BUCKEYE FOREST
INTEGRATED RESOURCE MANAGEMENT PLAN

THE
CONSERVATION FUND

March 6, 2017

Cover photograph: The Buckeye Forest. Courtesy of Stephen Joseph.

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Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms and Abbreviations

ARB	California Air Resources Board
ARBOC	Air Resources Board Offset Credit
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
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
CMZ	channel migration zone
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRT	Climate Reserve Ton
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
ESI	Environmental Services Inc.
ESU	Evolutionarily Significant Unit
FIP	Functionally Independent Population
FMU	Forest Management Unit
the Forest	Buckeye Forest
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
HAS	Hydrologic Subarea
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
MWAT	Maximum Weekly Average Temperature
NAD	North American Datum
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
PRI	Program-Related Investment
PWS	Planning Watershed
QMD	quadratic mean diameter
RPF	Registered Professional Forester
SCAPOSD	Sonoma County Agricultural Preservation and Open Space District
SCC	State Coastal Conservancy
SCI	Sustainable Conservation, Inc.
SFI	Sustainable Forestry Initiative
SLT	Sonoma Land Trust
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
WTL	watercourse transition line

1. Executive Summary

1.1 Project Description

The Buckeye Forest was acquired in May 2013 by The Conservation Fund (the Fund), in partnership with the California Coastal Conservancy, Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), the Gordon and Betty Moore Foundation, Packard Foundation, and the Sonoma Land Trust. The forest is owned by Sustainable Conservation, Inc. (SCI), known as Buckeye Forest (the Forest) in California. SCI works with the Fund, a nonprofit corporation, to create partnerships with the private, nonprofit, and public sectors to protect our outdoor heritage. 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, and as a condition of partner funding, SCI conveyed a conservation easement (CE) over the majority of the Forest to SCAPOSD to maintain the conservation values inherent in the Forest in perpetuity. The conservation easement describes the Forest as having "significant conservation values" to SCI, Sonoma County and its residents, and the State of California that are worthy of conservation. The conservation values include "significant natural, ecological, fish and wildlife habitat resources; forestry resources; and open space and scenic resources." One of the requirements under the CE is to prepare a Forest Management Plan, as well as a Recreational Use Plan, within two years of recordation of the easement, and thus the Fund prepared this Integrated Resource Management Plan (IRMP) to document the sustainable management of the Forest and provide for compatible public access. The Plan follows requirements established in the Sustainable Forestry Initiative (2010-2014 Standard) and the Forest Stewardship Council U.S. Forest Management Standard (version 1.0), and as further specified during The Conservation Fund's 2012 Forest Stewardship Council audit.

The preparation of the Plan has been aided significantly by work previously done by the Fund and its partners to prepare the Garcia River Forest (GRF), Big River and Salmon Creek (BRSC), and Gualala River Forest (GuRF) Integrated Resource Management Plans (August 2006, 2009, and October 2013 respectively). While there are significant differences between the current condition of the Forest and the GRF, BRSC, or the GuRF, including stocking levels and the financial obligations incurred in acquiring the various forests, there is also much in common with the ultimate management objectives. Consequently, many of the principles and strategies contained in the previous North Coast Forest plans have therefore been adapted for this Plan.

1.2 Overview of Forest Characteristics and Conditions

The Forest encompasses 19,552 acres (18,337 of which are protected under the CE) 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 Rockpile and Buckeye creeks draining the northern half and the Wheatfield Fork draining the southern half.

The Gualala River is a high-priority refugia watershed identified in the 2004 "Recovery Strategy for California Coho Salmon." The Forest includes more than 20 miles of Class I and II watercourses, associated riparian habitats, aquatic habitat to support listed coho and steelhead, and an array of additional sensitive species. 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 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 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. Standing timber on the Forest is depleted compared to historic levels as confirmed via timber inventory.

1.3 Streams and Roads

Extensive logging and road building practices in this 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, 2014).

Most roads on the Forest were constructed for timber harvesting in the 1950s and 1960s. Earth moving associated with logging practices of the era, including road construction, skid trails, and landings, has contributed to erosion and sedimentation of streams. Logging practices at the time also removed over-story shade canopy from primary anadromous spawning grounds. The removal of coniferous species in the riparian corridors has resulted in a lack of mature trees for woody debris recruitment and thus a lack of deep pools with shelter needed for salmon and steelhead summer rearing habitat (GRWC, 2014). During winter rains, the extensive road network on the property is susceptible to both wash outs and landslides (Rob Evans and Associates, 2013).

1.4 Forest Management

The forest management policies and strategies described in this Plan are derived in part from the GRF, BRSC, and GuRF IRMPs. 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 payments, property taxes, on-site maintenance, management, and restoration projects.
- Develop and implement improved forest management greenhouse gas reduction projects under the U.S. Forest Project Protocol.
- 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

Public access to the Forest or portions thereof is an important objective of the Conservancy and SCAPOSD. To this end, the CE requires the development of a Recreational Use Plan, within 2 years of Easement recordation, to provide for safe, feasible public access for low-intensity outdoor recreation on the Property, including making the Forest available for guided public tours open to groups of at least 25 people no less than six times per year. The conservation easement acknowledges that legal access to the Forest is limited and may be insufficient to provide public access. Issues have arisen which have complicated SCI's ability to safely provide these tours. Therefore, SCI, the District, and the Conservancy have entered into a Memorandum of Understanding ("MOU", Attachment H) which temporarily suspends SCI's requirement to provide tours and develop a Recreational Use Plan while SCI works cooperatively to identify, evaluate and, if feasible, implement alternative safe and legal public access to 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. These large forest tracts were assembled over the last century, as the predecessors of the current owners acquired and aggregated many smaller parcels from homesteaders and others emigrating to the cities during the early to mid-20th century. As a consequence, these forests typically are comprised of many smaller parcels most of which are eligible for certificates of compliance, thus enabling the subdivision of these large holdings without the significant permitting and environmental oversight usually required to subdivide land.

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 Sonoma 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 North Coast region. More than 57 percent of California's annual timber revenue comes from the five-county region of Humboldt, Shasta, Siskiyou, Mendocino and Humboldt counties. The forest products industry is important to many local economies in the Northern California timber counties, with over 65 percent of the primary forest products jobs earning $535 million (70 percent) of labor income annually (Morgan et al. 2012).

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" (CDFW, 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; costs of ownership 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 partnership with the State Water Board (SWB), the State Coastal Conservancy (SCC), California Wildlife Conservation Board (WCB), and the David and Lucile Packard Foundation. Recently, the Fund purchased the Gualala River Forest (GuRF), in conjunction with our conservation partners the WCB, the Nature Conservancy (TNC), Keith Campbell Foundation, and the Mellon Foundation, to protect and restore an additional 13,913-acre contiguous commercial forest tract in the North Fork Gualala River watershed.

2.1.2 Buckeye Forest Acquisition

SCI, along with our conservation partners the SCC, Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), the Gordon and Betty Moore Foundation, Packard Foundation, and the Sonoma Land Trust (SLT), seeks to extend this innovative approach to protect and restore an additional 19,552-acre contiguous commercial forest tract in the Gualala River watershed (acreage derived from GIS). SCI has also conveyed a working forest conservation easement (CE) to SCAPOSD that covers 18,337 acres (acreage from recorded CE). While our broad goals for the Buckeye Forest (the Forest) are similar in many respects to those reflected in the GRF, BRSC, and GuRF Integrated Resource Management Plans (IRMPs), there are important differences as well: the BRSC forests were acquired using SRF loan dollars (the repayment of which is intended to come from timber harvest revenues); each Forest has different timber stocking and age class distributions of merchantable timber, with higher production from BRSC than GRF or GuRF; and higher density of residential development in the vicinity of the BRSC forests. In addition, the emergence of a robust market for 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.

2.2 Principal Management Goals

As with the Fund's work on the GRF, BRSC, and GuRF, the Forest project seeks to balance the ecological needs of coastal forests with the economic imperatives of ownership, management and restoration. This IRMP 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, in keeping with the Forest Management Goals identified in CE Section 5.5.2(b):

- 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 PRI payments, property taxes, on-site maintenance, management, and restoration projects.
- Continue to implement improved forest management greenhouse gas reduction project registered under the U.S. Forest Project Protocol.
- 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.

As with the other North Coast forests, particular emphasis will be placed on achieving water quality enhancement and anti-degradation objectives by: a) permanently protecting the Forest 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), the Nonpoint Source Program Strategy and Implementation Plan, 1998 – 2013 (NPS Implementation Plan) and the 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 (CDFW, 2004).

