THE CONSERVATION FUND

LAND SUSTAINS US

Gualala River Forest

Integrated Resource Management Plan

In Partnership with the California Wildlife Conservation Board and The Nature Conservancy

2025

Cover photo: © Joaquin Quintana

For more information about this report, please contact:

The Conservation Fund
14951 Caspar Road
Caspar, CA 95420

Suggested citation: The Conservation Fund. 2025. *Gualala River Forest – Integrated Resource Management Plan*. Caspar, California.

Table of Contents

List of Tables

List of Figures

List of Appendices

1. Executive Summary

1.1 Project Description

The Gualala River Forest was acquired in December 2011 by The Conservation Fund, in partnership with the California Wildlife Conservation Board and The Nature Conservancy. The project is part of The Conservation Fund's North Coast Forest Conservation Initiative that seeks to demonstrate that large, under-stocked tracts 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.

As part of the sustainable management of the working forest, the Fund conveyed a conservation easement to The Nature Conservancy to maintain the conservation values inherent in the Gualala River Forest in perpetuity. The conservation easement describes the Gualala River Forest as "of great importance" to The Conservation Fund, The Nature Conservancy, residents of Mendocino County, and the State of California and a natural area which qualifies as a "relatively natural habitat of fish, wildlife, or plants, or similar ecosystem". One of the requirements under the conservation easement is to "achieve certification as a 'well managed forest' by the Forest Stewardship Council within two years of initiating harvest activities". The Conservation Fund prepared this Integrated Resource Management Plan to document the sustainable management of the forest. The Plan follows requirements established in the Forest Stewardship Council® U.S. Forest Management Standard (version 1.0) and Sustainable Forestry Initiative® 2022 Standards and Rules. The Plan is the required ten-year update to the original Plan approved in 2014.

1.2 Overview of Forest Characteristics and Conditions

The Gualala River Forest encompasses 13,913 acres of redwood timberland in the Gualala River watershed. Adjacent watersheds include the Garcia River to the north, Middle Russian River to the east and Lower Russian River to the south. Primary tributaries to the Gualala River on the property include the North Fork Gualala River and Rockpile Creek.

The Gualala River is a high-priority refugia watersheds identified in the 2004 "Recovery Strategy for California Coho Salmon." The Forest includes 34 miles of anadromous streams, 41 miles of perennial streams and associated riparian habitats, four major sub-basins currently supporting coho, and an array of additional sensitive species. Although there have been no recent confirmed reports of coho salmon in the Gualala basin, the watercourse habitat is improving and it is believed that coho may reoccupy the Gualala watershed. The size and location of the Forest provide significant contributions to the integrity and ecological viability of their respective watersheds and the larger ecoregion.

The Forest is typical of the north coast of California, dominated by native conifers (primarily redwood and Douglas-fir) and adapted to the steep slopes and heavy rainfall common to the region. The Forest is richly productive and supports significant wildlife, including many imperiled species, such as 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 beginning in the 1950s through the current day. Historic logging activities have also contributed to an influx and higher percentage of tanoak and other hardwood species than desired which is indicative of an early successional forest. The standing timber on the Forest is depleted compared to historic levels and forest recovery will take decades.

1.3 Streams and Roads

Extensive logging and road building practices in this fragile and highly erosive landscape have contributed to erosion and subsequent stream sedimentation, producing a legacy of increased sediment loads severely impacting aquatic habitat in the Gualala River and its tributaries. Data collected in stream channels throughout the watershed show channel aggrading and simplification due to amplified sediment inputs (GRWC, 2013).

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 over-story 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 (GRWC, 2013).

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.
- Improve ecological conditions by protecting and enhancing terrestrial and aquatic habitat on the Forest.
- Generate sufficient revenue to cover Program-Related Investment and Revolving Loan Fund payments, property taxes, on-site maintenance, management, and restoration projects.
- Develop and implement improved forest management greenhouse gas reduction projects under the Climate Action Reserve's Forest Project Protocol version 3.2.
- 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 where possible.

1.5 Community Use and Involvement: Public Access

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. These opportunities range from research, education, and demonstration to participation in restoration projects and unsupervised pedestrian access.

To foster community involvement and support, the Fund provides guided tours of areas intended for timber harvests, road improvement and restoration projects., 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 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 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 and much of the coastal watersheds in Mendocino and Humboldt counties continue to be held in large blocks of industrial timberland. Until recently, the economic value of these smaller parcels and alternative uses has not been competitive with the value of continued timber production, and they were largely ignored. But timber inventory depletion, the regulatory environment in California and the increasing value of land for "higher and better uses" has led some forestland owners to sell or look to "higher and better uses" yielding 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 and 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. The California forestry and logging industries directly contribute $437 million and 5,700 jobs to the state economy with a total wage income of $267 million in 2015. (UC ANR, 2020). According the 2021 Mendocino Agricultural Crop Report, timber was the second leading commodity in Mendocino County, with a gross "at mill" value of $67,128,681, a 28.5% decrease over the previous year's total of $93,855,560. Mendocino County ranked 7th in the State in timber volumes and produced roughly 4.8% of the State's total timber harvest in 2021.

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 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. With this purchase, the Fund 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. 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., 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 watershed. The Buckeye Forest, in Sonoma County, was acquired by the Fund in May 2013. The Garcia, Gualala and Buckeye forests create a contiguous, approximately 50,000 acres of protected forestland.

2.1.2 Gualala River Forest Acquisition

The Fund, along with our conservation partners including the Wildlife Conservation Board (WCB), the Nature Conservancy (TNC), the Keith Campbell Foundation, and the Mellon Foundation, extends this innovative approach in the protection and restoration of the GuRF. In addition the Fund has conveyed a working forest conservation easement (CE) to TNC.

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. The 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.

2.2 Principal Management Goals

The Gualala River project seeks to balance the ecological needs of coastal forests with the economic imperatives of ownership, management and restoration. This Plan presents our vision of what this balance looks like and how we will attain it over the coming decades.

This Plan identifies and describes in detail 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 registered 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.
- Emphasis is placed on achieving water quality enhancement and anti-degradation objectives by: a) permanently protecting the GuRF 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 Strategy for Implementing State Revolving Fund for Expanding Use Projects (Strategy),
- Nonpoint Source Program Strategy and Implementation Plan, 1998 – 2013 (NPS Implementation Plan)
- Gualala River Total Maximum Daily Load for Sediment developed by the U.S. Environmental Protection Agency (EPA), Region IX in December 2001 (Gualala River TMDL), as adopted by the North Coast Water Board in November 2004 in Resolution No. R1-2004-0087

- Total Maximum Daily Load Implementation Policy Statement for Sediment-Impaired Receiving Waters in the North Coast Region (TMDL Implementation Policy).

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

has provided significant additional financial support for the forests, enabling us to accelerate restoration activities and defer harvests when log prices are low.

2.4 Conservation Easement Requirements

As part of the sustainable management of the working forest, the Fund conveyed a CE to TNC to maintain the conservation values inherent in the GuRF in perpetuity. The CE describes the GuRF as "of great importance" to the Fund, TNC, residents of Mendocino County, and the State of California and a natural area which qualifies as a "relatively natural habitat of fish, wildlife, or plants, or similar ecosystem".

Additional requirements stipulated in the CE include the following:

- Aggregated development of less than 10,000 square feet allowed within the designated 5-acre Permitted Improvement Area (PIA). Within the PIA, one single-family residence, one guesthouse, and one employee house plus additional outbuildings (i.e., garages, sheds, greenhouses) may be constructed, repaired, improved and replaced. Outbuildings shall not include dwelling spaces nor be used for human habitation. The PIA will not be located to include watercourse and lake protection zones (WLPZ), wetlands, true oak (*Quercus*) woodlands and grasslands.
- In order to achieve better mix of conifers and hardwoods within the GuRF, an even-age management regime is permitted within tanoak-dominated areas with tanoak basal area exceeding 40 percent of the average stand basal area, prior to the fourth decade of holding. After 40 years, even-age stand management is permitted in future rotations only with approval by TNC and WCB. Even-age management is prohibited outside tanoak-dominated zones.
- Achieve certification as a "well managed forest" by the Forest Stewardship Council (FSC) within two years of initiating harvest activities.
- Plowing, cultivation, and/or farming are permitted only within the Permitted Improvement Area and are limited to a maximum of 20 acres, of which no more than 10 acres may be in perennial crops.
- Limited livestock watering troughs are allowed more than 100 feet from Sensitive Water Bodies or with prior TNC approval, and the Grazing Management Plan must be consistent with the requirements in Appendix D of the CE.

- Limited hunting is allowed by the Fund and its guests for non-commercial purposes only. Hunting of mountain lion, coyote, bear, or bobcat, is prohibited except through express TNC written approval.

3. Purpose of Plan

3.1 Plan Requirements

The Plan follows requirements established in the FSC® U.S. Forest Management Standard (version 1.0).

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 property 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:

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

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 the WCB and TNC 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 uncertainty 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). Sound implementation and the ultimate attainment of the project will depend in part on the commitment made to adaptive management, where research and monitoring are given a high priority, and new information is gathered to feed back into the basic data management system and all future plans.

This Plan identifies two information streams for adaptive management: 1) monitoring of implementation benchmarks established for Streams and Roads, Forest Management, and Community Involvement described in this Plan; and 2) 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. Property Setting and Current Conditions

4.1 Property Orientation

4.1.1 Property Location

The GuRF is comprised of 13,913 acres of timberland in California's North Coast Range mountains. Located in southwestern Mendocino County adjacent to and north of the Mendocino-Sonoma county line, the property lies approximately 15 miles east of the city of Point Arena and 7 miles northeast of the town of Gualala. The main waterbodies within the GuRF are: 1) the North Fork Gualala River and its major tributaries: Dry Creek, Stewart Creek, Hayfield Creek, and Bear Creek; 2) Rockpile Creek and its major tributaries: Horsethief Canyon and Red Rock Creek. Primary access to the GuRF is via Fish Rock Road on the northern boundary of the property (Figure 4-2).

4.1.2 Neighbors and Adjacent Lands

Adjacent to two other Fund timberland holdings, the GuRF is located southeast of the GRF and north of the recently acquired Buckeye Forest (formerly Preservation Ranch). Although the surrounding land use is primarily timber production, there are also five premium wine grape vineyards and numerous rural residential properties in the vicinity. The GuRF watershed is almost entirely privately owned, with approximately 53 percent in industrial timberland and the remaining 47 percent in small to large size ownership. Other large neighboring timberland owners include Gualala Redwood Timber LLC., Mendocino Redwood Company (MRC) and the Buckeye Forest (Figure 4-3).

4.1.3 Physiographic Setting

4.1.3.1 Description of Watershed

Figure 4-1: Mouth of the Gualala River, Mendocino County, California. Photo by Herman Turnip, Flickr.

