2 - Above	2 - 26 to 45	1 - Light
	4 - Forked Tree	3 - Above	3 - >45	2 - Moderate
	5 - Leaning Tree			3 - Severe
	6 - Crook or Sweep			4 - Fatal
	7 - Bole Cracks			
	8 - Epicormic Branching			

2.2. 1/100 Acre (11.8 ft radius) Plot

2.2.1.Regeneration – Trees < 5.0” DBH

The sample area measured for regeneration is a fixed 1/100th acre plot (11.8 ft radius). All live trees between 2.5” and 5.0” DBH (BRSC & GRF) and 1.0” and 5.0” DBH (Buckeye) and at least 7’ tall are measured in the 1/100th nested plot. All species with a tree form are measured, (see table 1 for species that should be measured as trees), if the individual meet the minimum DBH and height requirements.

- **Species** – Record species for all trees
- **DBH** – All live trees greater than 2.5” (1.0” for Buckeye) and less than 5.0” at DBH if the pith of the tree is within the 1/100th acre plot where it comes out of the ground.
- **Height** – All live trees greater than or equal to 7 feet tall are measured to the nearest foot.

2.3. Additional Plot Information

Any further information concerning the stand being cruised can be extremely important.

- GPS coordinates should be recorded at each plot center when the plot is established, and again when the plot is completed.
- The cruiser should also record plot aspect, % slope, cruiser, and date
- Items that should be noted are the location of skid trails that occur within the plot, springs, watercourses and historical artifacts when they assist in relocating the plot.
- Wildlife species of concern observed should be noted including raptors and their nests pileated wood peckers, tree vole, red legged frog, mountain lions, bears, etc.
- If a plot has no trees, please make a note of the plot conditions and record one species with species code XX, DBH equal to 12, and tree count equal to 0.

2.4. Site Class Sampling

Site tree sampling was completed in 2013 (Buckeye) and 2015 (GRF & BRSC) and no additional site tree data is required. This section is to remain in the OPDR for reference.

3. Data Entry and Transfer

Data will be collected using iPad tablets or other data logger provided by the cruising contractor. Cruisers shall email completed data to TCF at the end of each work day or as agreed. Cruisers should carry paper data sheets in the field so that data can be collected in the event that an iPad stops functioning.

4. Check Cruise Specifications

Total plot carbon and gross board foot volume must be within 5% of the check cruise results. Any cruiser who has more than 25% of their plots outside of this 5% range must have all of their plots re-cruised at their expense.

APPENDIX M

Garcia River Forest
Site Specific Management Plan
July, 2006

1 INTRODUCTION

1.1 TMDL Introduction

The Garcia River contains habitat or previously had habitat for Coho salmon, Chinook salmon, Pink salmon, and steelhead trout. The Central Coast Evolutionarily Significant Unit of Coho salmon is state and federally listed as endangered. Chinook salmon and steelhead trout are both state and federally listed as threatened. Further the Garcia River watershed has been listed by the U.S. EPA as impaired due to excessive sediment and temperature and has been placed on the 303(d) list of impaired water bodies. A Total Maximum Daily Load (TMDL) for sediment has been established for the Garcia River watershed by the North Coast Regional Water Quality Control Board (NCRWQCB).

The Basin Plan currently designates the following beneficial uses in the Garcia River watershed: municipal and domestic supply; agricultural supply; industrial service supply; freshwater replenishment; navigation; water contact recreation; non-water contact recreation; commercial and sport fishing; cold freshwater habitat; wildlife habitat; rare, threatened and endangered species; migration of aquatic organisms; spawning, reproduction and/or early development; and estuarine habitat.

In accordance with the Action Plan for the Garcia River Watershed Sediment TMDL (Garcia TMDL Action Plan), The Conservation Fund (TCF) submitted a statement of intent to the NCRWQCB declaring its intention to adopt Option 2 of the Action Plan, preparation of an Erosion Control Plan (ECP) and Site Specific Management Plan (SSMP), for its 23,780-acre ownership in the Garcia River Watershed (see Watershed Map). The ECP identifies areas of risk for sediment delivery and the control of sediment delivery associated with past and present land management. Adherence to the implementation plan and SSMP will reduce future risk of sediment delivery from TCF's property and will increase the ability of streamside areas to properly function with regard to sediment filtering, large woody debris recruitment, and stream bank stabilization.

TCF's ECP and SSMP are focused on timber harvesting methods, road construction, reconstruction, decommissioning, and silvicultural practices; no commercial gravel mining, ranching or other industrial operations are expected to occur.

Elements of the ECP are being developed in stages eventually covering the entire ownership (see detailed discussion, below). Therefore the ECP shall follow the SSMP in its development.

1.2 Garcia River Forest Introduction

The Garcia River Forest (GRF) is a 23,780-acre property (also referred to as the "Property" or the "Forest") located almost entirely within the Garcia River Watershed. The GRF was acquired in 2004 by The Conservation Fund, a non-profit that actively manages the Property for sustainable timber production while protecting, enhancing, and restoring the property's significant natural, ecological, and aesthetic values. The Property was purchased with both public and private funds. A conservation easement held by The Nature Conservancy (TNC) permanently protects the Property's significant water resources, springs and the water quality thereof, among many other purposes, and requires that 35 percent of the Property be maintained as a permanent ecological reserve network (see attached Reserve Area Map). The Conservation Fund has partnered with TNC, state agencies, and local consultants and stakeholders to prepare an Integrated Resource Management Plan (IRMP) for the property. The TMDL and Action Plan for the Garcia provided the basis for IRMP topics regarding water quality and watershed management; once complete, the SSMP and ECP will provide a detailed management framework.

An extensive overview and general analysis of sediment sources on the Garcia River Forest was completed by Jack Monschke Watershed Management in February 2005, approximately one year after purchase of the property in 2003 (see detail under "Baseline Data Inventory," below).

The specific baseline data inventory required in the ECP for roads and watercourse crossings is expected to require two to three years to complete from commencement in the spring of 2006. Baseline inventories of the Inman and Signal Creek planning watersheds by Pacific Watershed Associates (PWA) will be completed first and are currently underway. The remainder of the property including the North Fork Garcia, Middle Fork Garcia, Blue Waterhole Creek and Upper Garcia sub watersheds are expected to be completed in 2006 and 2007. Site-specific remediation measures for each site identified during the road inventory will be recorded and prioritized following completion of the inventory.

An assessment of geologically unstable areas was completed by Monschke and Best (1997) for the previous landowner in connection with a Watershed and Aquatic Habitat Assessment. The data and maps applicable to the Garcia River Forest have been adapted as the Assessment of Unstable Areas within the ECP. The Overview prepared by Jack Monschke has also been adapted into the Assessment of Unstable Areas. Other sources such as Kris Garcia may be used to develop and refine the mass wasting component of the ECP. Guidelines for operations on and near unstable areas are described in the SSMP and shall include provisions for silvicultural prescriptions, logging methods and road construction or reconstruction.

2 SITE-SPECIFIC MANAGEMENT PLAN

This Site-Specific Management Plan (SSMP) is a compilation of commonly used erosion control measures employed in the North Coast Region combined with requirements of the Garcia River TMDL to improve riparian habitat and function. Additionally the goals and objectives of the IRMP have been incorporated into this SSMP and are used to improve required protection measures as well as justify other proposed practices to protect water quality.

This SSMP is outlined in two basic components as detailed in the Garcia River Action Plan:

1) A description of land management measures to control sediment (Section 2.1), including a Road Management Plan to guide land managers with updated road design and

road location techniques as well as develop criteria to determine how roads should be treated based on their use classification (Section 2.2); and

2) A description of land management measures to improve the condition of the riparian management zone (Section 2.3). A comparison and description of proposed mitigation measures is provided in Section 2.4.

The measures incorporated into the SSMP shall provide equal protection to streams as those listed in the Garcia River Management Plan (GRMP) and in practice many elements of the GRMP will be adopted as best management practices for this SSMP.

2.1 Description of Land Management Practices to Control Sediment

The descriptions below pertain to sediment control from the following sources:

- Roads, landings, skid trails, watercourse crossing construction, reconstruction, maintenance, use, and obliteration (Section 2.1.1);
- Use of skid trails and landings (Section 2.1.2);
- Operations on unstable slopes (Section 2.1.3); and
- Use of near stream facilities (2.1.4).