2.3 Project Financing

The Fund purchased the Forest for $24.5 million on May 31, 2013 with funds from the following sources:

• State Coastal Conservancy grant	$10,000,000
• Sonoma County Agricultural Preservation and Open Space District	$4,000,000
• David and Lucile Packard Foundation	$2,500,000
• The Gordon and Betty Moore Foundation grant	$1,000,000
• The Conservation Fund's New Forest Fund	$7,000,000
Total	$24,500,000

As part of the SCC grant, the Fund entered into a revenue sharing agreement pursuant to which the Fund will share net revenues from Forest operations after the deduction of certain expenses and reserves.

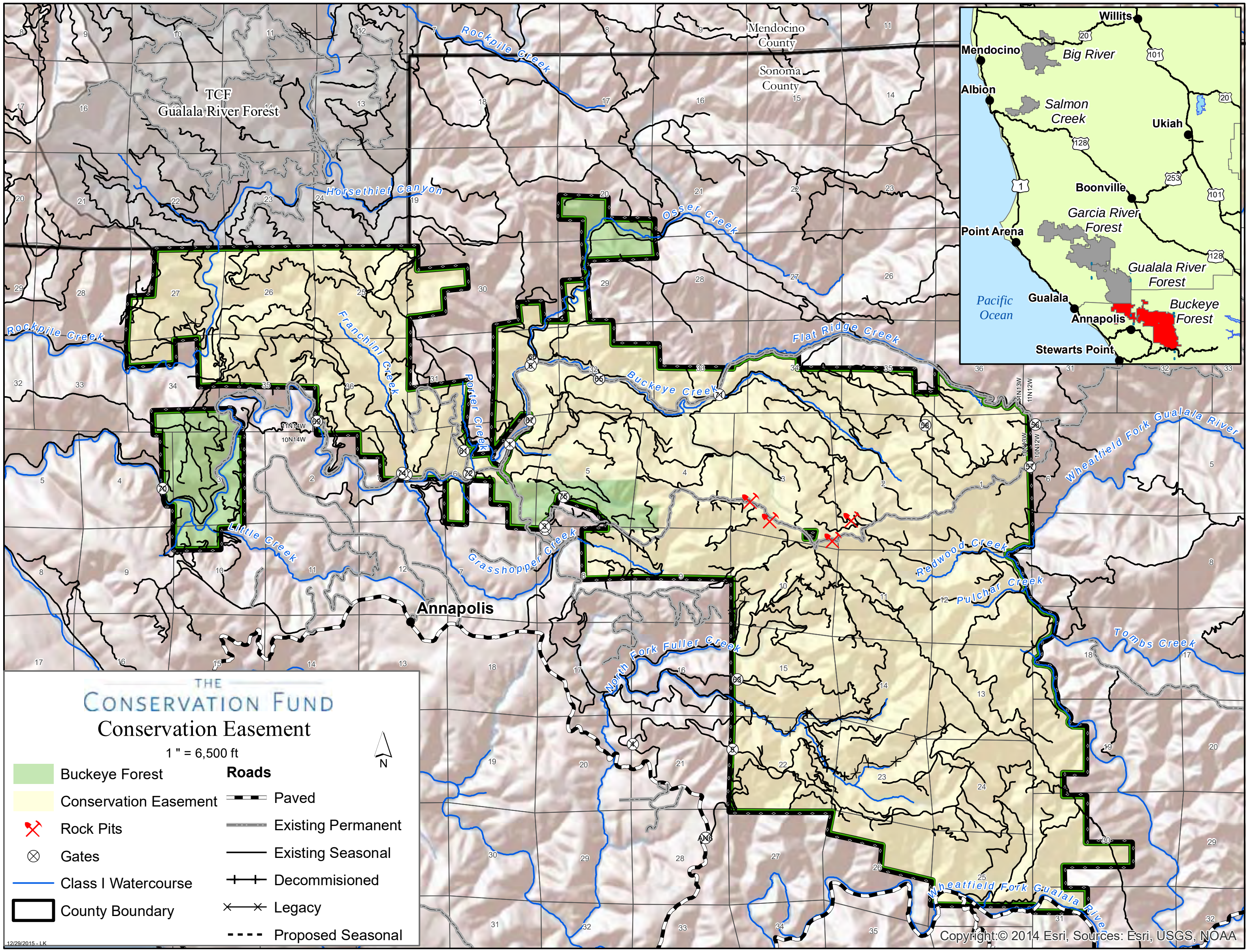
SCI has listed the Forest as an Improved Forest Management (IFM) carbon project under the ARB forest offset project protocol. This project is currently undergoing verification by Environmental Services Inc. (ESI).

2.4 Conservation Easement Requirements

The Forest is comprised of 19,552 acres of timberland, with 18,337 acres covered by the Conservation Easement (CE) as shown on Figure 2-1. The CE describes the Forest as having significant conservation values of great importance to SCI, SCAPOSD, residents of Sonoma County, and the State of California. The "Conservation Values" identified in the CE include "significant natural, ecological, fish and wildlife habitat resources; forestry resources; and open space and scenic resources," more particularly described in Section 2 of the CE. One of the requirements under the CE is to prepare a Forest Management Plan within two years of recordation of the CE. CE Section 5.2.2 includes requirements and restrictions for forest management activities, including a stated Forest Management Goal and specific requirements for the Forest Management Plan. This IRMP is intended to fulfill this requirement. The CE also includes a requirement to prepare a Recreational Use Plan within two years of recordation.

The following are additional requirements stipulated within the CE:

- Two Designated Building Envelopes totaling no more than 15 cumulative acres are permitted for development. The envelopes shall avoid habitat of sensitive, rare and endangered species. One primary residence is permitted within each envelope, and the residence shall not exceed 24 feet in height and/or 5,000 square feet in area, exclusive of garage. Accessory residential structures such as guest houses, garages, gardens, and sheds are permitted within the envelope as long as they do not exceed 3,000 cumulative square feet in area.
- Within the Designated Building Envelopes, accessory commercial, industrial, natural resource protection, recreational or educational structures are allowed as long as they do not exceed 5,000 cumulative square feet in area. Such structures may be placed outside the envelopes with written consent from SCAPOSD as long as they do not exceed one (1) cumulative acre in size. Other structures for low-intensity recreational and educational uses such as trailheads, campsites, and parking areas are permissible outside the envelopes with written consent from SCAPOSD.


THE CONSERVATION FUND
Conservation Easement
1 " = 6,500 ft
N
Buckeye Forest
Conservation Easement
Rock Pits
Gates
Class I Watercourse
County Boundary
Roads
Paved
Existing Permanent
Existing Seasonal
Decommissioned
Legacy
Proposed Seasonal
TCF
Gualala River Forest
Mendocino County
Sonoma County
Annapolis
Rockpile Creek
Horsethief Canyon
Osser Creek
Franchini Creek
Porter Creek
Buckeye Creek
Flat Ridge Creek
Little Creek
Grasshopper Creek
Redwood Creek
Pulchar Creek
Tombs Creek
North Fork Fuller Creek
Wheatfield Fork Gualala River
Willits
Mendocino
Big River
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
Stewarts Point
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3. Purpose of Plan

3.1 Plan Requirements

The Plan follows requirements established in the Sustainable Forestry Initiative® (2010-2014 Standard) and the Forest Stewardship Council® (FSC®) U.S. Forest Management Standard (version 1.0) (FSC-C001535), and as further specified during the Fund's 2012 FSC audit and within the requirements of the CE. The Forest IRMP will generally follow the same format as the Plans prepared for other North Coast Forests for continuity.

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

The intent of Criterion 7.1 is to "ensure that a written management plan, as described in the Principle-level intent and guidance above, exists for the 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 SCAPOSD for review and approval prior to adoption as specified in the CE.

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 Forest is comprised of 19,552 acres of timberland in California's North Coast Range mountains (Figure 4-2), with 18,337 acres covered by the CE. Located in northwestern Sonoma County adjacent to and south of the Mendocino-Sonoma county line, the property lies approximately one mile northeast of the community of Annapolis and 6 miles east of the town of Gualala. The main drainages within the Forest are: 1) Buckeye, Franchini, and Rockpile Creek watersheds; and 2) the Wheatfield Fork of the Gualala River watershed. Primary access to the Forest is via Kelly Road, a private road with locked gates and strictly enforced rules. .

4.1.2 Neighbors and Adjacent Lands

The Forest is located south of and adjacent to the GuRF, another Conservation Fund timberland holding. 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 Gualala River 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 Redwoods Inc. (GRI), Mendocino Redwood Company (MRC) and The ConservationFund (Figure 4-3).