The Gualala River drains a 191,000-acre (298 square mile) watershed within the northern California Coast Range of southern Mendocino and northern Sonoma counties, with a total mainstem and tributary distance of roughly 218 miles (Downie et al., 2003). Neighboring watersheds include the Garcia River to the north, Middle Russian River to the east and Lower Russian River to the south. The North and South Forks of the Gualala River flow together for 20 miles along the San Andreas Fault before flowing west to empty into the Pacific Ocean near the town of Gualala. FIGURE 4-2

Gualala River Forest

THE CONSERVATION FUND

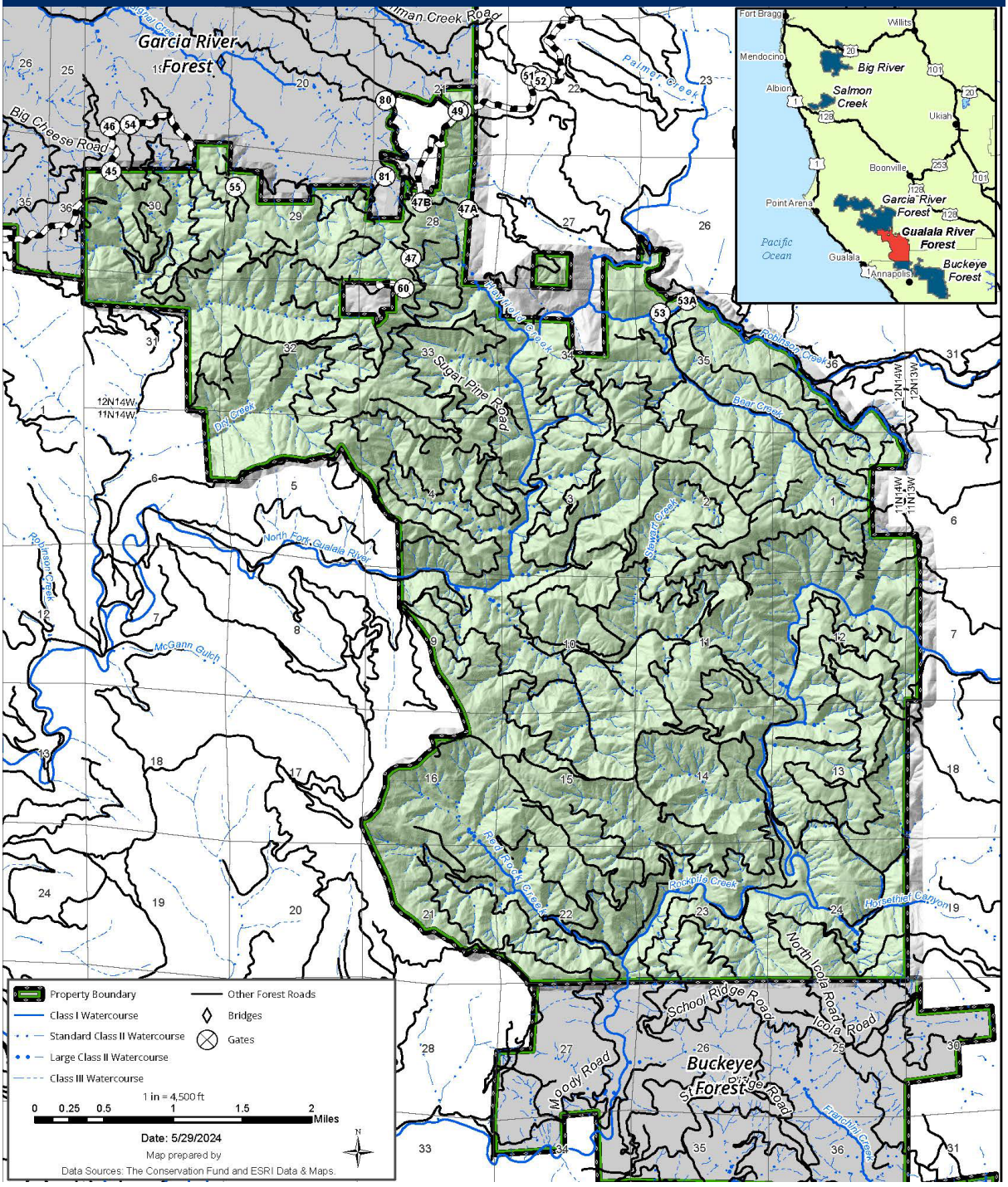
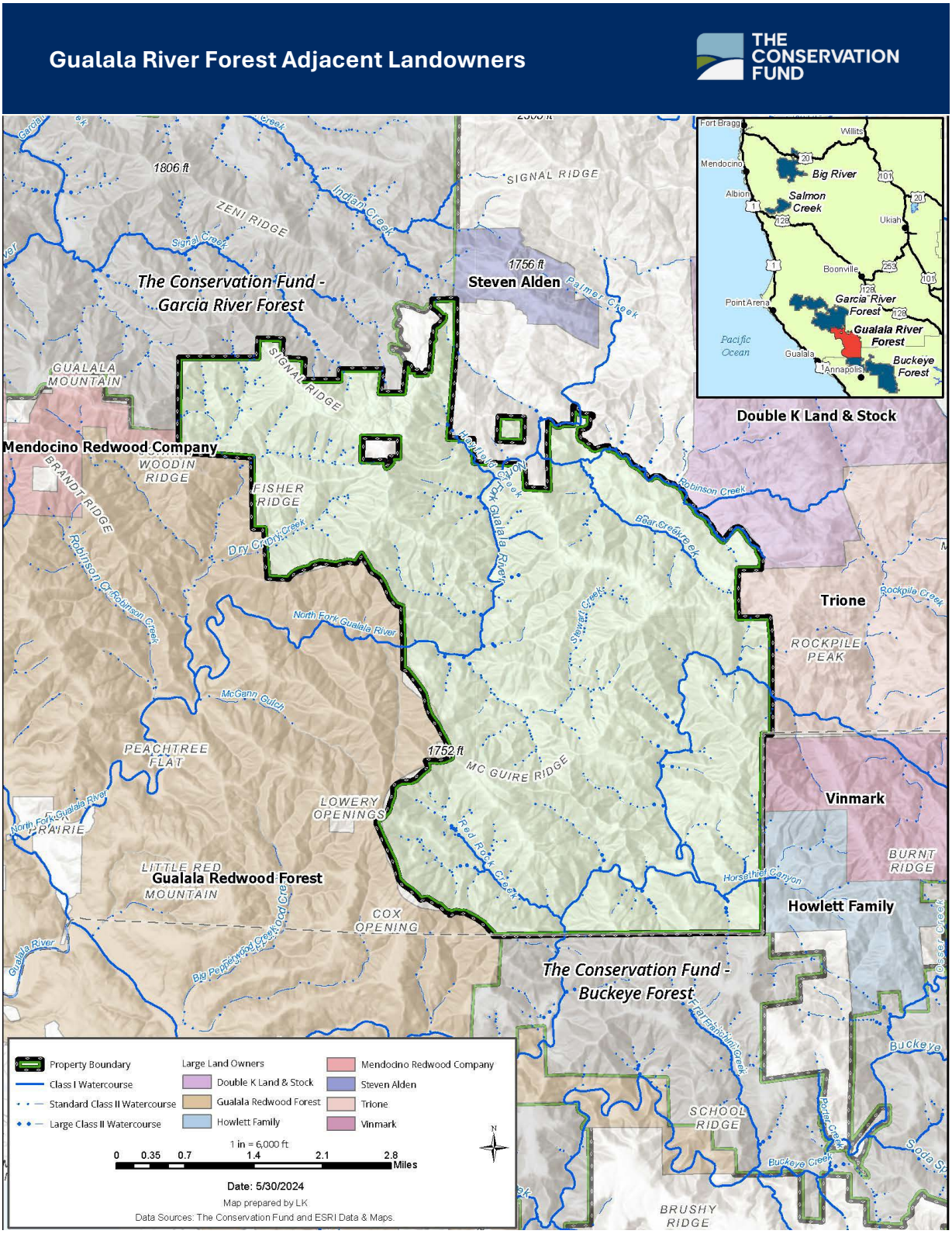


FIGURE 4-3


Gualala River Forest Adjacent Landowners
THE CONSERVATION FUND
1806 ft
ZENI RIDGE
Indian Creek
Signal Creek
SIGNAL RIDGE
1756 ft
Steven Alden
Palmer Creek
The Conservation Fund - Garcia River Forest
GUALALA MOUNTAIN
SIGNAL RIDGE
Mendocino Redwood Company
WOODIN RIDGE
BRANDT RIDGE
FISHER RIDGE
Robinson Creek
Dry Creek
Hauschulte Gulch
Gualala River
Bear Creek
Robinson Creek
North Fork Gualala River
Stewart Creek
Rockpile Creek
Trione
ROCKPILE PEAK
McGann Gulch
PEACHTREE FLAT
1752 ft
MC GUIRE RIDGE
Vinmark
LOWERY OPENINGS
North Fork Gualala River
PRAIRIE
Red Rock Creek
BURNT RIDGE
LITTLE RED MOUNTAIN
Gualala Redwood Forest
Horsethief Canyon
Howlett Family
COX OPENING
Gualala River
Big Peppertree Creek
The Conservation Fund - Buckeye Forest
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
Double K Land & Stock
Property Boundary
Class I Watercourse
Standard Class II Watercourse
Large Class II Watercourse
Large Land Owners
Double K Land & Stock
Gualala Redwood Forest
Howlett Family
Mendocino Redwood Company
Steven Alden
Trione
Vinmark
1 in = 6,000 ft
0 0.35 0.7 1.4 2.1 2.8 Miles
N
Date: 5/30/2024
Map prepared by LK
Data Sources: The Conservation Fund and ESRI Data & Maps.
SCHOOL RIDGE
Buckeye Creek
BRUSHY RIDGE

The five principal Gualala sub-basins in order of size are the Wheatfield Fork (37% of drainage), South Fork and Gualala main-stem (21%), North Fork (16%), Buckeye Creek (14%), and Rockpile Creek (12%). The main-stem extends only from the convergence of the North Fork and South Fork to the ocean, with much of this reach comprising the estuary or lagoon. This stretch of the Gualala River was designated "Wild & Scenic" by the State of California in 2003 (GRWC, 2013). The GuRF is located primarily within the North Fork Gualala River and Rockpile Creek watersheds, with the forest encompassing nearly 25 percent of these two subbasins (NCRM, 2011). The Gualala River watershed ranges in elevation from 150 feet to 1,860 feet above sea level. Topography within the watershed varies from moderate to steep slopes, moving from west to east towards the town of Yorkville and Highway 128 (NCRM, 2011).

4.1.3.2 Climate

Climate within the GuRF is coastally influenced Mediterranean, with low-intensity precipitation in the winter and cool, dry summers with coastal fog. The watershed is located within the Oregonian Biotic Province. Mean annual rainfall ranges from a low of 30 inches at the town of Gualala to nearly 100 inches on the inland coastal peaks. Most of the precipitation (roughly 90 percent) occurs between October and April, with the highest average rainfall during the month of January (NCRM, 2011).

4.1.3.3 Geology

The regional geologic landscape of the GuRF was shaped by the tectonic collision of the Farallon and North American plates during the Mesozoic and early to middle Tertiary, and subsequent deformation by extensive shearing along the San Andreas Fault System. As subduction continued, subsequent metamorphism and accretion of this new terrane to the western margin of North America resulted in what we collectively refer to as the Franciscan Complex (Blake and Jones, 1981).The Franciscan Complex is composed of three distinct belts: the eastern belt, the central belt, and the coastal belt. Generally, they decrease in age and metamorphic grade from east to west (Blake and Jones, 1981). Geologic mapping conducted in the region indicates that the GuRF is predominantly underlain by the coastal belt Franciscan complex with minor amounts of central belt in the northeastern portion of the ownership (McKittrick, 1995; Wagner and Bortugno, 1999; Fuller and et al., 2002). Generally, the coastal belt Franciscan consists of arkosic sandstone and andesitic greywacke sandstone that underwent low grade metamorphism as a result of subduction. Shear strength of the exposed bedrock is highly variable and dependent upon the local structure, bedding, and lithology.

Landslides are widespread across the GuRF locally and the greater Coast Range Mountains as a result of intense or long duration rainfall, downcutting of streams which undercuts steep slopes, inherent weakness of deformed bedrock, and shaking during episodic seismic events (Fuller and Custis, 2002). Large, deep-seated landslides (e.g. translational-rotational landslides) occur across the landscape and are generally characterized by a very slow moving slide mass and deep slide plane extending well into bedrock.

Figure 4-5illustrates slopes within the GuRF based on light detection and ranging (LiDAR) data. The steep slopes present in the Gualala watershed are shown in orange and red which contribute to slope instability. Recent unconsolidated channel deposits composed primarily of sand, silt and gravel are exposed along the active channels along the North Fork Gualala River within the GuRF.