2.1.1 Roads, Landings, Skid Trails, Watercourse Crossing Construction, Reconstruction, Maintenance, Use, and Obliteration

The Garcia River Forest is preparing a long term road plan with site specific information for the entire 24,000-acre ownership. Pacific Watershed & Associates was awarded funding by CDF&G to conduct road inventories throughout the Property. Inventories are underway which will enable completion of the Long Term Road System Plan by June 2007.

The current location of all known roads and watercourse crossings are shown on the attached property map. As the inventory proceeds the crossing types will be attributed and tabulated to determine the status and maintenance needs of each crossing.

The current road status is shown on the property map as either "permanent" with rock surface or "seasonal" with a dirt or unknown surface. As the inventory commences road status will be updated to reflect the current condition if it is different from the mapped designation.

The future plan and repair schedule for each road will be determined after the inventory is complete. At this time it is felt the best approach is to prioritize road repairs based on their potential to deliver sediment. Roads with a high sediment delivery potential shall be scheduled for repair first. To facilitate repairs and control cost road improvements will likely be completed on a sub-watershed or planning watershed level and cycle through the ownership by watershed. Emergency repairs and maintenance will continue property wide. Additionally, a mini road inventory shall be conducted for each THP if the THP is initiated before the PWA inventory is completed for a particular stretch of road or road system. The inventory shall include all of the same attributes as the road plan and all sites noted shall be repaired as part of the THP. Therefore it can be expected that all sites associated with a THP shall be repaired within five years of approval of the THP, although the actual rate of repairs will likely be sooner. Sites within THPs may also be prioritized such that some are mandated to be repaired during the first year of operations.

<u>Permanent Roads</u>: Roads used year round shall be designed, constructed, reconstructed or upgraded to permanent road status with the application of an adequate layer of competent

rock for surface material and the installation of permanent watercourse crossings and road prism drainage structures. These roads shall receive regular and storm period inspection and maintenance as required throughout the winter period.

Seasonal Roads: Roads used primarily during the dry season but to a limited extent during wet weather. These roads shall be designed, constructed, reconstructed, and upgraded to provide permanent watercourse crossings either culverts or rock fords and road surface drainage structures. Roads shall be upgraded as necessary with the application of spot rocking where needed to provide a stable running surface during the specified period of use. These roads shall receive inspection at least once during the wet weather period and shall receive at least annual maintenance.

Temporary Roads: Roads designated as temporary shall be designed to prevent erosion such that regular and storm period maintenance is not needed to prevent sediment discharges to a watercourse. All watercourse crossings, except rock fords, shall be removed prior to October 15 of each year of installation. Inspections of these roads will occur for three years after use. Ordinary maintenance will be performed when the road is opened for use.

All new roads and reconstructed roads shall be constructed in accordance with The California Forest Practice Rules and *The Handbook for Forest and Ranch Roads* (Weaver and Hagans, 1994).

All watercourse road crossings shall, at a minimum, utilize the standards described on pages 64 - 79 of the *Handbook for Forest and Ranch Roads*. These standards include but are not limited to the design and installation of permanent crossings using a culvert with a minimum diameter designed to pass at least a 100-year storm event. All crossings shall be designed and installed to prevent the diversion of stream flow down or through the road prism in the event of culvert failure, and to provide free passage to fish at all flow regimes. All watercourse road crossings that do not meet these minimum standards must be scheduled as necessary for upgrade as Sediment Delivery Sites under the Erosion Control Plan.

All road design, construction, and reconstruction shall use, at a minimum, the standards described on pages 39 - 54 and 81 - 120 of the *Handbook for Forest Ranch Roads*. These standards include but are not limited to the outsloping of the road prism (whenever feasible and safe) and the installation of rolling dips (rather than water bars) for additional road drainage. If insloped roads are necessary, ditch relief culverts shall be installed, at a minimum, at the distances described in Table 20 of the *Handbook for Forest and Ranch Roads*, and located to prevent discharge of road drainage directly onto erodible soils. All roads that do not meet the minimum standards must be scheduled as necessary for upgrade as Sediment Delivery Sites under the Erosion Control Plan. After January 3, 2002, there shall be no use of roads or near stream facilities, when the activity contributes to the discharge of visibly turbid water that causes a visible increase in the turbidity of an adjacent watercourse. As an exception, short-term, temporary use of near stream facilities may occur if there is no feasible alternative. A general Road Management Plan is included in the SSMP describing proposed road management practices.

2.1.2 Use of Skid Trails and Landings

Skid trail use will be limited by the general harvesting practices in the Forest Practice Rules 14 CCR 914 and further governed by the equipment exclusion and limitation zones described in the Riparian Management Section.

When skid trails are proposed for use within 200 feet of a watercourse and on slopes over 40 percent only stable existing trails will be used.

GRF will describe in timber harvest plans when and where skid trail use within the WLPZ will occur. The use of skid trails, landings or designated crossings in these areas is allowed if it can be shown that alternative yarding practices would create a greater risk and magnitude of sediment delivery or the cost of implementing those alternatives is not reasonable.

No construction of new trails on slopes over 40 percent within 200 feet of a Class I or II or III watercourse unless developed in consultation with a CEG and approved by the NCRWQCB. No use of trails on unstable slopes will be allowed within 200 feet of a Class I, II or III watercourse unless developed in consultation with a CEG and approved by the NCRWQCB. Stream protection measures are described in the table below. A variable width Watercourse and Lake Protection Zone has been established depending on slope. The zones apply to the use of heavy equipment near streams except for approved tractor crossings. Provisions for the use of near stream facilities within the WLPZ are incorporated when it can be shown as the least damaging alternative. Equipment use within the WLPZ will be allowed on stable existing trails subject to inspection and approval of a multidisciplinary review team. All temporary watercourse crossings designed to carry less water and debris than predicted for a 50-year flood discharge shall be removed and stabilized by October 15 of each year of installation. The approaches to all temporary watercourses crossings shall be pulled back to create side slopes of less than 50 percent where possible, and stabilized with rock, grass seed or slash mulched after removal.

Off-channel water drafting locations shall be developed to the extent feasible through the use of storage tanks or developed springs. Drafting shall conform to appropriate agency guidelines and applicable stream encroachment permits.

2.1.3 Operations on Unstable Slopes

The following list is composed of land management measures described in the GRMP that apply to operations on unstable slopes throughout TCF's ownership within the Garcia River watershed:

- No road construction shall occur across unstable areas without the field review and development of site specific mitigation measures by a Certified Engineering Geologist registered in the State of California. A report prepared by the Certified Engineering Geologist (CEG) shall be submitted with the THP which shall serve as notification to the NCRWQCB.

- Timber harvest activities on all slides and unstable areas must retain at least 50 percent evenly distributed total overstory and understory canopy with a higher canopy retention standards at the toe of the feature. Overstory canopy may be composed of conifers and hardwoods. Timber harvest activities proposed for these features shall be accompanied by a geologic report prepared by a licensed California Certified Engineering Geologist or Registered Geologist.

- No concentrated flow shall be directed across the head, toe, or lateral margin of any unstable area.

Mass Wasting Sensitivity Zones

Mass Wasting Sensitivity Zones (MWSZ) were developed and mapped by Tim Best, CEG and Jack Monshkee, watershed specialist as part of an Aquatic habitat Assessment developed in 1997 for the property. The following paragraphs describe MWSZ characteristics and the matrix at the end of this section has operational prescriptions previously developed for each zone.

The landscape is divided into five separate Mass Wasting Sensitivity Zones (MWSZ) representing different levels of inferred landslide hazard. Each MWSZ was qualitatively delineated based on similar physical characteristics contributing to shallow slope instability, the potential for shallow landslides to deliver sediment to stream channels and the potential for future land use activities to influence shallow hill slope stability. The following attributes were considered when mapping the terrain into MWSZs:

- Landslide characteristics: type, size, frequency, distribution and history
- Geomorphic characteristics: slope gradient and form
- Sediment delivery potential: landslide type and proximity to streams
- Physical characteristics: soil and bedrock.