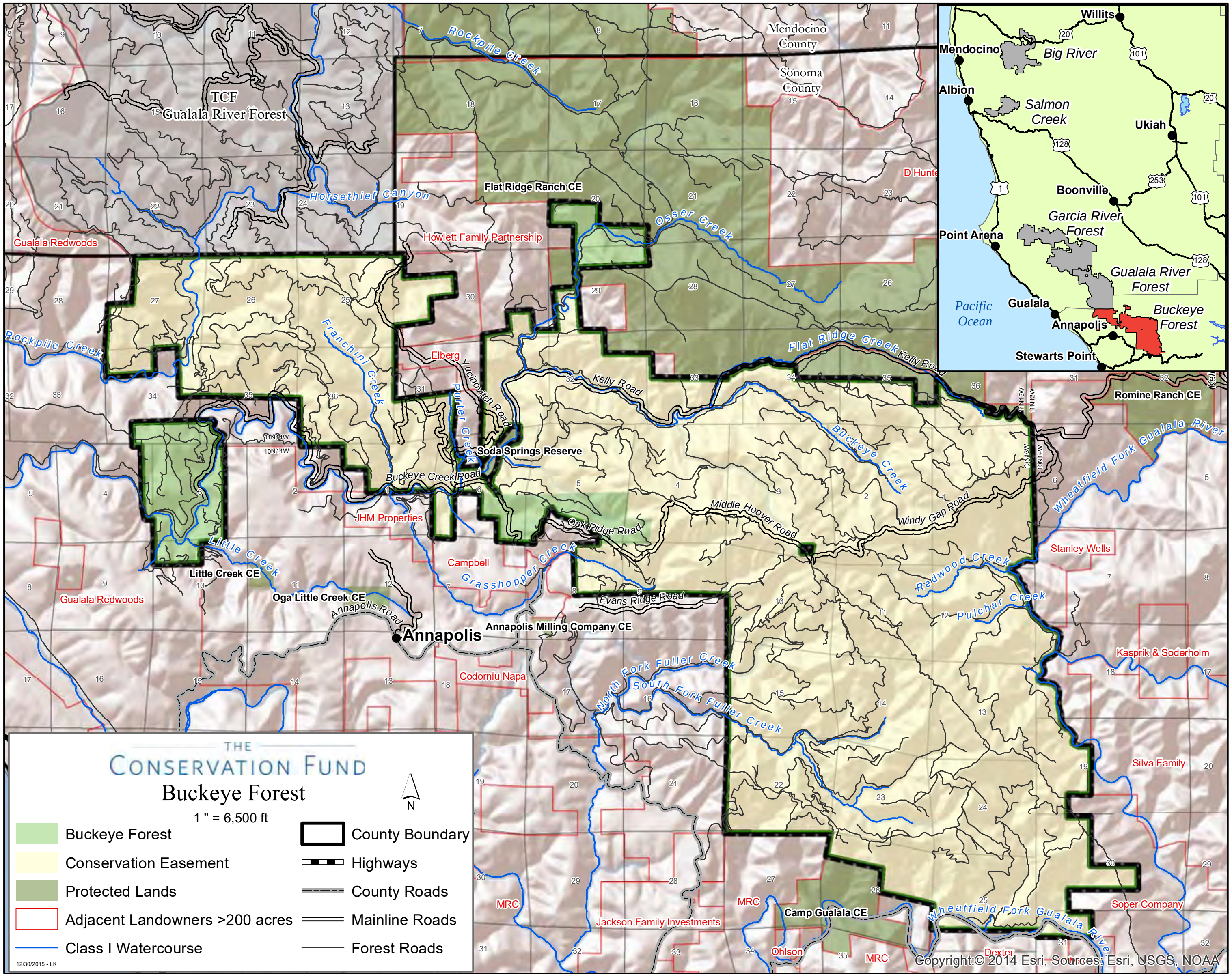
4.1.3 Physiographic Setting

4.1.3.1 Description of Watershed

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 perennial mainstem and tributary distance of roughly 217 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 4-1: Mouth of the Gualala River, Mendocino County, California. Photo by Herman Turnip, Flickr.


Fort Bragg
Willits
Mendocino
Ukiah
Williams
Clearlake
Clearlake
Boonville
Point Arena
Cloverdale
Gualala
Annapolis
Lake Sonoma
Middletown
Healdsburg
Lake Berryessa
Santa Rosa
Pacific Ocean
Bodega Bay
Napa
Petaluma
Vallejo
Point Reyes Station
Sausalito
San Francisco
Oakland
THE CONSERVATION FUND
1 " = 66,667 ft
Buckeye Forest
Highways
N
12/30/2015 - LK
Sources: Esri, USGS, NOAA



THE CONSERVATION FUND
Buckeye Forest
1 " = 6,500 ft
N
Buckeye Forest
Conservation Easement
Protected Lands
Adjacent Landowners >200 acres
Class I Watercourse
County Boundary
Highways
County Roads
Mainline Roads
Forest Roads
12/30/2015 - LK
Mendocino County
Sonoma County
TCF Gualala River Forest
Rockpile Creek
Horsethief Canyon
Flat Ridge Ranch CE
Howlett Family Partnership
Osser Creek
D Hunter
Gualala Redwoods
Franchini Creek
Elberg
Yuchnovich Road
Porter Creek
Flat Ridge Creek
Kelly Road
Soda Springs Reserve
Buckeye Creek
Buckeye Creek Road
Middle Hoover Road
Windy Gap Road
Oak Ridge Road
JHM Properties
Little Creek
Little Creek CE
Campbell
Grasshopper Creek
Oga Little Creek CE
Annapolis Road
Annapolis
Annapolis Milling Company CE
Evans Ridge Road
Redwood Creek
Pulchar Creek
Stanley Wells
Romine Ranch CE
Wheatfield Fork Gualala River
Kasprik & Soderholm
Codorniu Napa
North Fork Fuller Creek
South Fork Fuller Creek
Silva Family
Soper Company
Camp Gualala CE
MRC
Jackson Family Investments
Ohlson
Dexter
11N14W
10N14W
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Willits
Mendocino
Big River
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
Stewarts Point

The Gualala River watershed includes five major sub basins: Buckeye Creek, Rockpile Creek, Wheatfield Fork Gualala River, South Fork Gualala River, and North Fork Gualala River. The Forest consists of portions of Buckeye Creek, Rockpile Creek, and Wheatfield Fork Gualala River watersheds, encompassing approximately 10 percent of the total Gualala River watershed (Rob Evans and Associates, 2013).