4.1.3.4 Soils

The Natural Resource Conservation Service (NRCS) soil survey depicts four dominant distinct soil complexes on the GuRF (Rittiman and Thorson, 2002). Formed from the weathering of sedimentary rock, colluvial soils blanket a majority of the hillslopes across the Coast Range Mountains. Rittiman and Thorson (2002) mapped the following dominant soils on the GuRF:

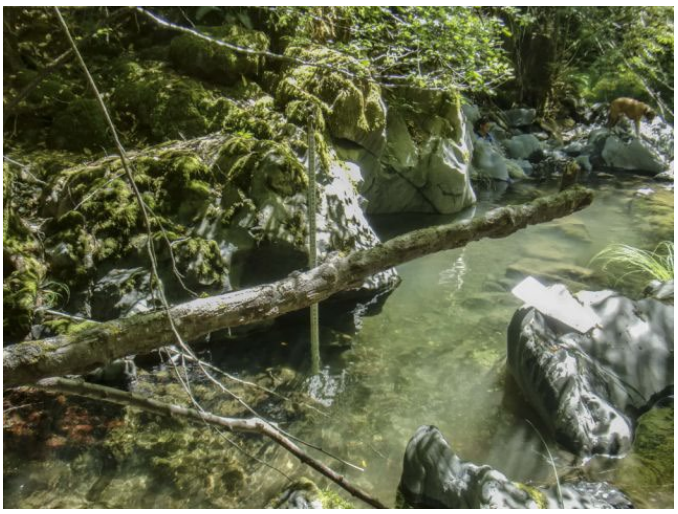


Figure 4-4: Robinson Creek East, a tributary to the North Fork Gualala River. Photo by Gualala River Watershed Council.

- Yellowhound-Kibesillah-Ornbaun complex
- Woodin-Yellowhound complex
- Ornbaun-Zeni complex
- Squawrock-Garcia-Witherell complex

Thickness of the overlying colluvial soil can be highly variable. Generally, colluvium is thin along ridges and upper sideslopes (typically 1-2 feet), and thick (as much as 5-10 feet) within deep swales and local depressions. The Gualala watershed is typical of North Coast watersheds that have geology prone to storm induced erosion events (GRWC, 2013). Kelsey et al. (1981) stated that watersheds in "The California Coast Ranges between San Francisco and the Oregon border contain the most rapidly eroding, large order, non-glaciated drainage basins of comparable size in the United States (Judson and Ritter, 1964). The combination of the underlying pervasively sheared and often folded Franciscan rocks (Bailey et. al., 1964), recent uplift, and a distinctive climate accounts for the large sediment yields." Suspended sediment and turbidity are elevated for periods of time during the high runoff, rainy season (GRWC, 2013).

For more information on soil types and descriptions, see Rittiman and Thorson (2002) and the NRCS soil series map on Figure 4-6. Soil loss tolerance rate is defined by the NRCS as the amount of soil that can be lost due to natural erosion annually with the soil maintaining its potential to produce food and fiber. The soil loss tolerance is mapped from NRCS data on Figure 4-7, illustrating high tolerance for soil generally throughout the property, i.e. the underlying soil can still be highly productive even with erosion.

FIGURE 4-5

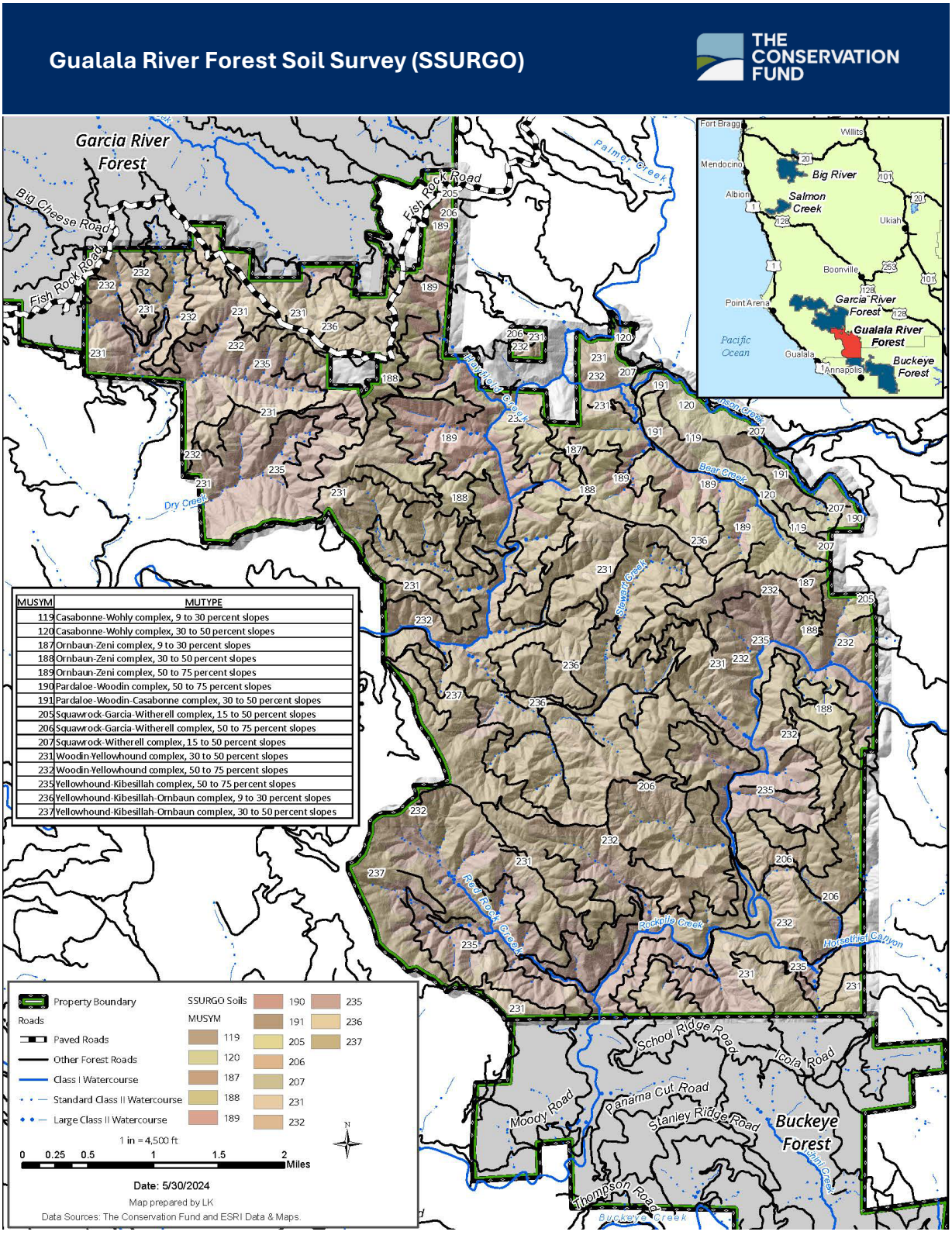

Gualala River Forest Soil Survey (SSURGO)
THE CONSERVATION FUND
Garcia River Forest
Big Cheese Road
Fish Rock Road
Palmer Creek
Dry Creek
Bear Creek
Stewart Creek
Rockpile Creek
Horsethief Canyon
School Ridge Road
Icola Road
Moody Road
Panama Cut Road
Stanley Ridge Road
Buckeye Forest
Thompson Road
Buckeye Creek
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
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
Property Boundary
Roads
Paved Roads
Other Forest Roads
Class I Watercourse
Standard Class II Watercourse
Large Class II Watercourse
SSURGO Soils
MUSYM
1 in = 4,500 ft
0 0.25 0.5 1 1.5 2 Miles
N
Date: 5/30/2024
Map prepared by LK
Data Sources: The Conservation Fund and ESRI Data & Maps.

FIGURE 4-6

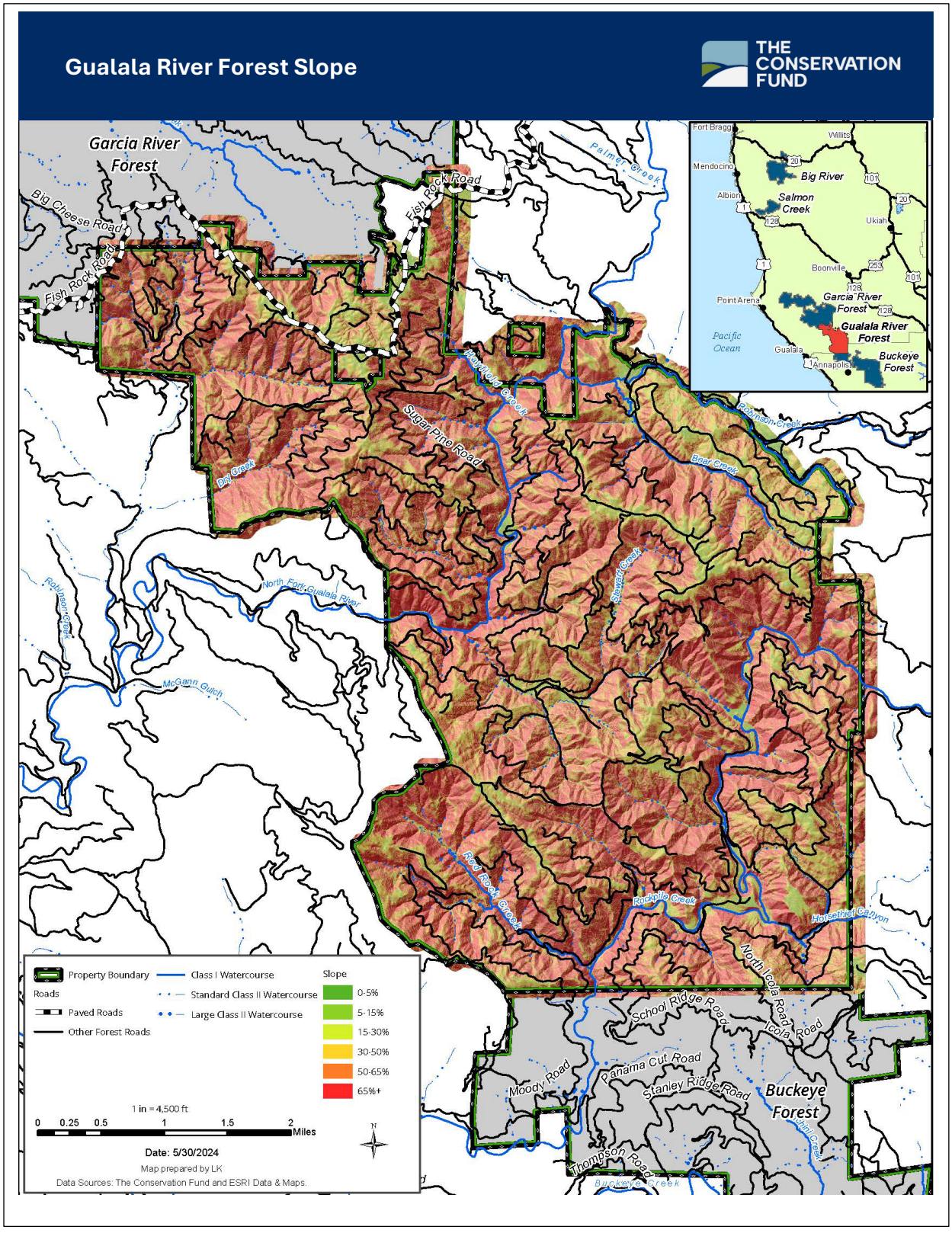
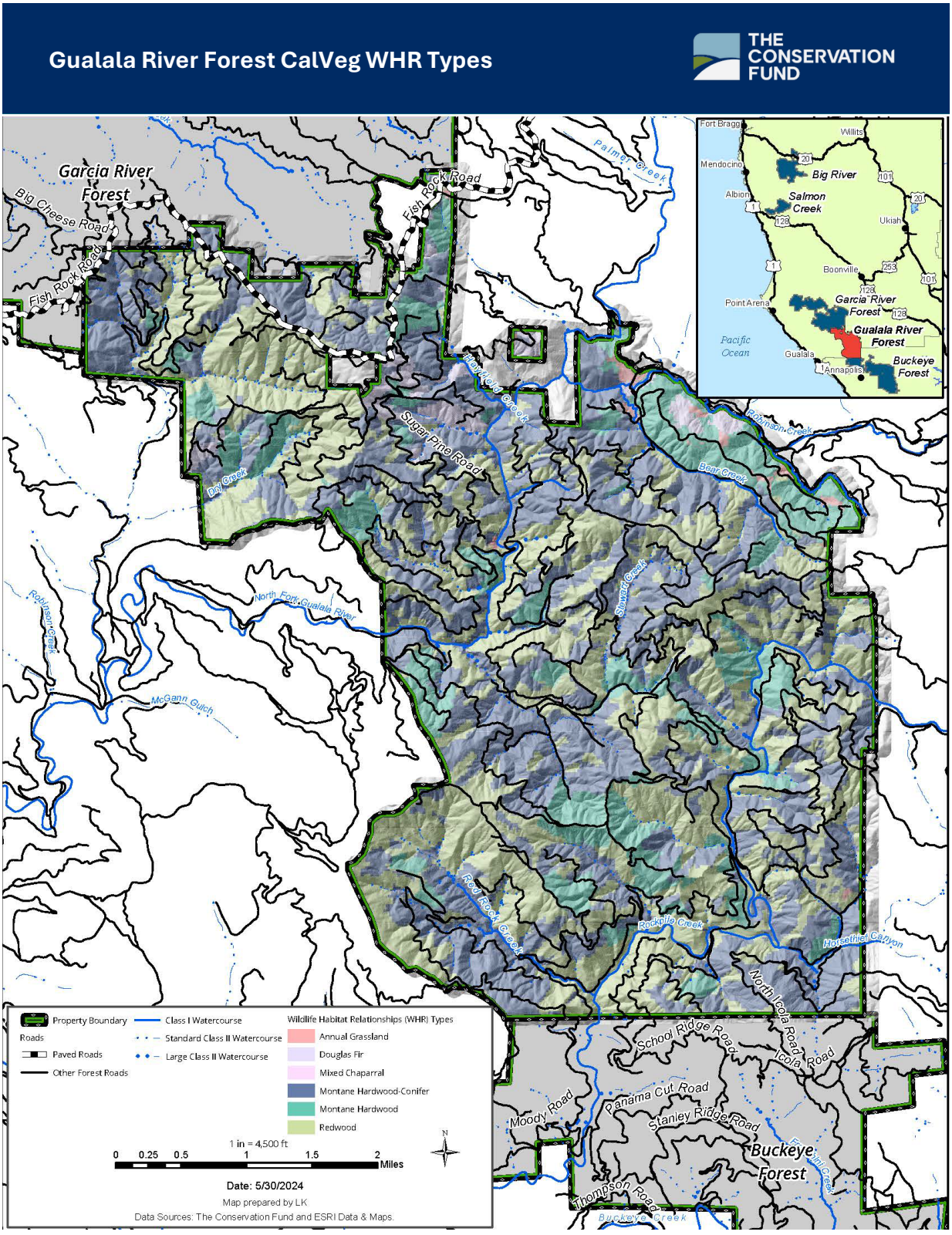