The delineation of each MWSZ was based on qualitative observations of shallow landslide characteristics, geomorphic characteristics (slope gradient and form) and sediment delivery potential made from aerial photographs with limited field verification, coupled with a GIS-based analysis of average slope gradient and soils type. Average slope gradients were determined from digital terrain models (DEM). Localized slope gradients were identified from topographic maps, aerial photographs and limited field reconnaissance. Because most of the deep-seated landslides are not associated with past or potential land use activities, the occurrences of such slides were not incorporated into the delineation of MWSZ.

The delineation of MWSZ boundaries for each area of the property was based on interpretive judgments that apply to relatively large areas of the property. In the interest of caution, and because conditions within each area may vary, emphasis was placed on capturing areas of higher landslide sensitivity.

Mass Wasting Sensitivity Zones are shown on the maps entitled Landslide and Mass Wasting Sensitivity Zone Map. A description of each Mass Wasting Sensitivity Zone is found below.

MWSZs 1 & 2

- **Characteristics:** MWSZs 1 and 2 are located on gentle to moderate slopes where there are relatively few shallow mass wasting features. MWSZ 1 is characterized by low gradient slopes (average slope gradients less than 35%) occurring along ridge crests and valley bottoms. MWSZ 2 is characterized by moderate slopes with average slope gradients ranging between 35% and 55%. Mass wasting in both of these zones is uncommon and the surface does not exhibit debris slide morphology. These zones as depicted may contain locally steeper areas more prone to land sliding that were not detected on photos or topographic maps.

- **Shallow Landslides:** Shallow landslides are infrequent in both of these zones, accounting for less than 15% of the total. Due to moderate slope gradients, significant sediment delivery from any shallow landslide occurring within the zone is anticipated to be low.

- **Deep-seated Landslides:** Large-scale, deep-seated, ancient to dormant translational/ rotational landslides and earth flows may be contained within the unit but because of the low level of inferred activity they have a low probability for significant sediment delivery.

MWSZ 3

- **Characteristics:** MWSZ 3 is located on moderate to steep side slopes with shallow landslides locally evident but not abundant. Slopes are locally incised by narrow and steep first to second order stream channels and shallow to deep bedrock hollows. Within this zone average slope gradients are generally between 55% and 65% although in some areas slopes will exceed 65%. This zone may contain small areas of locally steep ground and strongly convergent topography not identified by this remote analysis that would otherwise be classified as MWSZ 4.

- **Shallow Landslides:** MWSZ 3 unit is moderately stable, with moderate to few shallow debris slides and debris torrents per unit area. Sediment delivery is based on proximity to a stream channel and existence of convergent slope that may enhance sediment delivery to a watercourse. Sediment delivery from debris slides initiating in MWSZ 3 ranges from low to moderate, although many of the slides that initiated adjacent to stream channels have a high sediment delivery ratio compared to slides that initiated on planar to divergent slopes.

- **Deep-seated Landslides:** Large-scale, deep-seated ancient to dormant translational/ rotational landslides and earth flows may be contained within the unit, but because of the low level of inferred activity they have a low probability for significant sediment delivery.

MWSZ 4

- **Characteristics:** MWSZ 4 is confined to select bedrock hollows and swales located within the heads of first order channels. These areas are located on steep gradient slopes with strongly convergent form and either exhibit a relatively high density of shallow landslides or are morphologically similar to such areas. The width of the unit is typically between 300 and 500 feet with average slope gradients often exceeding 60%. Often the zone extends the entire distance down slope along the narrow channel.

  It is the combination of strongly convergent slope form and relative high density of shallow landslides that distinguishes MWSZ 4.

- **Shallow Landslides:** MWSZ 4 is moderately to highly prone to shallow debris slides and debris torrents originating near the axis of the steep swales where thick soils accumulate and surface and subsurface storm runoff is concentrated. Based on measurements of landslide surface area, shallow landslides originating in MWSZ 4 account for nearly 50% of the total debris flows/torrents and nearly 24% of the total shallow landslides across the property. A disproportionate number of slides are debris flows/torrents which characteristically have a very high sediment delivery ratio. Many of the debris slides and debris torrents are road and/or skid trail related.

- **Deep-seated Landslides:** Large-scale, deep-seated ancient to dormant translational/ rotational landslides and earthflows may be contained within the unit but have a low potential for significant sediment delivery.

MWSZ 5

- **Characteristics:** MWSZ 5 is located on steep inner gorge or near inner gorge slopes with a relatively high density of shallow landslides. Slopes are typically planar and smooth, descending directly to first order or larger streams. Slope gradients generally exceed 70%. A break in slope often delineates the upslope edge of the gorge. This unit may contain gentler slopes located along the valley bottoms that were not identified in this remote analysis.

- **Shallow Landslides:** Shallow debris slides are very common throughout the zone. Debris flows/torrents, on the other hand, are relatively rare, presumably due to a thin soil mantle and the characteristic planar nature of inner gorge slopes. Shallow slope failures within MWSZ 5 account for approximately 50% of all shallow landslides.

  Most failures are attributed to slope steepness and undercutting by stream bank erosion. A large number are road related, caused by diverted road runoff and/or fill instability. A secondary cause of failure is loss of soil strength from root decay following timber harvesting. Due to the steep nature of the slopes, which descend directly to the stream channel, sediment delivery from failures within Zone 5 is typically very high.

- **Deep-seated Landslides:** Large-scale, deep-seated ancient to dormant landslides and earthflows may be contained within the unit but have a low potential for significant sediment delivery.

Prescriptions used on geologically unstable areas are enumerated below in the Mass Wasting Management Matrix .

Management Activity	MWSZ 5	MWSZ 4	MWSZ 3	MWSZ 2	MWSZ 1
Road and Landing Construction	If inner gorge topography, no new road or landing construction unless field reviewed and approved by a California Registered Geologist. If not inner gorge topography road construction shall be minimized. If road construction must occur, the road must utilize the highest design standards to lower risk of mass wasting sediment delivery.	If inner gorge topography, no new road or landing construction unless field reviewed and approved by a California Registered Geologist. If not inner gorge topography road construction shall be minimized. If road construction must occur, the road must utilize the highest design standards to lower risk of mass wasting sediment delivery.	No new road construction across steep convergent swales unless field reviewed and approved by a California Registered Geologist and it is the best road alternative.	Roads and landings shall be constructed at design standards that lower risk of mass wasting sediment delivery.	Roads and landings shall be constructed at design standards that lower risk of mass wasting sediment delivery.
Use of Existing Haul Roads and Landings	Existing roads and landings shall be abandoned when no longer needed. If abandoning is not feasible, then roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery.	Existing roads and landings shall be abandoned when no longer needed. If abandoning is not feasible, then roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery.	Existing roads and landings shall be abandoned when no longer needed. If abandoning is not feasible, then roads or landings shall be maintained at the design standards that lower risk of mass wasting sediment delivery.	Roads and landings shall be maintained at design standards that lower risk of mass wasting sediment delivery.	Roads and landings shall be maintained at design standards that lower risk of mass wasting sediment delivery.