4.1.3.2 Climate

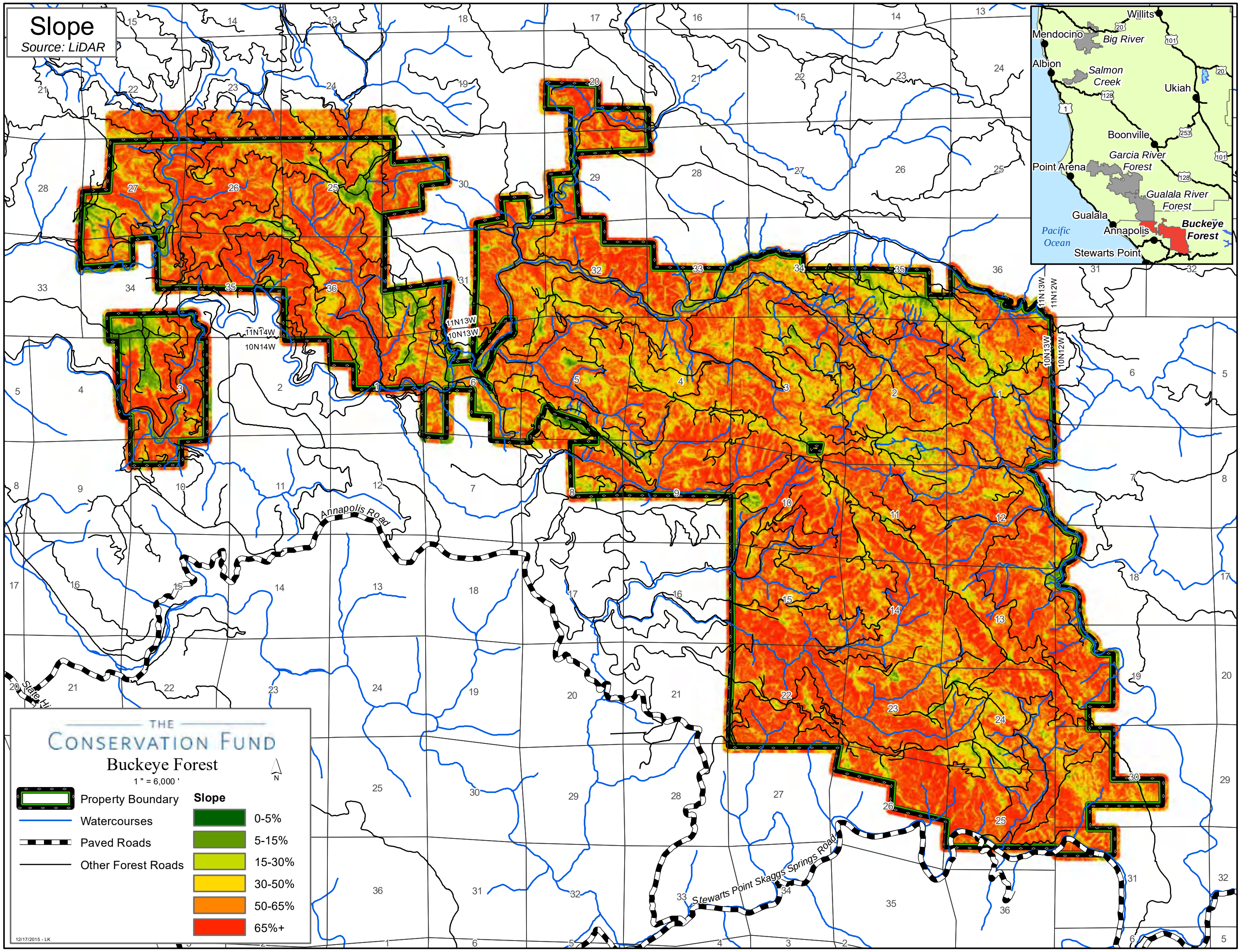
Sonoma County has a Mediterranean climate with typically dry summers and mild, wet winters, with 90 percent of the rainfall occurring from November through April. The climate near the Sonoma coast is heavily influenced by the Pacific Ocean and is characterized by mild seasonal temperatures, strong prevailing northwest winds, with low clouds and fog during the summer months. The Forest extends across a variety of microclimates created as a consequence of rugged topography and the variable marine influence of the Pacific Ocean. Annual precipitation at the Skaggs Springs Las Loma monitoring station, located 5 miles to the east of the Property was 61.8 inches from the period 1939 to 1978 (Rob Evans and Associates, 2013).

4.1.3.3 Geology

The regional geologic landscape of the Forest 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 the Farallon plate was subducted beneath the North American plate a deep subduction trench formed and a majority of the rock that comprises the Coast Range Mountains was deposited in this offshore basin as deep sea fan deposits as much as 150 million years ago. Tectonic forces mixed these sediments with other less common rock types 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). Subsequent shearing along the San Andreas Fault System significantly deformed the Franciscan Complex locally and the Coast Range Mountains regionally.

Landslides are widespread across the Forest 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 rockslides (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. A majority of the shallow landslides (e.g. debris slides and flows) occur on slopes over 65 percent and are concentrated on steep streamside slopes along the outside of meander bends along Buckeye Creek and Fuller Creek and their larger tributaries (Fuller et al., 2002). Recent unconsolidated channel deposits composed primarily of sand, silt and gravel are intermittently exposed along the active channels of the larger drainages within the Forest.

Figure 4-4 illustrates slopes within the Forest based on light detection and ranging (LiDAR) data.


Slope
Source: LiDAR
THE CONSERVATION FUND
Buckeye Forest
1 " = 6,000 '
Property Boundary
Watercourses
Paved Roads
Other Forest Roads
Slope
0-5%
5-15%
15-30%
30-50%
50-65%
65%+
Annapolis Road
Stewarts Point Skaggs Springs Road
11N13W
10N13W
11N14W
10N14W
11N12W
10N12W
Willits
Mendocino
Big River
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Gualala
Pacific Ocean
Annapolis
Buckeye Forest
Stewarts Point
12/17/2015 - LK

4.1.3.4 Soils

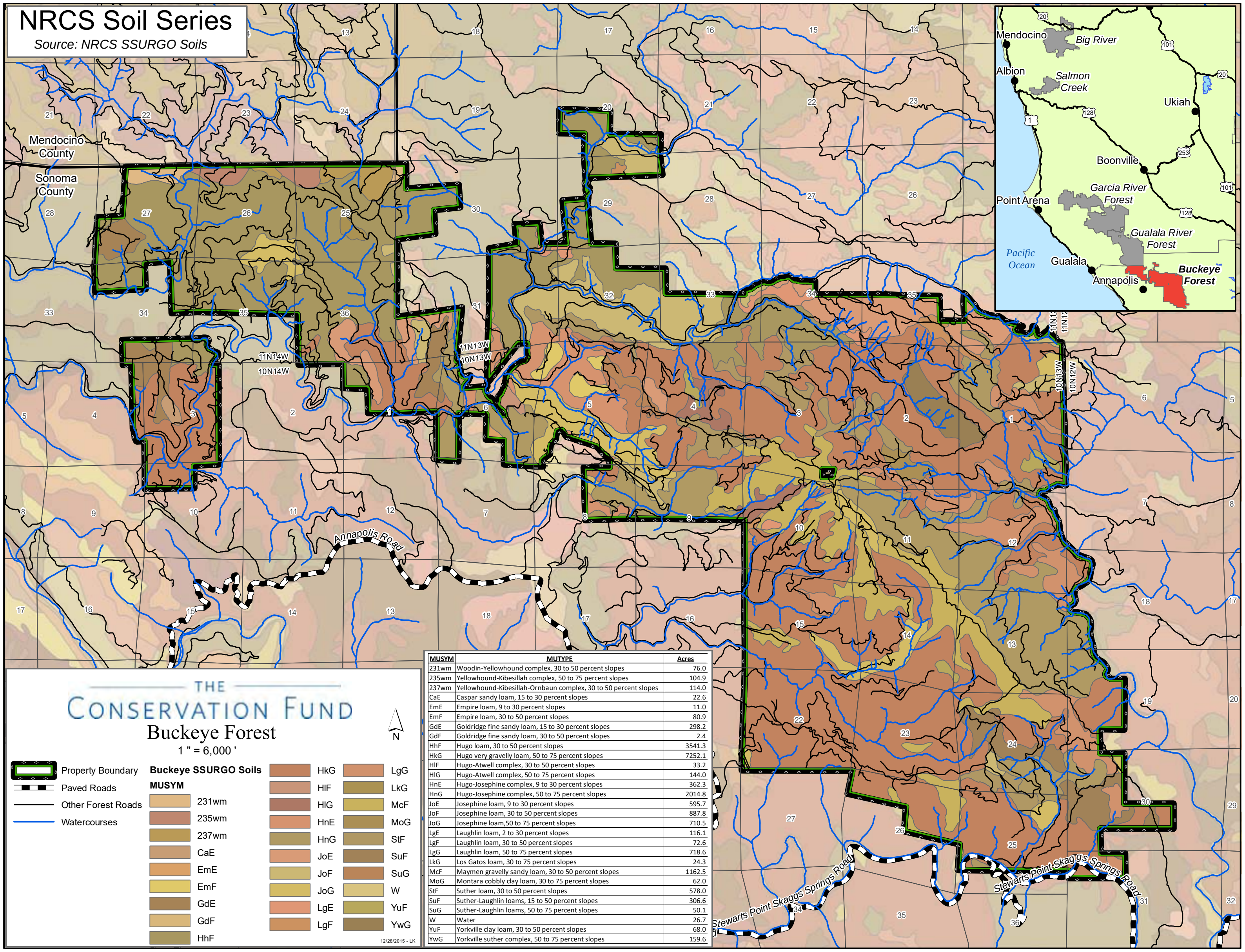
The Natural Resource Conservation Services (NRCS) soil survey depicts six distinct soil series on the Forest (Miller, 1972). Formed from the weathering of sedimentary rock, colluvial soils blanket a majority of the hillslopes across the Coast Range Mountains. Miller (1972) mapped the following dominant soils on the Forest:

Figure 4-5: Buckeye Creek. Photo courtesy of Stephen Joseph.