Gualala River Forest Slope
THE CONSERVATION FUND
Garcia River Forest
Big Cheese Road
Fish Rock Road
Palmer Creek
Sugar Pine Road
Dry Creek
Hurdy Gurdy Creek
Robinson Creek
Bear Creek
Stewart Creek
North Fork Gualala River
McGann Gulch
Red Rock Creek
Rockpile Creek
Horsethief Canyon
North Icoia Road
School Ridge Road
Icoia Road
Panama Cut Road
Moody Road
Stanley Ridge Road
Buckeye Forest
Thompson Road
Buckeye Creek
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
Property Boundary
Roads
Paved Roads
Other Forest Roads
Class I Watercourse
Standard Class II Watercourse
Large Class II Watercourse
Slope
0-5%
5-15%
15-30%
30-50%
50-65%
65%+
1 in = 4,500 ft
0 0.25 0.5 1 1.5 2 Miles
N
Date: 5/30/2024
Map prepared by LK
Data Sources: The Conservation Fund and ESRI Data & Maps.

FIGURE 4-7


Gualala River Forest CalVeg WHR Types
THE CONSERVATION FUND
Garcia River Forest
Big Cheese Road
Fish Rock Road
Palmer Creek
Sugar Pine Road
Dry Creek
Hunting Creek
Robinson Creek
Bear Creek
Stewart Creek
North Fork Gualala River
Rattlesnake Gulch
McGann Gulch
Red Rock Creek
Rockpile Creek
Horsethief Canyon
North Icoia Road
School Ridge Road
Icoia Road
Moody Road
Panama Cut Road
Stanley Ridge Road
Buckeye Forest
Thompson Road
Buckeye Creek
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
Property Boundary
Roads
Paved Roads
Other Forest Roads
Class I Watercourse
Standard Class II Watercourse
Large Class II Watercourse
Wildlife Habitat Relationships (WHR) Types
Annual Grassland
Douglas Fir
Mixed Chaparral
Montane Hardwood-Conifer
Montane Hardwood
Redwood
1 in = 4,500 ft
0 0.25 0.5 1 1.5 2 Miles
N
Date: 5/30/2024
Map prepared by LK
Data Sources: The Conservation Fund and ESRI Data & Maps.

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	State or Federal	Responsible Agency
California Coastal Act	State	California Coastal Commission
California Endangered Species Act	State	California Department of Fish & Wildlife
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 that 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 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 to ensure sustainable and environmentally appropriate forestry in California. CAL FIRE promulgates rules to implement the law. Over time, the legislature has passed many laws increasing its scope and detail. CAL FIRE has done likewise with the regulations. 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 – are often 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 TMDLs for each impaired water body to address both 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 focused on sediment and temperature pollution, both of which generally are generated from nonpoint sources such as stormwater 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. Beneficial uses of the Gualala River listed by the NCRWQCB (Watershed Planning Chapter, 2005) include:

- Commercial and sport fishing
- Cold freshwater habitat
- Migration of aquatic organisms
- Spawning, reproduction, and early development of salmonids; and
- Estuarine habitat.

The Water Quality Control Plan for the North Coast Region (Basin Plan) also includes the following potential beneficial uses within the North Fork Gualala River watershed: municipal and domestic water supply, agricultural water supply, industrial service water supply, groundwater recharge,

freshwater replenishment, navigation, water contact recreation (REC-1), non-contact water recreation (REC-2), wildlife habitat, rare/threatened/endangered species, and aquaculture. Existing beneficial uses within the Rockpile Creek watershed include all of the above, plus warm freshwater habitat, minus freshwater replenishment, (NCRWQCB, 2011).

The Gualala River watershed was listed under the CWA Section 303(d) List of Impaired Waterbodies for excessive sedimentation and subsequent anadromous salmonid habitat loss, high water temperature levels, and high levels of naturally occurring aluminum (within the mainstem Gualala River only). The EPA established the Gualala River TMDL for Sedimentation/Siltation on December 20, 2001. Regional Water Board staff are currently developing an action plan to address continuing water quality impairments in the Gualala River watershed, with a projected completion date of March 2026. (A very small portion of the GuRF is also within the Garcia watershed and subject to the TMDL requirements of the Garcia Watershed—these will be addressed in site-specific project prescriptions.)

4.2 Forest and Terrestrial Conditions

4.2.1 Forest Overview

The GuRF is typical of the north coast of California—dominated by native conifers (primarily redwood, Douglas-fir and sugar pine), steep slopes, and 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 through the current day. The timber inventory on the Forest is depleted compared to historic levels but is comparable to other industrial timberland in the region. And because of its unique properties and appearance, redwood is still one of the most valuable lumber species in the world.

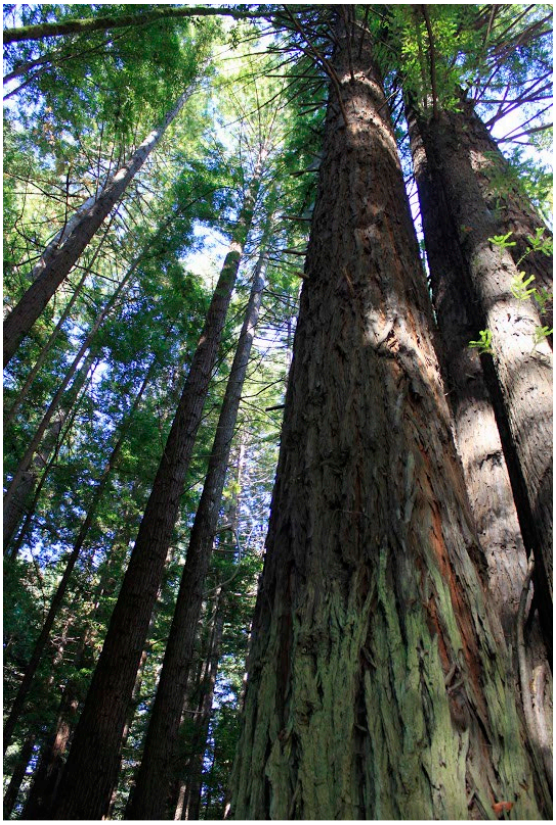


Figure 4-8: Redwood stand on the North Coast. Photo by Whitney Flanagan, The Conservation Fund.

The Forest is well situated for continued IFM—there is good road infrastructure, low to average site productivity for forests in the redwood region, and a mixture of mature forest and rapidly growing young stands. That said, less than half the Forest currently is able to support a commercial timber harvest, many of the roads and stream crossings will need upgrading in the next twenty years to

facilitate timber harvesting. The property 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 GuRF (and coastal Mendocino County forestland, in general) that constrain potential forest management operations—especially low-impact ecological silviculture. These include:

- Steep slopes. The steep slopes characteristic of the Coast Range routinely require specialized cable yarding equipment to move logs from the woods to the landing with the minimum of 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.
- Low volumes. 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—it 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.
- Hardwood competition. 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 years 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.
- Operating season. The high rainfall that helps make the forest so productive also means harvesting and road improvement operations basically cease during the rainy season to avoid 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.

- Limited markets for products. The timber market is volatile and dependent on housing starts and state and national economies. The number of sawmills in the region has declined steadily since 1970 but has currently stabilized at seven sawmills in our region. 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 four months and $50,000 to $80,000 to prepare and administer a timber harvest plan (THP), which is five to ten times 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.

Forest Inventory System

The Fund maintains linked forest inventory and geographic information system (GIS) databases in order to be able to assess, document, and monitor the forest conditions.
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 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.

4.2.3 Current Stand Conditions

The forest uses an unstratified, systematic sample with fixed radius plots to track long term forest growth.

Table 4.2: Inventory Summary

	2015 Inventory Summary	2024 Inventory Summary
Species	MBF/acre	MBF/acre

Hardwoods	3.46	5.16
Doug-fir	4.04	6.83
Redwood	2.84	4.22
Sugar pine	2.59	3.58

4.2.4 Productivity and Site Index

The GuRF is generally redwood and Douglas-fir site class 3 and 4 lands. The average measured site index at base age 50 from the current inventory (installed in 2015) is Douglas-fir = 101, redwood = 102, 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. 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. The principal hardwood species is tanoak, with a mixture of madrone, oak (*Quercus sp.*), California laurel, and other 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.

Appendix A contains a more detailed discussion of botanical resources of the GuRF by botanists Geri Hulse-Stephens and Kerry Heise.