Management Activity	MWSZ 5	MWSZ 4	MWSZ 3	MWSZ 2	MWSZ 1
Tractor Yarding	Equipment exclusion zones on inner gorge slopes. Equipment exclusion zones on non-inner gorge slopes except for existing roads or where alternative-yarding method creates potential for greater sediment delivery.	Equipment exclusion zones on inner gorge slopes. Equipment exclusion zones on non-inner gorge slopes except for existing roads or where alternative-yarding method creates potential for greater sediment delivery	Equipment limited existing roads or stable trails.	Tractor trails will be maintained or utilized such that they will not increase the risk of mass wasting in this unit.	No special actions
Tractor Trail Construction or Reconstruction	No new tractor-trail construction.	No new tractor trail construction unless field reviewed and approved by a California Registered Geologist.	No new tractor trail construction unless field reviewed and approved by a California Registered Geologist unless it is the best skid trail alternative	Tractor trails will be constructed such that they will not increase the risk of mass wasting in this unit.	No special actions

Management Activity	MWSZ 5	MWSZ 4	MWSZ 3	MWSZ 2	MWSZ 1
Timber Harvest	No harvest on inner gorge slopes unless field reviewed and approved by both a California Registered Geologist. On non-inner gorge slopes the AMZ retention standards apply. If unit extends above AMZ retain 50% canopy with trees dispersed evenly across slope unless field reviewed and approved by a California Registered Geologist.	No harvest on inner gorge slopes unless field reviewed and approved by both a California Registered Geologist. On non-inner gorge slopes the AMZ retention standards apply. If unit extends above AMZ retain 50% canopy with trees dispersed evenly across slope unless field reviewed and approved by a California Registered Geologist.	Retain 50% canopy with trees dispersed evenly across slope Tree retention shall be emphasized in the axis of headwall swales. Deviations from this default must be field reviewed and approved by a California Registered Geologist.	No special actions	No special actions
Heavy Equipment Site Preparation or Burning	No site preparation will occur in MWMU 1	No site preparation will occur in MWMU 2	No heavy equipment site preparation. Some broadcast burning may occur. No ignition of broadcasting burning in this unit. Fire will be avoided in the unit where possible.	No special actions	No special actions

2.1.4 Use of Near Stream Facilities

The only features that may occur as near stream facilities are the development of rock pits, existing camping areas for logging and management crews and areas designated for public access which will be defined at a later date.

If rock pit use or development occurs within the riparian management zone of a Class I, II or III watercourse, runoff from the site will be contained either by an earthen berm around the pit or straw bail check dams to filter water runoff from rock pits.

2.2 Road Management Plan

The Road Management Plan is organized into the following sections:

- Background and Overview (2.2.1);
- Road Management Timeline (2.2.2);
- Road Maintenance and Improvement Guidelines (2.2.3);
- Winter Operations (2.2.4); and
- Road Decommissioning Guidelines (2.2.5).

2.2.1 Background and Overview

Please refer to Section 1.2, Garcia River Forest Introduction, for background information.

The 24,000-acre Garcia River Forest includes approximately 247 miles of roads ranging from permanent to temporary.[1] The Garcia River Forest Base Map shows the road class, location and watercourse crossings currently identified within the Garcia River Forest.

It has been documented that forest roads can contribute sediment to streams. Increased stream sediment can result in cemented gravels reducing salmonids ability to spawn and/or inhibiting fry emergence. High sediment levels can also cause pool filling and associated reduction in pool habitat. Extreme sediment loads can cause stream temperatures to be elevated due to the reduction in stream depth. Near stream roads can also reduce stream shading where the road is very wide or very close to the stream. Reduced stream shading has been shown to be linked to increased water temperature which also stresses juvenile salmonids.

The previous landowner conducted minor road maintenance activities and remediation projects; however, the forest land and roads have been essentially resting for the past six years. These and other past management practices on the Property have reduced road related stream sediment. Specifically many bridges and multi-plate culverts have been installed to replace standard culverts on Class I streams. Class II watercourse crossings have been rock armored and new culverts buried to stream grade or slightly below stream grade. WLPZ roads have been rocked or otherwise improved to reduce stream sedimentation caused by near stream roads. Many other forest roads have also been rocked.

GRF is committed to continuing this trend of road improvement over time and has developed and will continue to refine the Road Management Plan to: 1) reduce sediment inputs resulting from the existing road network as well as minimize potential inputs from new roads; 2) develop proactive measures to help reduce stream sedimentation as a result of road runoff in collaboration with regulatory agencies and other partners; 3) develop a timeline for road maintenance, upgrade, conversion and decommissioning activities; and 4) guide and dovetail with the development of THPs, restoration projects, monitoring efforts, and other activities throughout the Property.

[1] Item descriptions from CDF Forest Practice Database Dictionary

Permanent existing mainline roads which form the core of the road system and provide access for fire suppression, log hauling, wildlife surveys, future road improvement and abandonment projects and other management activities shall be maintained to provide all weather access. The roads shall be out-sloped with a minimum reliance on ditch relief culverts. New watercourse crossings shall be sized for 100-year storm events or preferably rock ford crossings. Culverted crossings shall be constructed with a critical dip so there is a minimum of diversion potential should the culvert become blocked. Permanent roads shall be surfaced and maintained with a layer of competent rock.

Secondary roads, seasonal and temporary roads will be evaluated during the road assessment currently underway by PWA. It is expected that maintenance and improvements of secondary roads will primarily be carried out with grant funding or in conjunction with THPs, with the exception of emergency repairs and high priority sites as previously described. Secondary roads shall be constructed and maintained to allow season access for resource management activities. The roads shall be out-sloped with a minimum reliance on ditch relief culverts. New culverted watercourse crossings shall be sized for 100-year storm events or preferably be rock ford crossings. Culverted crossings shall be constructed with a critical dip so there is a minimum of diversion potential should the culvert become blocked.

At present there are no roads designated as temporary on the Property. It is expected that many roads currently classed as seasonal shall be downgraded or converted to temporary road status following the property wide road assessment.

2.2.2 Road Management Timeline

It is GRF's long-term goal to develop a road system which provides access to the Property for fire protection, resource surveys, monitoring, harvest planning, research, education, public access, and other activities while reducing annual maintenance expense. It is expected that timber resources will be managed with uneven age silvicultural systems with a ten to twenty year harvest cycle. Road improvement projects that are not treated through grant funding and annual maintenance will generally be completed in conjunction with THPs and therefore the timeline to rotate through the Property with road upgrades will be similar to the overall harvest schedule. As described previously, sites in need of immediate attention will be remediated within the first ten-year period. Projects which require a 1603 stream alteration permit and do not otherwise qualify as an emergency repair will likely be conducted in conjunction with grant funded programs or nearby THPs.

Garcia River Forest will use the road inventory system developed by Pacific Watershed Associates and other existing sources to evaluate and prioritize sites and conduct effectiveness monitoring over time.

2.2.3 Road Maintenance and Improvement Guidelines

The purpose of this section is to identify and clarify logging road attributes that will determine whether a road should be maintained in its current configuration or be reconfigured with rolling dips and out-sloping, re-classed as a temporary road, or decommissioned and replaced. Primary associated objectives identified during GRF management planning were: 1) improve fisheries and wildlife habitat by reducing road related runoff and improving riparian function; and 2) provide efficient access for a variety of activities by maintaining permanent roads. The primary constraint identified was initial increased management costs associated with road improvements.

To reduce sediment delivery from the existing road system, emphasis will be placed on increasing the number of drainage points along roads either by out-sloping, constructing additional rolling dips or increasing ditch relief. Reducing the potential for diversion at culverted watercourse crossings is also a top priority. Low gradient (0-4 percent grade) roads will be primarily drained by out-sloping with occasional dips or ditch relief as necessary. Higher gradient (five to ten percent grade or more) roads will be drained primarily with rolling dips and ditch relief culverts as necessary. It is expected that within a ten year period most roads will be drained by a combination of out-sloping with rolling dips. It is recognized however that ditch relief culverts cannot be completely abandoned and will be used as drainage structures on roads where blockage is not a problem and the ditch relief culverts reduce disturbance by eliminating the need for annual waterbarring. Ditches may also be used to reduce saturation of the road or road sub-grade where natural soil moisture is high. Reducing diversion will be accomplished in the following ways: 1) new culverts and culverts proposed for replacement will be sized to meet 100-year storm events; 2) new or replaced culverts will be installed such that the culvert is at stream grade and will therefore be self cleaning to the extent possible; 3) new or replaced culverts will be installed deep enough such that a critical dip can be constructed to provide protection against stream diversions; and 4) trash racks or stakes shall be installed upstream of culverts to catch or turn debris prior to reaching the pipe.

New roads will be designed with gentle grades where possible, with long rolling dips constructed into the road and outsloped to relieve surface runoff. Where possible watercourse crossings will be designed such that road grades dip into and then climb out of watercourses to eliminate the need for abrupt critical dips. Crossings on secondary roads which see only periodic activity will be rock fords or temporary crossings where possible to reduce maintenance requirements and the potential for sediment delivery.