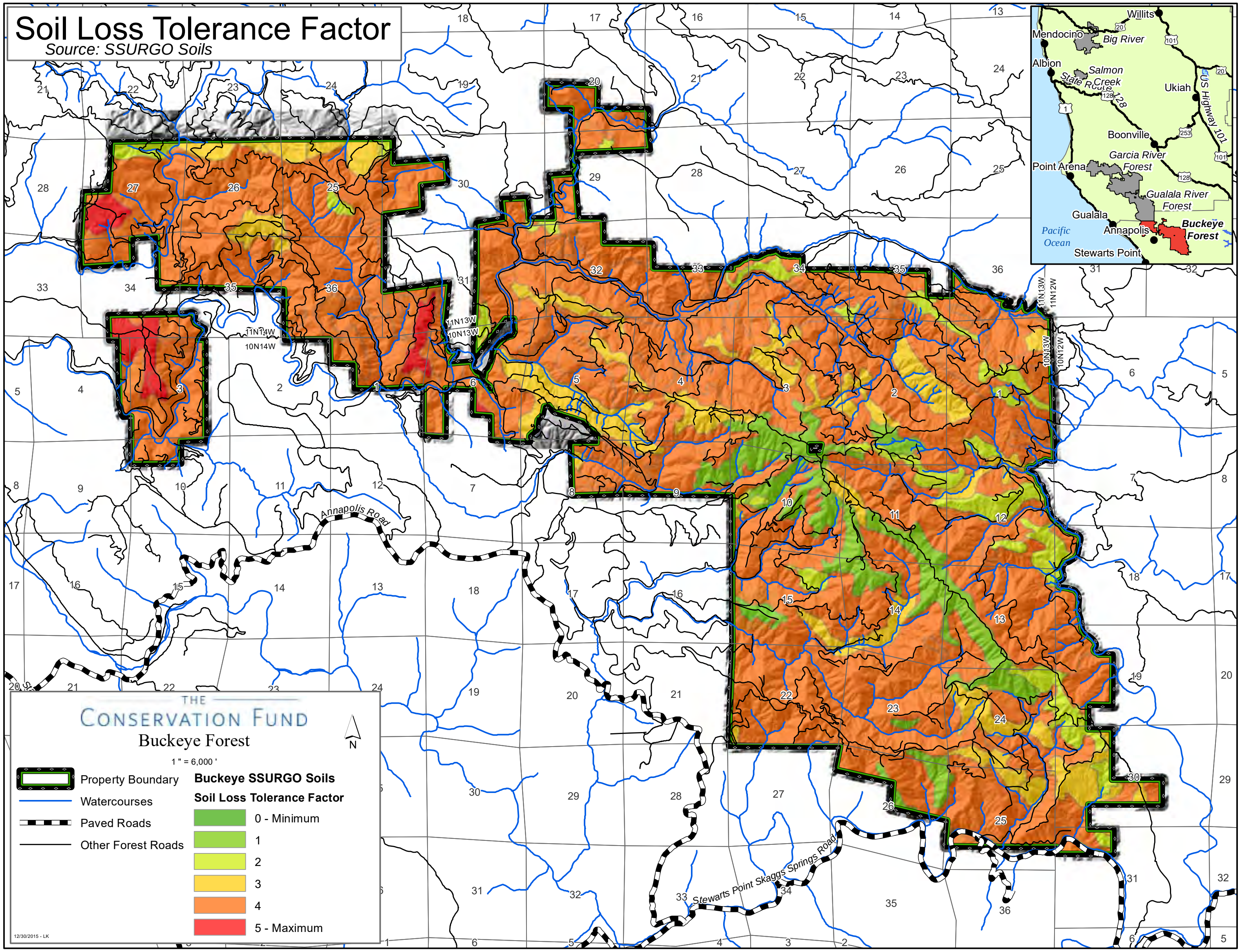
- Hugo Series
- Josephine Series
- Laughlin Series
- Maymen Series
- Suther Series
- Goldridge Series

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.

For more information on Soil Types and Descriptions, see Miller (1972) 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 loss along the northeast boundary of the property and moderate tolerance generally throughout the property, i.e., the underlying soil can still be highly productive even with erosion.



MUSYM	MUTYPE	Acres
231wm	Woodin-Yellowhound complex, 30 to 50 percent slopes	76.0
235wm	Yellowhound-Kibesillah complex, 50 to 75 percent slopes	104.9
237wm	Yellowhound-Kibesillah-Ornbaun complex, 30 to 50 percent slopes	114.0
CaE	Caspar sandy loam, 15 to 30 percent slopes	22.6
EmE	Empire loam, 9 to 30 percent slopes	11.0
EmF	Empire loam, 30 to 50 percent slopes	80.9
GdE	Goldridge fine sandy loam, 15 to 30 percent slopes	298.2
GdF	Goldridge fine sandy loam, 30 to 50 percent slopes	2.4
HhF	Hugo loam, 30 to 50 percent slopes	3541.3
HkG	Hugo very gravelly loam, 50 to 75 percent slopes	7252.1
HlF	Hugo-Atwell complex, 30 to 50 percent slopes	33.2
HlG	Hugo-Atwell complex, 50 to 75 percent slopes	144.0
HnE	Hugo-Josephine complex, 9 to 30 percent slopes	362.3
HnG	Hugo-Josephine complex, 50 to 75 percent slopes	2014.8
JoE	Josephine loam, 9 to 30 percent slopes	595.7
JoF	Josephine loam, 30 to 50 percent slopes	887.8
JoG	Josephine loam,50 to 75 percent slopes	710.5
LgE	Laughlin loam, 2 to 30 percent slopes	116.1
LgF	Laughlin loam, 30 to 50 percent slopes	72.6
LgG	Laughlin loam, 50 to 75 percent slopes	718.6
LkG	Los Gatos loam, 30 to 75 percent slopes	24.3
McF	Maymen gravelly sandy loam, 30 to 50 percent slopes	1162.5
MoG	Montara cobbly clay loam, 30 to 75 percent slopes	62.0
StF	Suther loam, 30 to 50 percent slopes	578.0
SuF	Suther-Laughlin loams, 15 to 50 percent slopes	306.6
SuG	Suther-Laughlin loams, 50 to 75 percent slopes	50.1
W	Water	26.7
YuF	Yorkville clay loam, 30 to 50 percent slopes	68.0
YwG	Yorkville suther complex, 50 to 75 percent slopes	159.6



Soil Loss Tolerance Factor
Source: SSURGO Soils
THE CONSERVATION FUND
Buckeye Forest
1 " = 6,000 '
N
Property Boundary
Watercourses
Paved Roads
Other Forest Roads
Buckeye SSURGO Soils
Soil Loss Tolerance Factor
0 - Minimum
1
2
3
4
5 - Maximum
Annapolis Road
Stewarts Point Skaggs Springs Road
11N13W
10N13W
11N14W
10N14W
11N12W
10N12W
Willits
Mendocino
Big River
Albion
Salmon Creek
State Route 128
Ukiah
US Highway 101
Boonville
Point Arena
Garcia River Forest
Gualala River Forest
Gualala
Pacific Ocean
Annapolis
Buckeye Forest
Stewarts Point

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	All State Agencies
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 California Department of Fish & Wildlife (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 Rockpile, Buckeye and Wheatfield Fork watersheds: municipal and domestic water supply, agricultural water supply, industrial service water supply, groundwater recharge, navigation, water contact recreation (REC-1), non-contact water recreation (REC-2), wildlife habitat, rare/threatened/endangered species, and aquaculture (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. The Gualala River TMDL for water temperature is scheduled to be completed by 2019; the TMDL for aluminum is scheduled for completion by 2021.

4.2 Forest and Terrestrial Conditions

4.2.1 Forest Overview

The Forest is typical of the north coast of California—dominated by native conifers (primarily redwood and Douglas-fir), 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 improved forest management (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 Forest (and coastal Sonoma/Mendocino County forestland, in general) that constrain potential forest management operations—especially low-impact ecological silviculture. These include:

- <u>Steep slopes.</u> The steep slopes characteristic of the Coast Range routinely require specialized cable yarding equipment to move logs from the woods to the landing with the minimum amount of soil disturbance. This style of harvesting operation is considerably more expensive than ground-based (tractor) logging, which is only possible on gentler 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 have had much of the valuable timber already removed. Although 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. Currently, timber markets are at a cyclical low, although the local market is expected to improve in the coming year or two. The number of sawmills in the region purchasing conifer saw logs has declined on an almost annual basis (although the remaining mills are efficient and well-capitalized). 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. SCI budgets six months and $30,000 to $50,000 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 GIS databases in order to be able to assess, document, and monitor the forest conditions. Since acquiring the property, SCI has acquired high definition digital imagery LiDAR data used to provide high resolution timber stand classification as well as providing us with improved mapping capabilities. These tools are critical for understanding forest conditions, habitat availability, road plans and landslide vulnerability and will form the basis for the field inventory.