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

Habitat Patch Type	Representative Acreage on Forest
Annual Grassland (AGS)	101
Douglas-Fir (DFR)	286

Mixed Chaparral (MCH)	.4
Montane Hardwood-conifer (MHC)	5,692
Montane Hardwood (MHW)	1,834
Redwood Forest (RDW)	5,623
Non-forest	378
Total Acreage:	**13,913**

4.3.2 Special Status Species

The GuRF overlaps two U.S. Geological Survey (USGS) 7.5-minute quadrangle maps: Gube Mountain (3812373) and McGuire Ridge (3812374). A Rarefind Report (California Natural Diversity Database, or CNDDB) search of the GuRF property within these two USGS quad maps identified five occurrences of three sensitive animal species (see Table 4-4 below). The California Native Plant Society (CNPS) predicted the occurrence of four rare plant species based on data results from the McGuire Ridge quad map; no rare plant species were predicted within the Gube Mountain quad. Further data contributing to Table 4-4 are from Heise and Hulse-Stephens (2013) and GRWC (2013).

Federally threatened listed species confirmed in the forest include Coho salmon, steelhead trout, and northern spotted owl. The northern spotted owl, the best understood terrestrial species, 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 Gualala River Forest

Species	**Listing Status**
Animals	
California red-legged frog (*Rana draytonii*)	FT CDFW: SSC
Coho salmon (*Oncorhynchus kisutch*) Central California Coast Evolutionarily Significant Unit (ESU)	FE SE
Foothill yellow-legged frog (*Rana boylii*)	CDFW: SSC
Gualala roach (*Lavinia symmetricus parvipinnis*)	CDFW: SSC
Sonoma tree vole (*Arborimus pomo*)	CDFW: SSC

Steelhead (*Oncorhynchus mykiss*) Central California Coast ESU	FT
Western pond turtle (*Emys marmorata*)	CDFW: SSC
Plants	
Fringed false hellebore (*Veratrum fimbriatum*)	None
Running-pine (*Lycopodium clavatum*)	None
Santa Cruz clover (*Trifolium buckwestiorum*)	BLM: Sensitive
Swamp harebell (*Campanula californica*)	BLM: Sensitive
Thin-lobed horkelia (*Horkelia tenuiloba*)	BLM: Sensitive
White-flowered rein orchid (*Piperia candida*)	BLM: Sensitive

Listing Status Codes:

FE= Federally Endangered, FT=Federally Threatened; SE=State Endangered

CDFW: SSC = California Species of Special Concern

BLM: Sensitive

4.3.3 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.

Figure 4-9: Northern spotted owl. Photo by Mike Stephens.

One NSO activity center is located on the GuRF based on current surveys. 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 habitat fitness 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 that the owls require for survival and reproductive success. 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 timber harvest is proposed. Historically the USFWS has overseen the administration and consultations with regard to species protected under the ESA. This responsibility has now shifted 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 NSO survey protocol in 2011, which was subsequently revised 2012. CAL FIRE has been charged with reviewing NSO data submitted with 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 property 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), suppresses its calling behavior (Crozier et al., 2006), and is steadily increasing in Mendocino County.

Barred owls originated from the eastern United States and Canada and began relatively recently migrating through the central plains and southern boreal forests of North America to the west coast, likely due to anthropogenic changes. Barred owls are considered a non-native and invasive species because they are not native to this region, where they now outcompete the native Northern Spotted Owl for food and habitat, causing significant declines in the spotted owl population due to their larger size, more aggressive nature, and broader prey selection; essentially acting as an invasive species that disrupts the local ecosystem by negatively impacting the native spotted owl population. The barred owl has proved to be highly competitive with the Northern spotted owl, displacing the spotted owl from its preferred habitat and occasionally directly killing spotted owls. As a result, there has been a serious decline in the spotted owl population in Washington, Oregon and northern California. At this time, it is believed that the spotted owl is threatened with extinction within the next 5-10 years in Mendocino County unless measures can be taken to reduce the barred owl population and/or stop the southward migration through California.

Even as habitat quality has increased, spotted owl populations across The Conservation Fund's North Coast ownership have been on the decline for the last 10+ years – coinciding with a relatively rapid increase of barred owl detections in spotted owl nesting and roosting areas—defined by California Department of Fish & Wildlife as Activity Centers. In addition, spotted owls have stopped responding to research survey calls because they are afraid of barred owls locating them. The current low population estimate of spotted owls may be due to barred owl invasion as well as lower overall habitat quality (because of prior harvesting practices).

In 2024, TCF was approached by researcher Danny Hofstadter, affiliated with University of Wisconsin, to participate in a barred owl removal study. This pilot effort will cover major lands in Mendocino and Sonoma County and are intended to 1) better understand how spotted owls respond to removal of barred owls, 2) better understand the barred owl through genetic and dietary testing, and 3) buy time for spotted owls to persist in order to see if a coexistence or habitat differentiation strategy may evolve. Grant funding has been secured for these research efforts, which are expected to take place over three-years. Based on the research already underway by Danny Hofstadter, it is expected that the spotted owl population on TCF lands will increase due to the barred owl removal. Researchers and TCF will continue throughout the 3-year study (and beyond) to survey for spotted owls and track spotted owl populations.

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 B.

4.4 Watershed Conditions

4.4.1 Water Quality Overview

The GuRF 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 sediments 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, (1) sediment concentrations can increase due to

accelerated erosion, (2) water temperatures can increase due to removal of overstory riparian shade, (3) dissolved oxygen can be depleted due to accumulation of slash and other organic debris, and (4) concentrations of organic and inorganic chemicals can increase due to harvesting and fertilizers and pesticides."

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 described in detail in Section 5.

The Gualala River Watershed Council (GRWC) contributed the majority of the information on stream conditions and aquatic species affecting management and is excerpted below. The GRWC Aquatic Management Plan for the GuRF is included in its entirety as Appendix C.

4.4.2 Stream Conditions

The complexity of stream conditions within the North Fork Gualala River and Rockpile Creek sub-basins and the clear differences between tributaries and main-stems makes it difficult to develop Fund ownership-wide assessments and recommendations. In order to be specific this section provides information on streams in the context of CalWater Planning Watersheds within the North Fork Gualala River and Rockpile Creek Super Planning Watersheds (SPWS)(GRWC, 2013).

North Fork Gualala River Super Planning Watershed

The North Fork sub-basin (CalWater 2.2a 113.81, North Fork SPW) encompasses 47.9 square miles of private land in the northern region of the Gualala River Watershed. The main channel has a zig-zag pattern in response to faulting. Two major faults have influenced channel formation in the North Fork SPW. The Tombs Creek Fault bisects the headwater channels, and the San Andreas Fault runs along the lower portion of the main-stem. There are 127 miles of "blue line" streams, and five major tributaries: Little North Fork, Robinson Creek, Dry Creek, Stewart Creek, and Billings Creek. Predominant land uses include timber production, grazing, small vineyards, and some 40-acre and larger subdivisions in the headwaters.

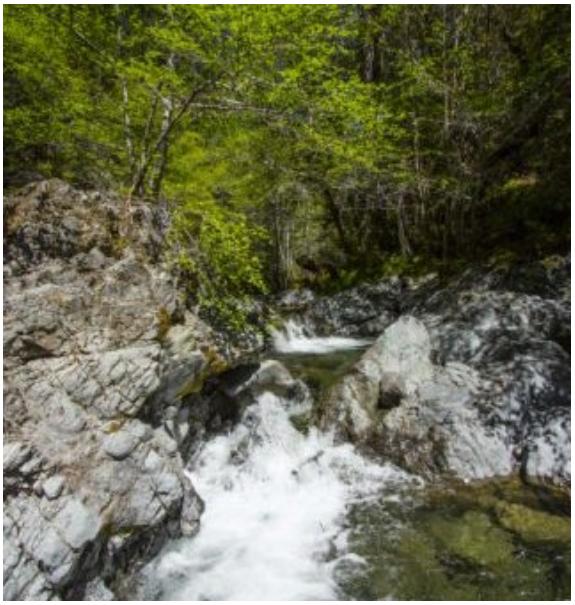


Figure 4-10: North Fork Gualala River just below Hayfield Creek. Photo by Gualala River Watershed Council.

At 7,925 acres the GuRF ownership is 26% of the North Fork basin spanning Robinson Creek, Stewart Creek and Billings Creek Planning Watersheds (PWS).

The basin has the highest timber site quality in the watershed. With over 70 inches of rainfall per year within the coastal fog influence, the lower and middle reaches of the North Fork sub-basin contain prime timber growing ground for Redwood and Douglas fir. In the upper third of the North Fork sub-basin, there is an abrupt vegetation transition to the mélange clay soil type. At the base of the Billings Creek PW along the Tombs Creek fault, dense conifer stands give way to prairie grasslands and oak woodland.

The North Fork sub-basin has the highest road density (6.5 miles per sq. mile) in the watershed. The road network is extensive, made up of mainly private roads. The roads were built primarily to support timber operations; most were constructed during the period from the 1950s to 1970s. Due to the Gualala River Watershed Council (GRWC) Restoration Program and the cooperative efforts of Gualala Redwoods, Inc. (GRI), extensive road restoration projects have been completed in the Doty Creek and Robinson Creek PWs decreasing the effective road density to 4.6 miles per sq. mile.

Legacy in-stream sediment deposits are slowly transporting out of the watershed. Sediment levels, indicative of disturbance, occur along 29 of 127 miles (23%) of the blue lines streams in the sub-basin. This is a 40% reduction compared to levels in 1984. Most of the reduction is occurring in the headwater tributaries, while the lower reaches show less change (Klamt, et al. 2002).

Within the North Fork Basin tributaries Maximum Weekly Average Temperature (MWAT) ranges are primarily within suitable categories (13°C to 17°C) with Robinson Creek East as the outlier with temperatures at 18.7°C. The main-stem sites vary from suitable to unsuitable for summertime rearing (15.5°C to 22.0°C). There is a trend of higher water temperatures upstream in the North Fork to lower temperatures as the stream flows towards the ocean. In the upper reaches air temperatures are generally higher and canopy density lower in the northeastern oak woodland and grassland, probably contributing to higher water temperatures. As the North Fork flows west into the coastal influence and better canopy coverage, it also receives flows from cooler tributaries and springs, combining to reduce the main-stem water temperatures (Klamt et al., 2002).

The North Fork SPWS is considered the highest priority watershed as an “Initial Focus Core Area” for restoration (NMFS, 2012). Two factors contribute to this ranking and the importance the sub-basin provides to the Gualala River watershed as a whole. First, it provides the highest quality salmonid refugia available in the watershed and is the only sub-basin to have possible remnant populations of coho salmon. During the past decade coho salmon have been found in the Little North Fork and its tributary Doty Creek, McGann Gulch, and Dry Creek. Second, the North Fork is an important source of base flows and cold water infusion to the lower Gualala during the late season periods when the estuary is prone to warmer temperatures and high salinity conditions. The North Fork contributes greater runoff per unit area than the other major tributaries feeding the lower river and estuary/lagoon in the summer months (ECORP Consulting, Inc. et al., 2005).

Lack of large wood abundance, excess sediment and deficient in-channel canopy density in the headwaters are the cause of most salmonid limiting factors in the North Fork basin (Klamt, et al., 2003). In the lower basin, limiting factors are being addressed on a planning watershed scale by the upgrading of road systems and the placement of large wood through GRWC restoration programs and landowner collaboration.

Robinson Creek CalWater Planning Watershed

Robinson Creek PWS is a 13.7 mi^2 (8,792 acre) sub-watershed that drains 45.9 miles of blue line stream of which approximately 16 miles is salmonid habitat. The three main tributaries Dry Creek, Robinson Creek and McGann Gulch within the Robinson Creek PWS all have suitable temperatures for coho salmon.

The GuRF encompasses approximately 1,982 acres (3.1 sq. miles) concentrated in the headwaters of Dry Creek. Although the ownership area is confined to two headwaters streams, these drainages are important ecosystems to Dry Creek, one of the last streams where coho have been documented in the watershed.

Robinson Creek PWS has a high road density of 6.8 miles per mi^2, totaling 43 miles of primarily private timber roads. A recent collaborative restoration effort on GRI property within the PW has decreased the effective road density to 3.6 miles per mi^2. It is estimated 83% of the total erosion yield within the watershed is road-related (O'Connor, 2008). Approximately 23% (21 miles) of the total road network is on GuRF property.