The use of forest roads by heavy equipment for the purposes of log hauling and road construction is restricted by appurtenant Forest Practice Rules. Following the Forest Practice Rule prescriptions will ensure continuity between future THPs, the Road Management Plan and the ECP/SSMP.
Typical diagrams of erosion control structures and watercourse crossings techniques to be used on the Garcia River Forest are attached (Appendix 1).

2.2.4 Winter Operations

The use of heavy equipment (defined as 1.5 tons or greater) between October 15th and May 1st shall be limited to roads that have permanent drainage and are surfaced with an adequate layer of rock to maintain a stable road surface throughout their period of use. A stable road surface is defined as a surface that does not allow the concentration of road runoff to the extent that depressions or rills that are capable of channeling water are formed on the road surface. On near stream facilities (roads, landing and skid trails), use of heavy equipment in this time period shall be limited to facilities with drainage collection and storage capabilities and/or facilities with a stable soil surface throughout the period of use.

There shall be no road construction or reconstruction from October 15th to May 1st in any year, except for emergency road maintenance.

Specific practices to be incorporated during the period October 15th through November 15th and April 1st through May 1st. The following measures are commonly accepted best management practices (BMPs) which conform to the California Forest Practice Rules for the spring and fall "winter periods:"

1. Erosion Hazard Rating (EHR): Tractor operations will be restricted to those areas where the EHR is moderate or less.
2. There will be no site preparation in the winter period.
3. Tractor operations will be restricted to those areas where the EHR is moderate or less. Cable yarding when proposed may take place on slopes where the EHR is moderate or high.
4. Operations on tractor roads on slopes >40 percent within 200 feet of a Class I, II or III watercourse shall be suspended once three inches of precipitation have fallen as rain. Cumulative rainfall shall be measured starting October 16th of the timber operations season.
5. Rainfall data will be obtained from the RAWS weather station located at Boonville (The web site is www.fs.fed.us/raws/; the Ness ID is CA2BB592, or search name using BOONVILLE Station ID BNVC1.)
6. All tractor roads shall have drainage and/or drainage collection and storage facilities installed as soon as practical following yarding and prior to either: (1) the start of any rain which causes overland flow across or along the disturbed surface within a WLPZ or within any ELZ or EEZ designated for watercourse or lake protection; or (2) any day with a National Weather Service forecast of a chance of rain of 30 percent or more, a flash flood warning, or a flash flood watch.
7. Timber operations shall be limited to dry, rainless periods when soils are not saturated. Within THP areas operations shall cease for 48 hours after any event where one-quarter inch or more of rain has fallen.
8. Operations within the WLPZ: There will be no tractor operations within any WLPZ of Class I or II waters or EEZ of springs and wet areas in the period between Oct. 15th and May 1st.
9. Equipment use limitations (in addition to the above limitations): use of logging roads tractor roads or landings during the periods Oct. 15th – Nov. 15th and April 1st through May 1st shall not take place at any location where saturated soil conditions exist, where a stable logging road or landing operating surface does not exist, or where visibly turbid water from the road, landing, skid trail surface or inside ditch may reach a watercourse or lake.

10. Operating on known unstable areas on roads where operations have been proposed will be allowed provided the road is treated according to the THP and TMDL prior to November 15th. If an unstable area is discovered during timber operations, the LTO shall immediately notify the RPF. The RPF will identify the extent of the unstable area and will designate (flag) a 25-foot Equipment Exclusion Zone and file an amendment to the plan with CDF. Heavy equipment shall not operate within the 25-foot EEZ and harvest trees that are located within the unstable area shall be felled away from the unstable area and yarded from outside the EEZ.
11. Straw bale check dams or silt fences shall be installed at the outlet of all road drainage structures prior to its use for log hauling after January 3, 2002, if less than one hundred feet of 90 percent vegetative buffer exists between the outlet and a watercourse. Road drainage structures with less than one hundred feet of 90 percent vegetative buffer between the road and the watercourse, and that are associated with roads not in use after January 3, 2002, must be scheduled as necessary for upgrade as Sediment Delivery Sites.
12. The use of logging roads, skid trails and landings shall not take place when visibly turbid water from the roads landings or trails running in the inside ditch may reach a watercourse."

2.2.5 Road Decommissioning Guidelines

The criteria for determining which roads can be decommissioned are based on resource protection. Roads located near (within the WLPZ) of a Class I or Class II stream or constructed on unstable slopes such as active landslides or headwall swales are likely candidates for decommissioning due to their potential contribution to in-stream sediment.

Roads to be decommissioned must not eliminate or substantially reduce access to areas where any of a variety of management activities are anticipated. In the case where a road has been determined to be undesirable due to its location but access is still required the landowner is obliged to maintain the existing road or find another route. Reconfiguring the road network is a very difficult task and will have long-term effects on management activities. Road decommissioning should not result in the construction of a replacement road that is environmentally unsound. Removing a road from a stream zone with the intent of moving upslope can require that the landowner make a value judgment between a near stream road and a road constructed on steep slopes with multiple watercourse crossings. Road improvement with rock surfacing, rolling dips and oversized culverts or bridge installation is generally more cost effective than relocation. If access is necessary, improving existing roads will be considered before constructing an alternate route especially if the alternate route results in a poorly located road.

In areas with excess roads it may be desirable to decommission roads or reduce their status to "temporary" to minimize potential sediment delivery and increase growing space. These types of roads are considered to be a low priority if they do not meet the above-mentioned criteria for decommissioning and are generally un-used.

The economics of road decommissioning also contribute to the decision making process; unfortunately it is not practical to use a “one size fits all” prescription. Some roads, which appear to be poorly located, should remain in place because they service a larger area with good arterial roads. While it may be physically possible to relocate a road, it may be cost prohibitive. The types of roads which will be a priority to evaluate as potential candidates for decommissioning are listed below:

1. Roads that parallel watercourses and dead end in landings are the highest priority for decommissioning or repair because of their proximity to streams, their lack of arterial roads, and because they likely can be decommissioned without impact to future management activities.
2. Roads that cross unstable areas or headwall swales may be decommissioned if alternate routes exist to both ends of the subject road. In some cases this can be done with only a minor loss of access and can be accomplished without (much) concern of relocating the road higher up the slope. Roads crossing unstable areas are deemed to be the second priority for decommissioning because there are fewer roads on unstable slopes than WLPZ roads; further, the management implications and fieldwork necessary to make an informed decision will delay the decision making process.
3. Long-term plans will include decommissioning and replacing or upgrading roads that are poorly located but are necessary in the short term for management activities.

Proper implementation of these measures will reduce the potential for excess runoff and diversions common to forest roads. Over the long term the reduction in stream sedimentation will improve salmonid habitat conditions and reduce yearly maintenance costs.

2.3 Land Management Measures That Apply in the Riparian Management Zone

The Garcia River Forest has established an Ecological Reserve on Class I streams as part of the conservation easement with The Nature Conservancy. The Class I Ecological Reserves shall be managed to promote the development of a late seral stage forest, therefore only selection or thinning silvicultural techniques shall be used within these areas. The Class I Ecological Reserve consists of a 200 foot zone on both sides and adjacent to Class I streams - the exception being that the main stem of the Garcia River has a 300 foot zone on either side of the stream.

The Riparian Management Zone (RMZ) is a zone within the reserve area where specific operating restrictions shall be applied. The RMZ is a slope dependent zone as shown in Table 1 below. The RMZ for Class I watercourses will be 150-200 feet based on slope. The RMZ for Class II streams will be 50 to100 feet wide depending on slope. The RMZ for Class III watercourses shall be 50 feet wide. All zones shall be measured from the active channel or bankfull stage, whichever is wider. The proposed zone widths for Class I streams exceed the Forest Practice Rules, are equal to the Forest Practice Rule WLPZ width for Class II streams, and meet or exceed the CDF Equipment Limitation Zone widths for Class III streams.

Primary considerations in the Riparian Management Zone (RMZ) are: recruitment of Large Woody Debris (LWD); creation of a filter strip buffer to protect against upslope activities; protection of bank stability; and maintenance or creation of cool stream temperatures by providing shade and increased relative humidity.

To promote the development of large wood and filter strip properties:

The following management practices shall be implemented within the RMZ to advance the development of LWD and filter strip properties, reduce sediment inputs, and promote stream bank stability.