As part of SCI's carbon certification, stratification of the forest inventory was completed to determine species composition across the Forest. Timber cruising completed in fall and winter 2013 provide a more accurate picture of the standing carbon stocks as well as more traditional metrics like mbf/acre and forest species composition. The Forest Planning and Projection System (FPS) software is used to compile and grow the forest inventory in a spatially explicit manner and subject to our specific silvicultural prescriptions. For each THP, SCI shall provide relevant stand tables either from the 2013 inventory, the forester's estimate of the stands based on specific THP cruise data or the 2013 stand tables grown forward to the THP submittal year for the proposed harvest area.

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

4.2.3 Current Stand Conditions

The Forest will be using a new stratification system consisting of three categories, or bins.
Table 4-2 below summarizes the new strata system.

Table 4-2: Forest Stratification System

Category	Class Names	Class Breaks
Percent Canopy Cover over 25ft	O (Open) L (Low) M (Medium) D (Dense) E (Extremely Dense)	20% canopy cover bins where % cover is defined as crown elements above 25ft
Mean Tree Height	1, 2, 3, 4, 5, 6, 7	25 foot height bins of mean tree heights
Tree Height Variability (Coefficient of Variation [CV] of Tree Height)	H (Homogeneous) I (Intermediate) V (Variable)	Homogeneous stands are any stand with CV < 0.23 Intermediate: 0.23<= CV < 0.33 Variable: CV >= 0.34

Conifer / HW Dominance	CON (Conifer Dominated) HW (Hardwood Dominated) CH (Conifer dominated mixed) HC (Hardwood dominated mixed)	Classification is based on 25% bins where crown shape was used to determine conifer or hardwood occupancy of the upper canopy.

4.2.4 Productivity and Site Index

The Forest is generally redwood and Douglas-fir site class 3 and 4 lands. The average measured site index at base age 50 from the 2013 inventory is Douglas-fir = 93, redwood = 77, and sugar pine = 88.

4.3 Terrestrial Habitat and Species

4.3.1 Habitat Overview

Terrestrial habitat communities present on the Forest include Redwood, Douglas-fir, Coastal Oak Woodland, Montane Hardwood-Conifer, Montane Hardwood, Mixed Chaparral, Coastal Scrub, Annual and Serpentine Grasslands, and Moist Meadows. Primary conifer species are coastal redwood (*Sequoia sempervirens*) and Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*). The dominant hardwood species on the Forest is tanoak (*Lithocarpus densiflorus*), with pacific madrone (*Arbutus menziesii*), oak (*Quercus* spp.), California laurel (*Umbellularia californica*), and other California hardwoods interspersed throughout the Forest (Rob Evans and Associates, 2013).

On most sites redwood would dominate if vegetation succession were allowed to proceed naturally. Each of the habitat types listed above provide food and cover for a wide variety of wildlife species. Redwood habitats provide food, cover, or special habitat elements for 193 wildlife species including a variety of sensitive species (Marcot, 1979). Oak Woodlands are reported to provide food (mast) or cover for over 313 wildlife species, including resident populations of quail, wild turkey, squirrel, and deer. Oak Woodlands are defined as areas dominated by Oregon white oak (*Q. garryana*), Shreve oak (*Q. parvula* var. *shrevei*), and black oak (*Q. kelloggii*) with associated species including interior live oak (*Q. parvula*), California bay, and pacific madrone with poison oak and or grasses in the understory. However, Douglas-fir encroachment poses a threat to true Oak Woodlands impacting the unique habitat diversity found on the Forest. Previous studies estimated between 1,000 to 2,000 acres of Oak Woodland present on the Forest. However, for SCI's mapping purposes, an Oak Woodland stand must be at least two acres in size. SCI has thus identified 272 acres of Oak Woodland in 45 separate stands, eight of which are over 10 acres in size. These stands are shown in the Policy Digest High Conservation Values Map, as well as the Stands and Strata map. SCI will revisit the acreage of Oak Woodland and other habitats when the fine-scale vegetation and habitat map is made available by Sonoma County Vegetation Mapping & LiDAR program, which is projected for 2016.

Within grasslands, mesic swales provide habitat for wetland plants. Stanley Meadow, located above Buckeye Creek, is a moist open glade surrounded by Douglas fir, redwood, and sugar pine (*Pinus lambertiana*) and supports a unique assemblage of native bunchgrass and several rare herbaceous species including Pacific hairgrass (*Deschampsia cespitosa subsp. holiformis*), Bolander's reedgrass

(*Calamagrostis bolanderi*), thin-lobed horkelia (*Horkelia tenuiloba*), and Harlequin lotus (*Hosackia gracilis*). In terms of native plants, the unique assemblage of rare species, and the habitat supporting this diversity, the Stanley Meadow complex is an exceptional site (Heise and Hulse-Stephens, 2014).

A complete survey of vegetation types has not been made of the property. However, Appendix A contains a more detailed discussion of botanical resources of the Forest by botanists Geri Hulse-Stephens and Kerry Heise.

4.3.2 Special Status Species

The Forest overlaps six U.S. Geological Survey (USGS) 7.5-minute quadrangle maps: Annapolis (3812363); Big Foot Mountain (3812372); Gube Mountain (3812373); McGuire Ridge (3812374); Stewarts Point (3812364); and Tombs Creek (3812362). A Rarefind Report (California Natural Diversity Database, or CNDDB) search of the Forest overlapping these six USGS quad maps identified only two occurrences of one sensitive animal species: the Sonoma tree vole (see Table 4-3 below). Further occurrence data contributing to Table 4-3 came from Heise and Hulse-Stephens (2014) and GRWC (2014).

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 4-3: Terrestrial Rare, Threatened, Endangered, Sensitive and Species of Concern Which May Potentially Occur on the Forest

Species	Listing Status
Animals	
California red-legged frog (*Rana draytonii*)	FT CDFW: SSC
Coast range newt (*Taricha torosa*)	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
Southern torrent salamander (*Rhyacotriton variegatus*)	CDFW: SSC
Steelhead (*Oncorhynchus mykiss*) Central California Coast ESU	FT
Tailed frog (*Ascaphus truei*)	FT CDFW: SSC
Western pond turtle (*Emys marmorata*)	CDFW: SSC
Plants	
Bolander's reed grass (*Calamagrostis bolanderi*)	CNPS: Rank 4
Brewer's milkvetch (*Astragalus breweri*)	CNPS: Rank 4
California pinefoot (*Pityopus californicus*)	CNPS: Rank 4
Harlequin lotus (*Hosackia gracilis*)	CNPS: Rank 4
Marsh zigadenus (*Zigadenus micranthus* var. *fontanus*)	CNPS: Rank 4
Methuselah's beard lichen (*Usnea longissima*)	BLM/USFS: Sensitive CNPS: Rank 4

Santa Cruz clover (*Trifolium buckwestiorum*)	BLM: Sensitive CNPS: Rank 1B
Serpentine bird's beak (*Cordylanthus tenuis*)	CNPS: Rank 4
Thin-lobed horkelia (*Horkelia tenuiloba*)	BLM: Sensitive CNPS: Rank 1B
White-flowered rein orchid (*Piperia candida*)	BLM: Sensitive CNPS: Rank 1B

<u>Listing Status Codes</u>:

FE= Federally Endangered, FT=Federally Threatened; SE=State Endangered; SR=State Rare
CDFW: SSC = California Species of Special Concern
CNPS: Rank 1B = Rare, Threatened, or Endangered in California and Elsewhere, Rank 4 = Watch List
BLM: Sensitive
USFS: Sensitive

4.3.3 Northern Spotted Owl

Figure 4-9: Northern spotted owl. Photo by Whitney Flanagan.

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.

Review of the CNDDB reveals the presence of six (6) NSO activity centers within the Forest ownership. Surveys conducted by SCI in 2014 and surveys conducted by the previous landowner from 2005-2011 suggest that at least five (5) of these sites are likely occupied by NSO. 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, 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. The USFWS is in charge of administration and consultations with regard to species protected under the ESA. The USFWS developed an NSO survey protocol in 1991 (revised in 1992). In order to address the presence of barred owls, the USFWS issued an updated NSO survey protocol in 2011, which was subsequently revised in 2012. CAL FIRE has been charged with reviewing NSO data submitted with THPs to determine if harvesting will result in the take of NSO because USFWS does not have the staffing to evaluate each THP.

The California Forest Practice Rules (FPR) define minimum foraging and nesting/roosting habitat conditions and provide a variety of procedures for addressing potential impacts to NSO due to timber operations. Generally, a 100 acre no-harvest core area is provided around each NSO activity center and certain minimum amounts of foraging and nesting/roosting habitat must be maintained within 0.7 mi of each NSO activity center. Additionally, prior to commencing timber operations, surveys for NSO must be completed in conformance with the USFWS guidelines.