Implementing road-related sediment source reduction strategies and the appropriate management of headwater systems will benefit downstream reaches by attenuating floods, maintaining water supplies and quality, preventing increased in-stream siltation and aggradations, and provide a steady supply of food resources.

Stewart Creek CalWater Planning Watershed

Stewart Creek PWS is a 10.3 mi^2 (6585 acre) sub-watershed that drains 27.1 miles of blue line stream, of which approximately 11.3 miles are class I streams, primarily concentrated in the North Fork main-stem. There are two small tributaries that feed into the North Fork: Stewart Creek and Hayfield Creek. Coho and steelhead were historically present on the North Fork main-stem according to 1960s and 1970s CDFW stream surveys.

The Conservation Fund owns 4,392 acres (6.9 sq. miles) within the planning watershed. Representing 67% of the sub- watershed, the Fund is the largest landowner. There are approximately 6.3 miles of Class I streams on property within the PW.

Stewart Creek PWS has a high road density of 7.6 miles per mi^2, with a total of 78 miles of primarily private timber roads. It is estimated 56% of the total erosion yield within the watershed is road-related (O'Connor Environmental, 2008). Approximately 68% (53 miles) of the total road network is on GuRF property. The GRWC is currently working with GRI on assessment and implementation of

sediment source restoration on their 22 miles of road within the watershed. To date 17% of the GRI road network in the basin has been hydrologically disconnected.

Implementing road-related sediment source reduction strategies, increasing in-stream canopy density and improving large wood abundance along the North Fork main-stem are the top priority recommendations for the watershed (Klamt et al, 2003)

Billings Creek CalWater Planning Watershed

At 10,650 acres (16.6 mi^2), Billings Creek PWS is the largest sub-watershed within the North Fork SPWS. The planning watershed drains 39 miles of blue line streams, of which approximately 17 miles are potential salmonid habitat. There are two tributaries that feed into the Billings Creek main-stem: Robinson Creek East and Palmer Creek.

The Conservation Fund owns 1,551 acres (2.4 mi^2) within the planning watershed. There is a small portion of Billings Creek at the east property boundary, but Robinson Creek East and its tributary Bear Creek are the primary watercourses with approximately 2.7 miles of Class I streams.

Billings Creek PWS has a road density of 4.8 miles per mi^2 representing a total of 79 miles of primarily private timber roads. It is estimated 37% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008). Approximately 15 miles of the total road network is on GuRF property. Road-related sediment should be addressed with a focus on in-stream and near-stream roads where channel braiding and/or aggradation are still persistent today (Klamt et al, 2003).

As discussed earlier the terrain changes to more open grassland at the beginning of Billings Creek and the Tombs Creek Fault Zone. Cattle grazing occurs on the east side of the property impacting Billings Creek, Robinson Creek and the lower portion of Bear Creek. Exclusionary fencing should be installed.

Large wood abundance should be augmented in the lower reaches of Robinson Creek East along with riparian restoration to provide increased bank stability and in-stream refugia habitat.

Rockpile Creek Super Planning Watershed

The 35 $mi.^2$ (22,389-acre) Rockpile basin drains 88 miles of "blue line" streams, and over 60% of the basin has a high to very high landslide potential rating. There are two major tributaries to Rockpile Creek: Horsethief Canyon and Redrock Creek.

At 5,356 acres the GuRF ownership is 24% of the Rockpile Creek SPWS. The majority of the ownership spans Redrock Creek and Middle Rockpile Creek PWS. The property boundary includes a small amount of acreage (2 acres) in Lower Rockpile Creek.

In the lower reaches of the sub-basin, streams meander slightly through narrow alluviated alleys within steep valleys. The main channel is somewhat sinuous and low gradient, with a narrow floodplain and stable point bars.

Mid-century pre-1973 tractor harvesting was the dominant method used in the Rockpile basin, removing most of the old growth conifer-dominated stands throughout the lower and central reaches of the basin in a comparatively narrow time frame between 1952 and 1968. Between 1952 and 1964, 65% of the area had been subject to tractor harvest operations and by the end of the first logging era in 1968, 73.5% of the basin had been harvested (GRWC 2013).

The Rockpile Creek SPWS has 169 miles of private roads. Road density is 4.6 miles per $mi.^2$ within the basin. The North Coast Watershed Assessment Program (NCWAP) restoration map targets the central and upper sub-basin reaches with the highest priority for future restoration work in sediment reduction.

Similar to the North Fork, stream channel morphology in the Rockpile sub-basin shows the following evolution over the last half century: (1) a high density of debris flow mounds in the active channel triggered by mid-20th-century storm events, (2) progressive abatement of the frequency of these point sources over successive decades, and (3) apparent improvement of in-stream channel conditions between 1984 and 2000 as evidenced by a reduction in the percentage of channel length affected by excess sediment storage or sediment sources (Klamt et al., 2002).

GRWC has eleven temperature monitoring sites throughout the basin with temperature data from 1994 to 2012. Recent temperature data show the two tributaries (Redrock and Horsethief Canyon) temperatures are in the suitable ranges for salmonids (MWAT 13.2°C to 15.9°C). The main-stem sites vary from moderately suitable to moderately unsuitable for summertime rearing (MWAT 17.1°C to 19.1°C). There is a slight trend, not as pronounced as in the North Fork, of cooling temperatures as the stream flows towards the ocean.

2001 CDFW habitat inventory data was limited in scope; only 39% of the basin was surveyed and stopped at the GRI property line. Data show habitat deficiencies related to canopy cover, pool frequency/depth, and shelter cover in the areas surveyed. More recent GRWC survey results illustrate continued channel simplification in the lower reaches of the main-stem (Lower Rockpile PWS). However, pool frequency and depth do not appear to be limiting in the central watershed (GRWC, 2012).

The Rockpile Creek SPWS is considered a “Phase I Expansion Area” for salmonid restoration efforts in the Gualala River Watershed. Key limiting factors and basin recommendations are similar to the North Fork SPWS, with more emphasis on inadequate riparian composition and density in the middle and upper watershed. Lack of large wood abundance, excess in-stream sediment and deficient in-channel canopy density in the central and upper basin are key factors limiting salmonid habitat (Klamt, et al., 2002).

Red Rock CalWater Planning Watershed

Red Rock Creek (PWS), at 2,219 acres (3.5 mi.^{2}), is the smallest sub-watershed within the Rockpile Creek SPWS. The sub-basin drains 7.4 miles of "blue line" streams, of which approximately 3.2 miles are Class I streams. Anadromous habitat is found in the Rockpile Creek main-stem and its tributary, Red Rock Creek. The GuRF owns 1,561 acres (2.4 mi^2) which contain 2.5 miles of Class I streams within the planning watershed. The ownership represents 70% of the basin.

Red Rock Creek PWS has a road density of 6.1 miles per mi.^{2}, representing a total of 21 miles of private timber roads. It is estimated 84% of the total erosion yield within the watershed is road related (O'Connor, 2008). Approximately 15 miles (72%) of the total road network is on GuRF property. Some road-related sediment reduction work has been completed, but it is not known to what extent this work conforms to current standards. According to NCWAP, in the mid-1990s, extensive streambank rehabilitation work was implemented on roads in Redrock Creek; this work was carried out by the previous landowner, Coastal Forestlands, Ltd.

Implementing road-related sediment source reduction strategies, identifying and implementing riparian enhancement projects where current canopy density and diversity are inadequate along Rockpile main-stem and Redrock Creek, and improving large wood abundance along the Rockpile main-stem are the top priority recommendations for the watershed (Klamt et al., 2002).

Middle Rockpile CalWater Planning Watershed

Middle Rockpile Creek (PWS) is a 12.8 mi.^{2} (8,165 acre) sub-watershed draining 29 miles of blue line stream, of which approximately 11.4 miles are Class I streams. Anadromous habitat is found in the Rockpile Creek main-stem and its tributary, Horsethief Canyon. The Gualala Forest ownership is 3,793 acres (46%) of the 5.9 mi.^{2} basin and has 7.2 miles of Class I streams within the planning watershed.

Historically, streamside roads and landings were densely concentrated at the base of steep ravines in Middle Rockpile Creek planning watershed. Throughout Horsethief Canyon, heavy tractors cut into the steep sidebanks at the base of the streams, making the near vertical cut banks along these roads prone to failure during winter storms. The 1963 and 1981 air photos showed a high density of road debris slides accessing streams in the Middle Rockpile PWS (Klamt et al., 2002).

The planning watershed has a road density of 5.5 miles per mi.^{2}, representing a total of 70 miles of private timber roads. It is estimated 38% of the total erosion yield within the watershed is road related (O'Connor, 2008). Approximately 35 miles (50%) of the total road network is on Gualala Forest property.

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 Gualala River watershed: steelhead (*Oncorhynchus mykiss*) and coho salmon (*Oncorhynchus kisutch*). Selecting an analyzed species to be used for evaluating the impacts of watershed activities on a range of native aquatic species is an accepted premise. In California's

North Coast watersheds, salmonids are used as an indicator of watershed and ecosystem health and information and management recommendations provided throughout this plan are predominantly relevant to salmonid habitat and populations (GRWC, 2013).

Three anadromous fish species and five fresh water species, including the Gualala roach (a type of minnow endemic to the Gualala River), are commonly found in the freshwater environment of the GuRF (Table 4-5). All species, excluding coho are commonly observed in most Class I watercourses in the basin. Pacific lamprey has been observed but other lamprey species (river and Western brook lamprey) which may be present in the watershed have not been documented. There is very little evidence chinook salmon ever inhabited the watershed (GRWC, 2013).

Table 4-5: Aquatic Threatened, Endangered, and Species of Concern in the Vicinity of the Forest

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
Pacific lamprey (*Lampetra tridentata*)	
Freshwater Fish	
Gualala roach (*Lavinia symmetricus parvipinnis*)	CDFW: SSC
Coast range sculpin (*Cottus aleuticus*)	
Prickly sculpin (*Cottus asper*)	
Riffle sculpin (*Cottus gulosus*)	
Threespine stickleback (*Gasterosteus aculeatus*)	
Reptiles	
Western (Northern Pacific) pond turtle (*Emys marmorata*)	CDFW: SSC
Western aquatic garter snake (*Thamnophis couchi*)	
Amphibians	
Coastal (Pacific) giant salamander (*Dicamptodon tenebrosus*)	
Southern torrent salamander (*Rhyacotriton variegatus*)	
Northwestern salamander (*Ambystoma gracile*)	
Rough-skinned newt (*Taricha granulosa*)	
Red-bellied newt (*Taricha rivularis*)	
Coast range newt (*Taricha torosa*)	CDFW: SSC
Ensatina (*Ensatina eschscholtzi*)	
Black salamander (*Aneides flavipunctatus*)	
Tailed frog (*Ascaphus truei*)	FT CDFW: SSC
Western toad (*Bufo boreas*)	
Pacific treefrog (*Hyla regilla*)	
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

Coho Salmon (*Oncorhynchus kisutch*)

The Gualala River watershed hosts one of the few Functionally Independent Populations (FIPs) of the Central California Coast Coho (Spence et al., 2008) and has the highest Intrinsic Potential (IP), excluding the Russian River, of all the coastal watersheds for possible recovery of the California Central Coast Coho ESU (NMFS, 2012).

Coho 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.

In the Gualala known coho habitat is limited to the North Fork basin and more likely, the Doty and Robinson Creek Planning watersheds where small and possibly not self-sustaining coho populations have been observed during snorkel and electrofishing surveys.

Neither accurate nor credible coho salmon population estimates have been conducted in the Gualala River watershed (Klamt et al., 2002). Electrofishing (10 Pool Protocol) data from 2001 indicated that coho salmon were absent and possibly extirpated from the Gualala basin (CDFG, 2002), but coho young-of-the-year have been observed in the North Fork sub-basin and the Gualala River estuary during subsequent surveys and studies.