- There is no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard or fish barrier.
- There is no removal of LWD within 200 feet of any Class I stream and no removal of LWD within 300 feet of the main stem Garcia. Further there is no removal of any LWD within the Class II or III RMZ.
- On Class I and II watercourses, than there shall be no commercial harvest of the five largest diameter trees per 100 linear feet of watercourse within 50 feet of the active channel.
- There is no removal of trees from unstable areas within 100 feet of a Class I or II watercourse or within 50 feet of a Class III watercourse unless approved by a CEG.

To reduce sediment inputs:

- The RMZ shall consist of an EEZ where equipment operations shall be minimized and only allowed if it can be shown that it is the only feasible method to access the zone.
- Where necessary all permanent roads within 100 feet of Class I and II streams or within 50 feet of Class III watercourses including permanent crossings, shall be surfaced with competent rock to a sufficient depth prior to their use for log hauling to prevent road fines from discharging into watercourses. Seasonal or temporary roads shall be treated with rock, rolling dips, waterbars, grass seed or slash mulch to prevent sediment discharge.
- Any new soil exposure within the RMZ caused by land management activities shall be stabilized with the application of grass seed, mulch, slash packing or rocking before October 15 of the year of disturbance. Stabilization measures shall achieve at least 90 percent coverage of all soil within the Riparian Management Zone exposed by land management activities.

To promote stream bank stability:

- GRF will ensure that there are no land management activities, including commercial or salvage timber harvest, grazing or crop agriculture, within the first 25 feet of the Riparian Management Zone for Class I watercourses. This measure does not apply to watercourse crossings.
- Jack Monschke, watershed specialist, has identified five sites in Inman Creek in need of site remediation. A grant proposal to CDF&G has been approved and restoration work is expected to begin August 2006. See Appendix 4 for a complete description of the project.

2.3.1 Watercourse and Lake Protection Zones

The following summary tables shall be used in the development of Timber Harvest Plans on the Garcia River Forest. The content will be considered the enforceable standard of the THP.

Table 1: Class I RMZ / WLPZ Protection Measures

<table>
<tr><th>Slope Class</th><th>RMZ/ WLPZ Zone and Width</th><th>Protection Measures</th></tr>
<tr><td>< 30%</td><td>150’</td><td rowspan="3">An Equipment Exclusion Zone (EEZ) is established equal to the width of the RMZ/WLPZ.

Stabilization measures: Trails used within the EEZ or soil disturbance in excess of 100 square feet shall be stabilized with the application of grass seed, mulch, slash packing or rocking before October 15 of the year of disturbance. Waterbars shall be spaced to the high Erosion Hazard Rating (EHR) standards of the Forest Practice Rules and placed such that they discharge onto non-erodible material such as heavy slash, live vegetation, stumps or trees. Stabilization measures shall achieve at least 90 percent coverage of all soil within the RMZ exposed by land management activities. Additional mulching beyond the RMZ shall be considered on a case by case basis and as recommended on the PHI. Use of existing landings and associated skid trails within the RMZ shall be allowed if it can be shown to be the least damaging alternative and is proposed in the THP and approved by a multi disciplinary review team. When skid trails are proposed for use within 200 feet of a watercourse and on slopes over 40 percent only stable existing trails will be used.

Where necessary all permanent roads within 100 feet of Class I streams including permanent crossings, shall be surfaced with competent rock to a sufficient depth prior to their use for log hauling to prevent road fines from discharging into watercourses. Seasonal or temporary roads shall be treated with rock, rolling dips, waterbars, grass seed or slash mulch prior to the winter period to prevent sediment discharge.

Canopy retention standards: There shall be a 25 foot no cut buffer adjacent to Class I streams. Silviculture within the Ecological Reserve Network /RMZ shall be limited to selection or thinning silviculture which is designed to promote the development of large trees. To protect water temperature, filter strip properties, upslope values at least 85% total canopy shall remain after harvest within 75 feet of the channel. At least 65% total canopy shall remain in the remainder of the zone. The 5 largest trees per 100 lineal feet of watercourse shall be retained within 50 feet of the active channel. There is no removal of trees from unstable areas within 100 feet of a class I watercourse unless approved by a CEG. There shall be no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard or fish barrier. There is no removal of LWD within 200 feet of any Class I stream and no removal of LWD within 300 feet of the main stem Garcia.

There shall be no herbicide application or site preparation within the 200 feet of the active channel.</td></tr>
<tr><td>30-50%</td><td>175’</td></tr>
<tr><td>>50%</td><td>200’

Waterbar to extreme EHR standards</td></tr>
</table>

Table 2: Class II Riparian Management Zones and WLPZ Protection Measures

<table>
<tr><th>Slope Class</th><th>RMZ/WLPZ Zone and Width</th><th>Protection Measures</th></tr>
<tr><td>< 30%</td><td>50’</td><td rowspan="3">An Equipment Exclusion Zone (EEZ) is established equal to the width of the RMZ.

Stabilization measures: Trails used within the EEZ or soil disturbance in excess of 100 square feet shall be stabilized with the application of grass seed, mulch, slash packing or rocking before October 15 of the year of disturbance. Waterbars shall be spaced to the high Erosion Hazard Rating (EHR) standards of the Forest Practice Rules and placed such that they discharge onto non-erodible material such as heavy slash, live vegetation, stumps or trees. Stabilization measures shall achieve at least 90 percent coverage of all soil within the RMZ exposed by land management activities. Additional mulching beyond the RMZ shall be considered on a case by case basis and as recommended on the PHI. Use of existing landings and associated skid trails within the RMZ shall be allowed if it can be shown to be the least damaging alternative and is proposed in the THP and approved by a multi disciplinary review team. When skid trails are proposed for use within 200 feet of a watercourse and on slopes over 40 percent only stable existing trails will be used.

Where necessary all permanent roads within 100 feet of Class II watercourses including permanent crossings shall be surfaced with competent rock to a sufficient depth prior to their use for log hauling to prevent road fines from discharging into watercourses. Seasonal or temporary roads shall be treated with rock, rolling dips, waterbars, grass seed or slash mulch prior to the winter period to prevent sediment discharge.

Canopy retention standards: There shall be a 25 foot no cut buffer adjacent to Class II streams Silviculture within the Class II buffer shall be limited to selection or thinning silviculture whic is designed to promote the development of large trees. To protect water temperature, filter strip properties, upslope values at least 75% canopy shall be retained within 50 feet of the stream and at least 50% canopy shall be retained in the remainder of the zone. Within the zone 50% of the existing conifer canopy covering the ground shall be retained after harvest. The 5 largest trees per 100 lineal feet of watercourse shall be retained within 50 feet of the active channel. There is no removal of trees from unstable areas within 100 feet of a Class II watercourse unless approved by a CEG.

There is no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard or fish barrier. There is no removal of LWD within 100 feet of a Class II watercourse.

There shall be no herbicide application or site preparation within 75 feet of a Class II watercourse.</td></tr>
<tr><td>30-50%</td><td>75’</td></tr>
<tr><td>>-50%</td><td>100’

Waterbar to extreme EHR standards</td></tr>
</table>

Table 3: Class III Riparian Management Zones and ELZ Protection Measures

<table>
<tr><th>Slope class</th><th>RMZ Zone and Width</th><th>Protection Measures</th></tr>
<tr><td>< 30%</td><td>50’</td><td rowspan="3">An ELZ is established equal to the width of the RMZ.

Trails within 50 feet of the Class III watercourse used during logging operations shall be stabilized by slash mulch or straw mulch and waterbarring to the high EHR protection standards. Waterbars shall be placed such that they discharge onto non-erodible material such as heavy slash, live vegetation, stumps or trees. When skid trails are proposed for use within 200 feet of a watercourse and on slopes over 40 percent only stable existing trails will be used. To protect water temperature, filter strip properties, upslope values, at least 50% of the total canopy covering the ground shall be left in stand configuration composed of a diversity of species similar to that found in the pre harvest stand. There is no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard or a fish barrier. There is no removal of LWD within 50 feet of the active channel.