In addition to what is required by the ESA, SCI 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. SCI'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 Sonoma and Mendocino counties. Barred owls were frequently detected on the Forest during NSO surveys conducted in 2014. At this time, the long term impact of barred owls on the Forest's NSO population remains unclear.

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 Forest has been managed for industrial timber production for many decades. The Recovery Strategy for California Coho Salmon prepared by the Department of Fish and Wildlife (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" (CDFW, 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 Forest is included in its entirety as Appendix C. SCI will implement more robust water temperature monitoring on the Forest to augment GRWC's existing monitoring network in the watersheds when time and funding allows. Other monitoring needs will be researched and implemented as appropriate.

4.4.2 Stream Conditions

The complexity of stream conditions within the Rockpile Creek, Buckeye Creek and Wheatfield Fork 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 Rockpile Creek, Buckeye Creek and Wheatfield Fork Super Planning Watersheds (SPWS) (GRWC, 2014).

Rockpile Creek SPWS

The 35 mi^2 (22,389-acre) Rockpile basin drains 88 miles of "blue line" streams, and over 60 percent 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.

The Forest ownership is 1,454 acres approximately six (6) percent of the Rockpile Creek SPWS. The ownership spans the center of the watershed with acreage in Lower Rockpile Creek, Redrock Creek and Middle Rockpile Creek PWS.

In the lower reaches of the sub-basin, streams meander slightly through narrow alluviated floodplains within steep valleys. The main channel is somewhat sinuous and low gradient, with a restricted 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 percent of the area had been subject to tractor harvest operations and by the end of the first logging era in 1968, 73.5 percent of the basin had been harvested.

The Rockpile Creek SPWS has 169 miles of private roads. Road density is 4.8 miles per mi^2 within the basin. The North Coast Watershed Assessment Program (NCWAP) restoration map targets the central reaches within the Forest property with the highest priority for future restoration work in sediment reduction.

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 that is 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 2013. Recent temperature data show the two tributaries (Redrock and Horsethief Canyon) temperatures are in the suitable ranges for salmonids (Maximum Weekly Average Temperature [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 some areas within the Gualala, of cooling temperatures as the stream flows towards the ocean.

2001 CDFW habitat inventory data was limited in scope; only 39 percent 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. In 2007, habitat surveys were conducted on 9,800 ft. of the Rockpile mainstem by Kleinfelder, Inc. confirming the limiting factors found in the 2001 surveys.

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, 2013).

The Rockpile Creek SPWS is considered a “Phase I Expansion Area” by the National Marine Fisheries Service (NMFS, 2012) for salmonid restoration efforts in the Gualala River Watershed. Planning for restoration projects should be implemented. Key limiting factors and basin recommendations are similar to the rest of the watershed, 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, Kleinfelder, Inc., 2007).

<u>Lower Rockpile Creek CalWater Planning Watershed</u>

Lower Rockpile Creek (PWS) at 2,946 acres (4.6 mi^2) drains 9.4 miles of “blue line” streams of which approximately 5.6 miles are Class I streams. Anadromous habitat is found in the Rockpile Creek main-stem. The Forest ownership spans 645 acres (1.0 mi^2) which contains 0.8 mile of Class I streams within the planning watershed. The property represents 19 percent of the sub-basin.

Lower Rockpile PWS has a road density of 6.5 miles per mi^2 representing a total of 30 miles of private timber roads. It is estimated that 81 percent of the total erosion yield within the watershed is road related (O’Connor Environmental, 2008). Approximately seven (7) miles of the total road network (23 percent) is on Forest property. Some road related sediment reduction work has been completed on the property but it is not known to what extent this work conforms to current standards.

GRI has hydrologically disconnected nine (9) miles of road within the planning watershed, effectively lowering the road density to 4.6 mile per mi^2 in the Lower Rockpile basin. The GRWC has partnered with GRI and received funding for upgrading the remaining sediment source sites on the property within the basin. Implementation of the project is slated for 2015/2016. Through the GRWC Wood In Stream program, a pilot project to measure the effectiveness of large wood placement in alluvial systems within the watershed was implemented in the lower reach of the basin.

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 improving large wood abundance to increase shelter ratings along the Rockpile main-stem are the top priority recommendations for the watershed (Klamt et al., 2002).

<u>Rockpile Creek</u>

Rockpile Creek is a 2nd order stream and within Lower Rockpile Creek PWS has approximately 5.4 miles of anadromous habitat of which 0.8 mile are on the Forest ownership. The Rosgen channel type is F4; the average bank-full width is 31 feet.

GRWC has two established monitoring reaches (#221 and #401) and six (6) water and air temperature sites downstream from the property line on GRI property. Three feet or deeper pool frequency is above CDFW target levels of 40 percent with primary pools comprising 61% of the upper reach (#401) of Rockpile Creek. The lower reach (#221) at the confluence with the South Fork does not meet target levels. Large wood abundance is well below preferred levels with an average of 42 pieces per 1,000 ft. and an average volume level of 3,899 ft^3. Piece and volume levels are higher at site #401, consistent with greater primary pool formation in the reach. Average center of channel canopy density is 48 percent. Temperatures appear to be moderately unsuitable for salmonids with the annual summertime MWAT range between 17.7°C to 19.9°C. Steelhead young of the year and older are found in the system.

Location Description

The legal description of Rockpile Creek at the downstream (property-line) end is T11N R14W S34 and its North American Datum (NAD) 83 coordinates are 38.7517 north latitude and 123.4170 west longitude. Elevations at the property line range from about 100 feet at the downstream end to 130 feet at the upstream end according to the USGS McGuire Ridge and 7.5-minute quadrangle.

Monitoring Sites

Temperature data (#221, #275, #222 and #401) have been collected from 1994 through 2013; baseline reach data at site #221 were collected in 1998 and the reach has been resurveyed in 1999 and 2003.

<u>Red Rock CalWater Planning Watershed</u>

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 Forest owns 645 acres (1.0 mi^2) which contains 0.8 mile of Class I stream on Rockpile Creek within the planning watershed. The ownership represents 29 percent of the basin.

Red Rock Creek PWS has a road density of 6.1 mile per mi^2 representing a total of 21 miles of private timber roads. Approximately six (6) miles of the total road network (29 percent) is on the Forest tract. Road density for property within the planning watershed is 6.0 mile per mi^2. It is estimated that 84 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008). 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, Inc.

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).

Rockpile Creek

Rockpile Creek is a 2nd order stream, and within Redrock Creek PWS it has approximately 3.2 miles of anadromous habitat of which 0.8 miles are on the Forest ownership. The Rosgen channel type is F4; the average bank-full width is 59 feet.

In-stream data is limited for this specific section of the Rockpile Creek. However, GRWC has one installed monitoring reach and temperature site (#701) on the Forest property and another temperature site (#401) below (west) of the property line.

Pool frequency is optimal with primary pools comprising 58% of the surveyed reach. Large wood abundance is below optimal levels with 34 pieces per 1,000 ft. and a volume level of 2,961 ft^3. Center of channel canopy density is 60 percent. Although temperatures appear to be moderately unsuitable for salmonids (MWAT 19.5°C and Max 23.6°C) steelhead young of the year and older are found in the system.

Location Description

Rockpile Creek's legal description at the downstream (property-line) end is T11N R14W S27 and its NAD 83 coordinates are 38.7767 north latitude and 123.4056 west longitude. Elevations at the property line range from about 130 feet at the downstream end to 150 feet at the upstream end according to the USGS McGuire Ridge 7.5-minute quadrangle.

Monitoring Sites

Temperature data (#701) were collected in 2008, 2009 and 2013; baseline reach data (#701) was collected in 2006 by the GRWC.

Middle Rockpile CalWater Planning Watershed

Middle Rockpile Creek (PWS) is a 12.8 mi^2 (8,165-acre) sub-watershed that drains 29 miles of blue line stream of which approximately 9.6 miles are Class I streams. Anadromous habitat is found in the Rockpile Creek main-stem and its tributary, Horsethief Canyon. The Forest ownership is 248 acres (3%) of the 5.9 mi^2 basin, and the property does not include any Class I streams but does contain small unnamed drainages to the main-stem of Rockpile Creek.

Historically, streamside roads and landings were densely concentrated at the base of steep ravines in the Middle Rockpile Creek planning watershed. 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 mi^2 representing a total of 70 miles of private timber roads. It is estimated that 38 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008). Approximately 2.8 miles (4%) of the total road network is on the Forest property. The road network runs along the ridge top and intersects the headwaters of two small drainages.

Road-related sediment source reduction strategies on the 2.8 miles of road should be implemented when sediment source work is scheduled for the roads on the Gualala River Forest property in Middle Rockpile Creek PWS or road work within Franchini Creek (Grasshopper PWS) on the Forest property.