- 2002: coho young-of-the-year were observed in the North Fork sub-basin on McGann Gulch Creek, (R. Dingman, Gualala River Steelhead Project), and in Dry Creek (H. Alden, Gualala Redwoods, Inc.), both tributaries to the North Fork. Coho young-of-the-year were also observed on the Little North Fork and Doty Creek during electrofishing surveys (CDFG, 2002).
- 2003: in May during a Gualala River estuary sampling event a coho juvenile was found (ECORP Consulting, Inc. et al., 2005). In June, juvenile coho salmon were reported to have stranded immediately after an estuary summer breach event by NOAA fisheries personnel. Coho juveniles were found during the summer in tributaries of the North Fork during presence/absence snorkel surveys conducted by Wendy Jones (CDFG, 2004).
- 2004: juvenile coho were found in upper Dry Creek during snorkel surveys.
- 2005 to present: comprehensive surveys and/or studies that would lead to coho observations or population assessments were not conducted in the watershed during this period.

The last planting of coho salmon fingerlings in the watershed was in the Little North Fork tributary in 1998 (Klamt et al, 2002). With multiple sightings of juvenile coho continuing six years later, it is highly probable a remnant coho population exists in the Gualala.

Steelhead Trout (*Oncorhynchus mykiss*)

Starting in the 1940s and continuing today, steelhead trout have been recreationally fished on the Gualala River. CDFW conducted steelhead population surveys in 1976 and 1977 and found steelhead populations to be 7,608 and 4,324, respectively.

Figure 4-11: Steelhead in the North Fork Gualala River. Photo by Sean Case, Gualala River Watershed Council.

In 1973, CDFW estimated the steelhead population (for the entire system) was between 2,219 ("Park Hole") and 2,584 (estuary), based on recapture in two areas of the lower main-stem Gualala. CDFW estimated the adult steelhead population was 7,608, in 1975-76 the population was estimated at 6,300. In 1977, CDFW estimated the winter steelhead population at 4,400 (GRWC, 2013).

CDFW planted steelhead juveniles from the Mad River Hatchery in the Gualala River from 1972 through 1976, and then again from 1985 through 1989. A hatchery was operated by the Gualala River Steelhead Project (GRSP) in the late 1980s using native Gualala River brood fish that were caught by anglers. In 1994, the GRSP changed the emphasis of their program to rescue, rearing, and release.

Current adult steelhead population estimates for the Gualala River basin are not available. The GRWC currently conducts limited snorkel and spawning surveys with the goal of expanding the study scope to estimate watershed steelhead populations in the future.

In general, steelhead stocks throughout California have declined substantially. The most current estimate of the population of steelhead in California is approximately 250,000 adults, roughly half the adult population from the mid-1960s (McEwan et al., 1996).

Throughout their range, steelhead typically remain at sea for one to four growing seasons before returning to fresh water to spawn (Burgner et al., 1992). Most Gualala River steelhead migrated to

sea as two-year-old fish and returned after spending two years in the ocean. However, steelhead occasionally exhibit other life history patterns: scale analysis of adults indicated they spent from one to four years in fresh water and from one to three years in the ocean (GRWC, 2013).

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.

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).

4.4.4 Existing Road Conditions

The GuRF has an extensive network of maintained roads. Most roads have internal and external locked gates to control access. In addition to frontage on Fish Rock Road maintained by Mendocino County, the Forest contains all-season main access roads and seasonal roads historically used for timber harvesting and management activities. In 2015, the Fund contracted with geologist Elias Steinbuck to complete a Sediment Source Assessment. The Fund has upgraded 65 of a total of 798 identified sites or 8% of actionable sites (an additional 16 sites were identified where no mitigation was recommended). Concurrently 13 miles of road have been upgraded of the 147 total miles of mapped road. 6,240 cubic yards of sediment was saved.

4.5 Archaeology and Cultural History

A California Historic Resources Information System (CHRIS) property-wide records search was requested by the Fund from the Northwest Information Center (NWIC) at Sonoma State University on March 14, 2013. Appropriate NWIC base maps, referencing cultural resources records and reports, historic-period maps, and literature for Mendocino County were reviewed as part of the request. NWIC cultural resources include archaeological resources and historical buildings and/or structures.

The NWIC has record of 73 previous surveys covering roughly 70 percent of the GuRF (NWIC, 2013). Archaeological and cultural resource surveys have been conducted by previous landowners during the preparation of THPs; many cultural sites have been located on the property. 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 in order to detect and protect any previously unknown sites or artifacts.

In accordance with the American Indian Religious Freedom Act and the Antiquities Act, the CHRIS will be consulted prior to any land disturbing 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 site locations and descriptions be kept confidential to protect the resources; therefore, no listing is included in this Plan.

4.5.1 Native American Resources

The NWIC (2013) report included 32 recorded Native American cultural resources in or adjacent to the GuRF. Seven Native American villages and one campsite were referenced in the ethnographic literature in or near the GuRF. People living in the general area of the GuRF at the time of Euro-American contact spoke Central Pomo, one of seven Pomoan languages (NWIC, 2013).

Within this region of Mendocino County, Native American resources have typically been found along creeks and rivers, on midslope terraces above waterways, and along trending ridges. The waterways encompassed by the NWIC report include the North Fork Gualala River, Dry Creek, Hayfield Creek, Robinson Creek, Bear Creek, Stewart Creek, and Rockpile Creek. The report also includes the mid-slope terraces above these waterways and several major trending ridges, such as McGuire, Signal, Fisher, and Yellow Hound ridges. Based on these environmental factors, the NWIC indicates there is a high potential for identifying unrecorded Native American resources within the GuRF (NWIC, 2013).

4.5.2 Historic-Period Cultural Resources

NWIC base maps identified seven previously recorded historic era archaeological resources located within the GuRF. The review of historical literature and maps indicated potential for historic-period archaeological resources on the property. The General Land Office (GLO) plat maps from 1860 to 1884 show a home or barn within the project area. The Orbaun 1943 USGS 15' topographic quadrangle map shows four ranches—Rickard Ranch, Ciapusci Ranch, Zeni Ranch and the Gianoli Ranch just outside the GuRF boundary. Given these factors, the NWIC (2013) report indicated a high potential for identifying unrecorded historic-period archaeological resources within the GuRF.

However, the Ornbaun USGS quadrangle does not show any buildings or structures; thus, the NWIC believes there is a low potential for identifying any buildings or structures 45 years or older within the GuRF (NWIC, 2013).

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 GuRF 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 logger capabilities.

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, group selection or variable retention will likely be used on Douglas-fir sites; and all regeneration harvests will encourage natural regeneration.
- Timber stand improvement and protection activities, including forest thinning and the development of shaded fuel breaks will be prioritized in the next decade.
- Harvest levels will be significantly less than growth rates over the next few decades so as to increase timber inventory and carbon storage. Harvest levels and silviculture decisions are governed by the CalFire approved Option A Sustained Yield Plan.
- 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 old-growth stands on the property; 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 GuRF 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. 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.

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 property, 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 B for details). All Activity Centers recognized by the USFWS will be protected.

5.1.3 Harvest Levels

For the GuRF, 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 GuRF 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. 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 GuRF.

Actual harvest has been 1.02 million board feet since acquiring the property in 2011. The Option A modeled growth for 2014-2023 is 7.87 million board feet.

5.1.4 Silvicultural Objectives

The 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 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.

5.1.5 Harvest Retention Requirements and Guidelines

Figure 5-1: Downed wood in the Gualala River Forest. Photo by John Pearson.

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 ("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. A harvest can include many retention trees and thus, not all are mapped or recorded unless they are suspected to be an NSO nest trees. 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

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 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).

Snags and Wildlife Trees

Target: four per acre on average across 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 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 a long-term process and will be shaped over several harvest entries.

5.1.6 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 remaining trees are vigorous and free to grow while protecting and enhancing wildlife habitat, the end result being a forest well-stocked, 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 difficult to identify a universal prescription.

When in the field, foresters make thousands of individual judgement 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.

Experienced foresters 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.

5.1.7 Hardwood Management

Hardwood species, including tanoak, 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 historically dominated by conifers. Mixed hardwoods account for 42 percent of the basal area on the GuRF; in some strata, tanoak makes up 87% of the basal area although on average it makes up 35% of the basal area. For comparison, old growth conifer stands in the area often have ten percent or less of the basal area in hardwood species. Stands with greater than 25 percent of the basal area in hardwood species account for 96 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 Forests, 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 reduce the current level of tanoak relative to softwoods in 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 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. These targets may be adjusted once the inventory has been completed.
- Most hardwood 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, clumps of hardwoods and individual hardwoods which 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 and THP summary.
- 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 logging of tanoaks for commercial firewood was evaluated as part of the Jarvis Camp THP on BRSC. 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 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. 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.

5.1.8 Fire Management

Fire is both a natural and human-caused presence on the North Coast landscape and requires careful consideration and preparation. Figure 5-2 below 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 D) 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 North Coast Operations Manager.

5.1.9 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 in combination to ensure thorough review across multiple sectors and different temporal and geographic scales. There is 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.

5.1.9.1 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 at least weekly 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 re-convened for the Annual Operations Review, which inspects completed operations to evaluate conformance with the Fund's policies and discuss any special issues. In connection with Field Consultations, weekly harvest inspections, the Annual Operations Review, and/or the required agency reviews, certain sites or issues will be identified for continued specialized monitoring (e.g. Erosion Control Plan sites are typically monitored for at least two winters). Results of THP inspections or monitoring are available from Fund staff by request.

5.1.9.2 Long-term Harvest Monitoring

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

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	Current Value	50-Year Target Value	Criteria
Conifer volume	mbf/acre	15.9	30+	Net Scribner log scale, across all forested acres

Conifer growth	Board feet/ acre/year	626	1,000+	Across all acres, pre-harvest
Snags	Number/acre	0.7	>2	All species, >18” DBH
Hardwood competition	Percent basal area	35	<15	Average across all acres, all diameters
Harvest volume	Percent of inventory	0	<2.0	Across all acres, averaged for 10-year rolling window

5.1.9.3 Forest Certification

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 third party accreditation firms. 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.forests.org; the reports of the Fund's audits 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 GuRF 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. GuRF roads were inventoried in a Sediment Source Assessment completed in 2015 by Engineering Geologist, Elias Steinbuck to prioritize future road improvements within the Forest. The road assessment utilized 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, and prescribing cost-effective treatments.

The goals of the road assessments are to develop an erosion control and erosion prevention plan that, when implemented, will: 1) substantially reduce the potential for future sediment delivery to nearby streams by improving road surface drainage; 2) upgrade or decommission road drainage structures to accommodate a 24-hour, 100-year storm discharge; 3) where roads are recommended for upgrading, provide for year-round, safe use of the inventoried road routes; and 4) 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 THP and the Regional Water Board's General Waste Discharge Requirement (GWDR) order. 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 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.

Permanent Roads: 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 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.

Road Decommissioning: 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 NCRWQCB’s GWDR enrollment program. Annual monitoring reports are sent to the NCRWQCB every June (for plans not yet closed) describing the

condition of each site identified during the THP process, any new sites created or discovered, and whether or not the mitigation action proposed 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 consists 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.

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. 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 GuRF.

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 property will preclude the largest possible impacts on water quality. Comprehensive property-wide road assessments have been completed to identify and prioritize sites with sediment delivery potential. In addition, the following silvicultural practices (discussed previously in Section 5.1.4) 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 GuRF with minimal openings will reduce the potential hydrologic impacts often associated with even-aged management, which studies at Caspar

Creek have linked 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.

2. 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

Anadromous Streams:

There are two Conservation Easements on the property the first recorded November 2011 between Coastal Ridges LLC and The Conservation Fund. The second recorded December 2011 between The Conservation Fund and the Nature Conservancy. Both easements call for an extended Water Lake and Protection Zone (WLPZ) on Forest Practice Rules designated class I streams (fish bearing stream) up to 200 feet on both sides from the watercourse and lake transition line and an additional 25 foot no harvest buffer adjacent to the stream. The 25 foot buffer has been surpassed by the CDFW Anadromous Salmonid Protection Rules which call for a 30 foot no harvest buffer adjacent to class I streams.