Where necessary all permanent roads within 50 feet of Class III watercourses including permanent crossings shall be surfaced with competent rock to a sufficient depth prior to their use for log hauling to prevent road fines from discharging into watercourses. Seasonal and temporary roads shall be treated with rock, rolling dips, waterbars, grass seed or slash mulch prior to the winter period to prevent sediment discharge.

The residual overstory canopy shall be composed of at least 25% of the existing overstory conifers. Due to variability in Class III watercourses these percentages and species composition may be adjusted to meet onsite conditions. There is no removal of trees from unstable areas within 50 feet of a Class III watercourse unless approved by a CEG. There shall be no herbicide application or site preparation within the ELZ.</td></tr>
<tr><td>30-50%</td><td>50’</td></tr>
<tr><td>>50%</td><td>50’

Water bar to extreme EHR standards</td></tr>
</table>

2.4 Comparison and Description of Proposed Mitigation Measures

The Garcia River Management Plan (GRMP) describes 21 land management measures that apply to roads, watercourse crossings, skid trails and near stream facilities throughout the Garcia River watershed. The following paragraphs state the GRMP desired condition (in *italics*) and GRF's response to the GRMP (in **bold**).

1. *By January 3, 2005, a Long-term Road System Plan (Road Plan) shall be developed and submitted which describes the long-term road system, and identifies all roads and watercourse crossings. The road system described in the Road Plan shall be designed and constructed to provide surfacing, drainage, and watercourse crossings to match the intended road use and maintenance abilities. Roads (including road prism and watercourse crossing drainage structures) that are constructed or reconstructed after January 3, 2002, shall comply with the standards below. Existing usable roads will be scheduled for upgrading as necessary as Sediment Delivery Sites under the Erosion Control Plan. Roads that are not needed as part of the long-term road system and that discharge or threaten to discharge earthen material to waters of the state shall be scheduled as necessary for abandonment or obliteration as Sediment Delivery Sites under the Erosion Control Plan. The road plan shall include, at a minimum:*

   - *The location of all roads and watercourse crossings within the ownership,*
   - *The current status of each road, including road surface material, road and watercourse design, and use restrictions, and*
   - *The future plan and schedule for each road.*

   A. *Roads used year round shall be designed, constructed, reconstructed or upgraded to permanent road status with the application of an adequate layer of competent rock for surface material and the installation of permanent watercourse crossings and road prism drainage structures. These roads shall receive regular and storm period inspection and maintenance.*

   B. *Roads used primarily during the dry season but to a limited extent during wet weather shall be designed, constructed, reconstructed or upgraded to seasonal road status with the application of spot rocking where needed to provide a stable running surface during the period of use. These roads shall be designed, constructed, reconstructed, and upgraded to provide permanent watercourse crossings and road surface drainage structures. These roads shall receive inspection at least once during the wet weather period and shall receive at least annual maintenance.*

   C. *Roads that are not used or maintained during wet weather shall be constructed or reconstructed to a temporary road status. Spot rocking of the road surface shall be used, where needed, to provide a stable running surface during the period of use. Road surface drainage structures shall be designed and constructed to prevent erosion so that regular and storm period maintenance is not needed to prevent sediment discharge to watercourses. All roads that will not receive at least annual maintenance shall have watercourse crossings, except rock fords, removed prior to October 15 of each year of installation.*

   Agreed.

2. *All watercourse road crossings shall, at a minimum, utilize the standards described on pages 64 - 79 of the Handbook for Forest and Ranch Roads (prepared by Weaver and Hagans, 1994). These standards include but are not limited to the design and installation*

of permanent crossings using a culvert with a minimum diameter designed to pass at least a 50-year flood frequency event. Larger diameter culverts shall be used if debris that might result in blockage of the culvert inlet is present in the channel. All crossings shall be designed and installed to prevent the diversion of stream flow down or through the road prism in the event of culvert failure, and to provide free passage to fish at all flow regimes. All watercourse road crossings that do not meet these minimum standards as of January 3, 2002, must be scheduled as necessary for upgrade as Sediment Delivery Sites under the Erosion Control Plan. All watercourse road crossings installed after January 3, 2002, must be installed according to these minimum standards.

Agreed. GFR shall install culverts to accommodate a 100-year storm event which is a higher level of protection than required.

3. *All road design, construction, and reconstruction shall use, at a minimum, the standards described on pages 39 - 54 and 81 - 120 of the Handbook for Forest Ranch Roads (prepared by Weaver and Hagans, 1994). These standards include but are not limited to the outsloping of the road prism (whenever feasible and safe) and the installation of rolling dips (rather than water bars) for additional road drainage. If insloped roads are necessary, ditch relief culverts shall be installed, at a minimum, at the distances described in Table 20 of the Handbook for Forest and Ranch Roads, and located to prevent discharge of road drainage directly onto erodible soils. All roads that do not meet the minimum standards as of January 3, 2002, must be scheduled as necessary for upgrade as Sediment Delivery Sites under the Erosion Control Plan. All roads constructed or reconstructed after January 3, 2002, must be constructed or reconstructed to these minimum standards.*

   Agreed. See attached GRF Draft Road Management Plan which references *The Handbook of Forest and Ranch Roads* (Weaver and Haggins, 1994).

4. *Straw bale check dams or silt fences shall be installed at the outlet of all road drainage structures prior to use of the road for all roads used after January 3, 2002, if less than one hundred feet of 90 percent vegetative buffer exists between the outlet and a watercourse. Road drainage structures with less than one hundred feet of 90 percent vegetative buffer that are associated with roads not in use after January 3, 2002, must be scheduled as necessary for upgrade as Sediment Delivery Sites.*

   Agreed. In addition to straw bale check dams GRF will use slash mulch below drainage structures. In some situations, primarily on near stream roads, GRF may use rock (rip rap) to dissipate erosion at the outlet of erosion control structures. The use of slash or rock is considered an improvement over silt fence or straw bails because it does not need storm period maintenance.

5. *After January 3, 2002, there shall be no construction, reconstruction, or use of roads within the channel of any watercourse. This measure does not apply to watercourse crossings.*

   Agreed.

6. *After January 3, 2002, there shall be no construction, reconstruction, or use of skid trails on slopes greater than 40 percent within 200 feet of a watercourse, as measured from the channel or bankfull stage, whichever is wider.*

   As discussed, in some cases it will be necessary for GRF to use skid trails on slopes over 40 percent within 200 feet of a watercourse where it can be shown that this is the

least damaging alternative. Protection measures applied to Class I, II and III watercourses are tabulated on pages 6 and 7 of this document. The level of soil stabilization proposed will prevent deleterious sediment discharge into waters of the state of California. All skid trail use will be disclosed in the THP and may be subject to inspection of the Water Quality Control Board prior to plan approval. Class I riparian areas are within ecological reserve networks that are managed to promote late seral characteristics. The designated buffer on Class I streams for reserve areas is 200 feet for all Class I streams except the mainstem of the Garcia which will receive a 300 foot buffer. Additionally EEZs have been provided for Class I and II streams and ELZs on Class III streams on slopes less than 40 percent. The remainder of the forest will primarily be managed with unevenage silvicultural techniques with the intent of increasing tree size and improving wildlife habitat across the landscape. In lieu of operating restrictions we have provided wider than required stream canopy buffers on Class I streams and have committed to managing the forest using primarily unevenage management techniques. This landscape approach to forest and watershed management will result in greater overall protection for water quality and decreased stream sedimentation. For these reasons the described level of protection is roughly equivalent to item 6 of the Garcia River Action Plan.

7. *After January 3, 2002, there shall be no use of roads or near stream facilities, when the activity contributes to the discharge of visibly turbid water from the road or near stream facility surface or is flowing in an inside ditch in amounts that cause a visible increase in the turbidity of a watercourse. As an exception, short-term, temporary use of near stream facilities may occur if there is no feasible alternative.*

   Agreed. The GRF Road Management Plan states that, "The use of logging roads, skid trails and landings shall not take place when visibly turbid water from the roads landings or trails running in the inside ditch may reach a watercourse."

8. *After January 3, 2002, the use of heavy equipment (defined as 1.5 tons) between October 15 and May 1 shall be limited to roads that have permanent drainage and are surfaced with an adequate layer of rock to maintain a stable road surface throughout the period of use. A stable road surface is defined as a surface that does not allow the concentration of road runoff to the extent that depressions or rills that are capable of channeling water are formed on the road surface. On near stream facilities, use of heavy equipment in this time period shall be limited to facilities with drainage collection and storage capabilities and/or facilities with a stable soil surface throughout the period of use. As an exception, short-term, temporary use of heavy equipment on near stream facilities may occur if there is no feasible alternative.*

   Road use restrictions for the periods October 15th –November 15th and April 1- May 1, as with mid winter road use, are detailed in the Road Management Plan.

9. *After January 3, 2002, all roads and other near stream facilities that are actively used shall have drainage and/or drainage collection and storage facilities installed before the start of any rain that causes overland flow across or along the disturbed surface and could result in the delivery of sediment to a watercourse. Roads and near stream facilities that are no longer actively used and have the potential to discharge sediment to a water of the state shall be addressed as necessary as Sediment Delivery Sites.*

   Agreed

10. *After January 3, 2002, there shall be no road construction, reconstruction, or upgrading from October 15 to May 1, except for emergency road maintenance.*

Road use restrictions for the periods October 15th –November 15th and April 1- May 1, as with mid winter road use, are detailed in the Road Management Plan.

11. *After January 3, 2002, all new crossings installed as temporary watercourse crossings and designed to carry less water and debris than predicted for a 50 year flood discharge shall be removed and stabilized by October 15 of each year of installation. For all watercourses, the approaches to all temporary watercourses crossings shall be pulled back to create side slopes of less than 50 percent, and stabilized with rock, grass seed, mulch, or slash from the lowest (closest) drainage structure to the watercourse transition line. Existing temporary watercourse crossings not removed and stabilized by January 3, 2002, shall be addressed as necessary as Sediment Delivery Sites.*

    Road and skid trail use restrictions for the periods October 15th –November 15th and April 1- May 1, as with mid winter road use, are detailed in the Road Management Plan.

12. *After January 3, 2002, off-channel water drafting and livestock watering locations shall be developed to the extent feasible.*

    Agreed. Off channel water drafting shall be used where feasible

    Land Management Measures That Apply in Unstable Areas – effective date January 3, 2002

13. *No road construction shall occur across unstable areas without the field review and development of site specific mitigation measures by a Certified Engineering Geologist registered in the State of California. A report prepared by the Certified Engineering Geologist shall be submitted to the Regional Water Board before construction/ reconstruction activities begin.*

    Agreed. A report by a CEG will be prepared when road or skid trail operations are proposed on an unstable area which may result in sediment delivery to a watercourse. A report prepared by the California Geologic Survey as part of a pre harvest inspection or generated during a pre-consultation will also satisfy this requirement.

14. *No more than 50 percent of the existing basal area formed by tree species shall be removed from unstable areas that have the potential to deliver sediment into a watercourse.*

    Agreed. Garcia River Forest can agree to the following language proposed in the Categorical Waiver: "Timber harvest activities on all slides and unstable areas must retain at least 50 percent evenly distributed total overstory and understory canopy with a higher canopy retention standards at the toe of the feature." Overstory canopy may be composed of both conifer and hardwood species. Timber harvest activities on these features shall be accompanied by a geologic report prepared by a licensed California Certified Engineering Geologist or Registered Geologist.

15. *No concentrated flow shall be directed across the head, toe, or lateral margin of any unstable area.*

    Agreed.

16. *Agricultural activities on unstable slopes that have the potential to deliver sediment to a water of the state shall be minimized to the extent practical.*

Does not apply - agricultural activities other than forest management are prohibited on the GRF.

Land Management Measures That Apply in the Riparian Management Zone

A Riparian Management Zone width shall be assigned to each watercourse based on the class of the watercourse. For Class I and II watercourses, the Riparian Management Zone is a 100-foot strip of land on each side of, and adjacent to, the watercourse. For Class III watercourses, the Riparian Management Zone is a 50-foot strip of land on each side of, and adjacent to, the watercourse. The Riparian Management Zone shall be measured from the active channel or bankfull stage, whichever is wider.

The GRF shall be managed for the recruitment of large trees within the Class I Riparian Buffer Zone within the ecological reserve network. The remainder of the Property will be managed using primarily unevenage silvicultural techniques designed to improve the average tree size and improve overall stocking. GRF proposes a Riparian Management Zone of 200 to 300 feet for Class I watercourses and a 50 to 100 foot zone for Class II watercourses, depending on slope. Class III watercourses shall have a 50 foot Riparian Management Zone. The Class II and III zones are intended to coincide with CDF standard WLPZ widths which adequately protect the riparian zone.

17. *All roads within the Riparian Management Zone used after January 3, 2002, shall be surfaced with competent rock to a sufficient depth prior to use of the road to prevent road fines from discharging into watercourses.*

All permanent roads within 100 feet of Class I and II streams or within 50 feet of Class III watercourses including permanent crossings, shall be surfaced with competent rock to a sufficient depth prior to use for log hauling to prevent road fines from discharging into watercourses. Seasonal or temporary roads shall be treated with rock, rolling dips, waterbars, grass seed or slash mulch to prevent sediment discharge. New road construction within the Riparian Management Zone will be limited to crossings or when it can be demonstrated that new construction within the zone is the least damaging alternative. The measures described will adequately protect the resource from sediment transport.

18. *After January 3, 2002, any new soil exposure within the Riparian Management Zone caused by land management activities shall be stabilized with the application of grass seed, mulch, slash or rock before October 15 of the year of disturbance. Stabilization measures shall achieve at least 90 percent coverage of all soil within the Riparian Management Zone exposed by land management activities. Existing exposed soil caused by land management activities that is not stabilized prior to January 3, 2002, shall be addressed as Sediment Delivery Sites.*

GRF agrees to this mitigation with the Riparian Management Width prescribed above. The slope dependant zone adequately addresses the concern of sediment transport through the zone.

19. *After January 3, 2002, to promote stream bank stability, each landowner shall ensure that there are no commercial land management activities, including commercial or salvage timber harvest, grazing or crop agriculture, within the first 25 feet of the Riparian Management Zone for Class I or II watercourses. This measure does not apply to*

watercourse crossings. Commercial land management activities existing prior to January 3, 2002, must be phased out by January 3, 2007.

Agreed

20. *After January 3, 2002, in order to maintain present levels and promote future instream large woody debris, each landowner shall restrict commercial land use activities within the Riparian Management Zone to ensure that:*

    A. *There is no removal of downed large woody debris from watercourse channels unless the debris is causing a safety hazard.*

    B. *On Class I and II watercourses, at least five standing conifer trees greater than 32 inches in diameter at breast height (DBH) are permanently retained at any given time per 100 linear feet of watercourse. Where sites lack enough trees to meet this goal, there shall be no commercial harvest of the five largest diameter trees per 100 linear feet of watercourse.*

    C. *There is no removal of trees from unstable areas within a Riparian Management Zone that have the potential to deliver sediment to a water of the State unless the tree is causing a safety hazard.*

LWD shall be retained in the stream channel except when the removal of the LWD is beneficial (such as the removal of old Humboldt crossings, or at other approved crossing locations). LWD may be removed from streams as part of barrier modification with permits from CDF&G. The 5 largest trees per 100 lineal feet of stream zone shall be retained. Removal of trees from unstable areas within the RMZ may occur if reviewed by a CEG and approved by a multidisciplinary review team.

Land Management Measures That Apply to Gravel Mining in the Garcia River Watershed – effective date January 3, 2002

21. *In-channel gravel mining shall follow the following recommendations from the Garcia River Gravel Management Plan, prepared for the Mendocino County Water Agency, August 1996.*

Does not apply. No in-channel gravel mining is allowed on the GRF.

References

California Salmonid Stream Habitat Restoration Manual. California State Resources Agency Department of Fish and Game, Second Edition, 1994.

California Forest Practice Rules. California Department of Forestry and Fire Protection, Resource Management, Forest Practice Program. 2006

Garcia River Action Plan. North Coast Water Quality Control Board. 2002.

Weaver, W.D. and D.K. Hagans. Handbook for Forest and Ranch Roads. 1994