Timber operations within the WLPZ of class I streams 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 employ Best Management Practices on all forest roads as described in the latest version of the Handbook for Forest and Ranch Roads by Weaver and Hagens to reduce sediment inputs. The increased WLPZ width mandated by the conservation easements will improve shade canopy near fish bearing stream to ensure stream temperatures will decline over time.

- 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.

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 and GRWC.

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. 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 is 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. In 2014, in partnership with Gualala River Watershed Council, 72 pieces of large wood were placed in the mainstem North Fork Gualala River along one mile of stream. In 2018, with a grant from CDFW Fisheries Restoration Grant Program, a large log jam was removed in Horsethief Canyon, opening .83 miles of stream to anadromous fish passage. As part of the project 31 pieces of LWD were added to Horsethief Canyon and Rockpile Creek. In 2027, the Fund will implement the Robinson Creek LWD Project, placing 106 pieces of LWD in the stream along 9,000 feet of Robinson Creek.

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

Stream habitat monitoring is a long term project because natural changes in habitat occur slowly as riparian canopy matures and stream banks stabilize, thus a 10-15 year monitoring interval may not reveal any significant habitat changes. Because of the slow response time for stream recovery, measuring stream habitat more than once every 10 years is generally not recommended. As such streams are not routinely inventoried and we rely on our Best Management Practices to initiate and maintain positive changes to our stream environment.

The Fund expects positive changes from the road and riparian protection practices mentioned in the previous sections. Instream stored sediment is slow to respond; however, the addition of LWD aids significantly in sorting gravels, creating pools and providing cover therefore habitat changes as a result of instream habitat manipulation through the addition of large wood can be detected more easily.

Habitat improvements resulting from the addition of large wood are monitored using stream habitat data derived from the habitat sampling methodology found in the California Salmonid Stream Habitat Restoration Manual (Flosi et al., 2010) currently in use by CDF&W.

5.4 Invasive Weed Management

In their field surveys of the Forest, consulting botanists Geri Hulse-Stephens and Kerry Heise noted the GuRF is unique in its absence of large infestations of invasive plants. Instead, disturbed roadside areas within forested habitat are frequently dominated by native California broom (*Acmispon glaber*), California brome (*Bromus carinatus*) and blue wild-rye (*Elymus glaucus*). Unique to the GuRF, infestations of French broom (*Genista monspessulana*) and jubata grass (*Cortadaria jubata*) are infrequent and small. 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 ecologically". 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. Appendix A includes a detailed discussion of invasive weed management from botanists Geri Hulse-Stephens and Kerry Heise for the GuRF. Invasive species management will initially focus on the control of these three species.

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 sequester and store a remarkable amount of carbon dioxide, a greenhouse gas and the driver of global climate change. As a result, how forests are managed influences our atmosphere. 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 forests can play a role in reducing net greenhouse gas emissions.

As a conserved working forest, the GuRF 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 California Air Resources Board

Due to the Fund's recognition of the need to take action to address climate change , the GuRF has been 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:

1. 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.
2. 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.
3. 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.
4. 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 GuRF was managed as private industrial timberland. The landowner officially had "no trespassing" policies, including warnings on property 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. Marijuana growers cause pollution through the use of unauthorized herbicides and insecticides, break gates and locks to gain access, and can be a safety concern for field personnel and other users. 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. 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.

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.
- Prepare an annual report that describes major activities on the Forest, changes to policies, and monitoring results.

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 and restoration projects.. 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. 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.

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
CHRIS	California Historic Resources Information System
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
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
mmbf	million board-feet
MRC	Mendocino Redwood Company
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
PWS	Planning Watershed
QMD	quadratic mean diameter
RPF	Registered Professional Forester
SCC	State Coastal Conservancy
SCS	Scientific Certification Systems
SFI	Sustainable Forestry Initiative
SOD	Sudden Oak Death
SPWS	Super Planning Watershed
SRF	State Revolving Fund
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

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 property, 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 E 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

References

Bailey, E.H., W.P. Irwin and D.L. Jone, 1964. Franciscan and related rocks, and their significance in the geology of western California.

Blake, M.C. Jr., and Jones, D.L., 1981. The Franciscan Assemblage and Related Rocks in Northern California: A Reinterpretation, in, W.G. Ernst ed., 1981. The Geotectonic Development of California. Englewood Cliffs, NJ, Prentice-Hall, 706 p.

Burgner, R.L., J.T. Light, L. Margolis, T. Okazaki, A. Tautz, and S. Ito, 1992. Distribution and Origins of Steelhead Trout (Oncorhynchus mykiss) In Offshore Waters of the North Pacific Ocean.

Brundtland, G.H., 1987. Towards Sustainable Development - Our Common Future: Report of the 1987 World Commission on Environment and Development. Oxford University Press, Oxford.

California Department of Fish and Game (CDFG), 2002. Status Review of California Coho Salmon North of San Francisco.

California Department of Fish and Game (CDFG), 2004. Recovery Strategy for California coho salmon. Report to the California Fish and Game Commission. 594 pp. Copies/CDs available upon request from California Department of Fish and Game, Native Anadromous Fish and Watershed Branch, 1416 9th Street, Sacramento, CA 95814, or on-line: http://www.dfg.ca.gov/nafwb.cohorecovery.

Crozier, M.L., M.E. Seamans, R.J. Gutierrez, P.J. Loschl, R.B Horn, S.G. Sovern, E.D. Forsman, 2006. Does the presence of barred owls suppress the calling behavior of spotted owls? Condor 108:760-769.

Downie, S.T., C.M. LeDoux-Bloom, and J. Richardson. 2003. Gualala Basin Assessment Implementation Report. Appendix 1: Hydrology. CDFG Coastal Watershed Planning and Assessment Program. California Department of Fish and Game, Sacramento, California.

ECORP Consulting, Inc. and Kamman Hydrology & Engineering, Inc., 2005. Gualala Estuary and Lower River Enhancement Plan.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey and B. Collins, 2010. California Salmonid Stream Habitat Restoration Manual. State of California, The Resources Agency, California Department of Fish and Game, Wildlife and Fisheries Division. Fourth Edition. http://www.dfg.ca.gov/fish/resources/habitatmanual.asp

Fuller, M.S., and Custis, K., 2002. Geologic and Geomorphic Characteristics of the Gualala River Watershed. California Department of Conservation, California Geological Survey, Sacramento, CA, 98 p.

Fuller, M.S., Haydon, W.D., Purcell, M.G., Custis, K., 2002. Geology and Geomorphic Features Related to Landsliding, Gualala River Watershed, Sonoma and Mendocino Counties, California. California Geological Survey: Watershed Mapping Series, Map Set 5, Plate 1, scale 1:24,000.

Gualala River Watershed Council (GRWC), 2012. Gualala River Watershed Council Cooperative Monitoring Program 1998-2012, Gualala, California.

GWRC, 2013. Gualala River Forest Aquatic Management Plan. Prepared for The Conservation Fund. August 2013. Gualala, California.

Gunderson, L.H., C.S. Holling, and S.S. Light, eds., 1995. Barriers and Bridges to the Renewal of Ecosystems and Institutions. Columbia University Press, New York, New York.

Heise, K. and G. Hulse-Stephens, Geri, 2008. Botanical Survey for the Victoria Fork/Cal Watershed Unit Blue Water Hole Creek Garcia River Forest, Conservation Fund. Prepared for The Conservation Fund October 31, 2008. Willits, California.

Intergovernmental Panel on Climate Change (IPCC), 2007. *Climate Change 2007: Synthesis Report - Summary for Policymakers*. Valencia, Spain, 12-17 November 2007. Available at: http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf.

Judson, Sheldon and D. F. Ritter, 1964. Rates of regional denudation in the United States. In Journal of Geophysical Research, Volume 69, Number 16.

Kelly, E.G., E.D. Forsman, R.G. Anthony, 2003. Are barred owls displacing spotted owls? Condor 105:45-53.

Kelsey, H. M. and D. K. Hagans, 1981. Major Right-Lateral Faulting In the Franciscan Assemblage of Northern California In Late Tertiary Time.

Klamt, Robert R., C. LeDoux-Bloom, J. Clements, M. Fuller , D. Morse, and M. Scruggs, 2002. Gualala River Watershed Assessment Report, North Coast Watershed Assessment Program.

Laaksonen-Craig, S., G.E. Goldman, and W. McKillop, 2003. Forestry, Forest Industry, and Forest Products Consumption in California. UC Davis Publication 8070. http://anrcatalog.ucdavis.edu/pdf/8070.pdf.

Loarie, S.R., Carter, B.E., Hayhoe, K., McMahon, S., Moe, R., et al., 2008. *Climate Change and the Future of California's Endemic Flora*. PLoS ONE 3(6): e2502. doi:10.1371/journal.pone.0002502.

Marcot, B.G. 1979. California Wildlife/Habitat Relationships Program, North Coast/Cascades Zone.
5 vols. Pacific Southwest Region. USDA Forest Service, Eureka, CA.

McEwan, D. R., T. A. Jackson, F. Reynolds, and T. Curtis, 1996. Steelhead Restoration and Management Plan for California.

McKittrick, M.A., 1995. Geology and geomorphic features related to landsliding and relative landslide susceptibility categories, North Fork Gualala River, Mendocino County, California Division of Mines and Geology Open-File Report 95-05, scale 1:24,000.

National Marine Fisheries Service (NMFS), 2012. Final Recovery Plan for Central California Coast coho salmon Evolutionarily Significant Unit.

North Coast Regional Water Quality Control Board (NCRWQCB), 2011. Watershed Planning Chapter, February 2005.

NCRWQCB, 2011. Water Quality Control Plan for the North Coast Region. May 2011.

North Coast Resource Management (NCRM), 2011. Baseline Conditions Report for the Gualala River Forest. Prepared for The Conservation Fund on behalf of Coastal Ridges, LLC. October 6, 2011.

Northwest Information Center (NWIC), 2013. Property wide search THP, NWIC File No. 12-0895. California Historical Resources Information System. Sonoma State University. Rohnert Park, California. March 14, 2013.

O'Connor, M., 2008. Hillslope Erosion Monitoring for Preservation Ranch, Gualala River Watershed Erosion Rates by Planning Watersheds, unpublished data.

Pirosko, C., ed., 2003. Proceedings of the California Invasive Plant Council Symposium. Volume 7.

Rittiman, C.A., and Thorson, T., 2002. Soil Survey of Mendocino County, California, Western Part. U.S. Department of Agriculture, Natural Resources Conservation Service, 459 p.

Spence, Brian C., E. P. Bjorkstedt, J. C. Garza, J. J. Smith, D. G. Hankin, D. Fuller, W. E. Jones, R. Macedo, T. H. Williams and E. Mora, 2008. A Framework for Assessing the Viability of Threatened and Endangered Salmon and Steelhead in the North-Central California Coast Recovery Domain.

UC ANR, 2020. Economic Contribution of California's Forestry and Forest-Products Sectors. Publication 8760.

Wagner, D.L., and Bortugno, E.J., 1999. Geologic Map of the Santa Rosa Quadrangle: Division of Mines and Geology, Regional Geologic map series, Map 2A, scale 1:250,000.

Walters, C. 1986. Adaptive Management of Renewable Resources. Macmillan, New York.

Walters, C. J., and C.S. Holling. 1990. Large-scale management experiments and learning by doing. Ecology 71: 2060-2068.

Weaver, W.E., E. Weppner, and D.K. Hagans, 2014. Handbook for Forest, Ranch, and Rural Roads: A Guide for Planning, Designing, Constructing, Reconstructing, Maintaining and Closing Wildland Roads. Mendocino County Resource Conservation District, Ukiah, California.