Buckeye Creek SPWS

The 40 mi^2 (25,784-acre) Buckeye basin drains 79 miles of "blue line" streams and about 53 percent of the sub-basin is classified as high to very high potential for landsliding and represents a major source area for stream sediment. There are seven major tributaries to Buckeye Creek: Franchini Creek, Grasshopper Creek, Soda Springs, North Fork Buckeye, Flat Ridge Creek, Osser Creek and Roy Creek.

The watershed contains the only public access to the Gualala River. The forty (40)-acre Soda Springs Reserve is one of the few remaining old growth groves in the Gualala River watershed. To ensure the reserve remained a community park, Save the Redwoods League purchased it in the early 1990s and then transferred ownership to Sonoma County. The park is adjacent to the Forest tract.

The Forest ownership is 9,916 acres, approximately 39 percent, of the Buckeye Creek SPWS. The ownership spans the center of the watershed to the east with acreage in Little Creek, Grasshopper Creek and Harpo Reach and Flat Ridge Creek PWS.

Streams reaches throughout the wider Buckeye basin show longer reaches of moderate gradients compared to the North Fork and Rockpile basins. This indicates slower transport of sediment. Moderate stream gradients form a longer portion of the overall stream length in Little, Grasshopper, and Osser Creeks causing a higher potential for historic sediment accumulations and residual terrace formations in these areas.

By the end of 1968, 70 percent of the sub-basin had been harvested. Pre-2001 damage is still contributing substantial quantities of sediment to streams. Large amounts of stored sediments are still present in the watercourses within the Buckeye Creek watershed.

The Buckeye Creek SPWS has 251 miles of private roads. Road density is 6.2 mi^2 within the basin. The NCWAP restoration map targets the Grasshopper Creek PWS and the upper sub-basin reaches within the watershed for highest priority for future restoration work in sediment reduction.

Kelly Road, a privately owned major logging road was built in the 1950's and traverses several major tributaries to the Gualala River between the communities of Annapolis and Healdsburg. It runs along the Buckeye Creek stream bank for much of the drainage. In 2003, Pacific Watershed and Associates conducted a sediment source assessment through funding acquired from the Department of Fish & Wildlife; as yet the implementation work has not been completed. The road is used as the main access road to the property and easement holders along the road, including the Forest, contribute a use fee to the Kelly Road Association for maintenance. Serious consideration should be given to implementing the sediment source work outlined in the assessment.

Stream channel morphology show sediment accumulations continue to be noted in low gradient steps. In the Grasshopper Creek tributary, stream channels in many areas contain large amounts of stored sediment behind log jams of Large Wood. The channel continues to down-cut to pre-logging levels (Klamt et al., 2003).

The Buckeye Creek watershed is considered a high priority watershed as an “Initial Focus Core Area” for restoration (NMFS, 2012 and CDFW, 2002). Suitable water temperatures in a number of tributaries contribute to this ranking along with the importance the sub-basin provides to the Gualala River watershed as a whole. Steelhead are present in the watershed and historically coho salmon were known to spawn in the system.

GRWC has seventeen (17) temperature monitoring sites throughout the basin with temperature data from 1994 to 2013. Recent temperature data show Franchini, Grasshopper and Soda Springs Creeks temperatures are in the suitable ranges for salmonids (MWAT 13.9°C to 15.6°C). The main-stem sites vary from moderately suitable to unsuitable for summertime rearing (MWAT 17.1°C to 21.5°C). There is a trend of cooling temperatures as the stream flows towards the ocean.

In 2001 CDFW habitat surveyed 100 percent (51,085 ft.) of the Buckeye main-stem. Data show habitat deficiencies related to canopy cover, pool frequency/depth, and shelter cover in the areas surveyed. In 2005, Kleinfelder, Inc. habitat surveyed the portions of the Buckeye main-stem, Franchini Creek, North Fork Buckeye and Flatridge Creek that are contained within the property. Findings were similar to the 2001 study by CDFW with the exception of a high large wood abundance in Franchini Creek.

In general, more recent GRWC surveys illustrate stream reaches that are in recovery from channel simplification due to excess sediment loads and the lack of in-stream structure (Variation Index, GRWC, 2013). However, pool frequency and depth, canopy cover in the main-stems and large wood are lacking in most stream reaches (GRWC, 2013).

Key limiting factors and basin recommendations are similar to much of the Gualala River watershed, 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 main-stems are key factors limiting salmonid habitat (Klamt et al., 2002).

<u>Little Creek CalWater Planning Watershed</u>

Little Creek (PWS) at 5,868 acres (9.2 mi^2) and drains 21 miles of "blue line" streams of which approximately 13.8 miles are Class I streams. Anadromous habitat is found in the Buckeye Creek main-stem and its tributary, Little Creek. The Forest owns 1,256 acres (2.0 mi^2) which contains 3.2 miles of Class I streams (23%) within the planning watershed. The ownership represents 21 percent of the basin.

Little Creek PWS has a road density of 8.8 miles per mi^2 representing a total of 81 miles of roads. Forest owns approximately 19 miles (23%) of the total road network with a road density of 9.8 miles per mi^2; one of the highest in the watershed. Current sediment source work within the planning watershed includes the upgrading of fourteen (14) miles of high and medium priority roads completed by Gualala Redwoods, Inc., effectively lowering the planning watershed road density to 7.2 miles per mi^2. The GRWC has acquired funding to upgrade an additional 12 miles of road completing all high and medium priority sites on GRI property and the Brushy Loop rural subdivision. It is estimated that 86 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008).

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

Buckeye Creek

Buckeye Creek is a 3rd order stream. Within Little Creek PWS Buckeye Creek has approximately 10.2 miles of anadromous habitat of which 2.9 miles are in the Forest ownership. The Rosgen channel type is F4; the average bank-full width is 54 feet.

Water and air temperature has been monitored since 1995. Current data show Buckeye Creek temperatures below the property to be moderately suitable warming to moderately unsuitable traveling upstream and eastward (16.0°C (#223), 16.4°C (#224), 18.5°C (#231)).

The GRWC has installed two (2) monitoring sites on reaches of Buckeye Creek below the property line. Pool frequency is close to target levels with primary pools comprising, on average 35 percent of the surveyed area. Large wood abundance is below optimal levels with average between the two reaches at 40 pieces per 1,000 ft. and an average volume level of 1,234 ft^3. Center of channel canopy density is low at 54 percent. Although temperatures in some portions of the stream appear to be moderately unsuitable for salmonids (MWAT 18.5°C and Max 20.7°C) steelhead young of the year and older are found in the system.

Location Description

The legal description for Buckeye Creek at the downstream (property-line) end is T10N R14W S4 and its NAD 83 coordinates are 38.7387 north latitude and 123.4165 west longitude. Elevations at the property line range from about 100 feet at the downstream end to 165 feet at the upstream end according to the USGS Stewart's Point and McGuire Ridge 7.5-minute quadrangles.

Monitoring Sites

Temperature data has been collected (#235, #223, #231 and #224) from 1995 through 2013; reach data (#223 and #231) was collected in 1998, 2000 and 2008 by the GRWC. A proposed GRWC reach (#224) on the western edge of the Forest property has not been installed.

Little Creek

Little Creek is a small 1st order stream and has approximately 2 miles of blue line stream of which the lower 0.3 mile is within the Forest ownership. The stream is a tributary to the Buckeye Creek main-stem. Local residents provide accounts of coho spawning in lower Little Creek.

No habitat typing is available but water temperature is fully suitable (MWAT 14.5°C) for salmonids. Sediment source restoration is planned for 2015 along the upper reaches of Little Creek.

Location Description

The legal description of Little Creek at the downstream (property-line) end is T10N R14W S3 and its NAD 83 coordinates are 38.7341 north latitude and 123.4083 west longitude. Elevations at the property line range from about 110 feet at the downstream end to 120 feet at the upstream end according to the USGS Stewart's Point 7.5-minute quadrangle.

Monitoring Sites

Temperature data (#665 and #666) has been collected from 2010 through 2013.

Grasshopper Creek CalWater Planning Watershed

Grasshopper Creek PWS is a 9.0 mi^2 (5,766-acre) sub-watershed that drains 19.2 miles of blue line stream, of which approximately 11.1 miles are Class I streams. Anadromous habitat is found in the Buckeye Creek main-stem and its tributaries Grasshopper, Franchini and Soda Springs Creeks. The Forest ownership is 3,811 acres or 54 percent of the basin, and includes 6.0 miles of the Class I streams (54%) within the planning watershed.

Historically, streamside roads and landings were densely concentrated along the creeks within the watershed. Early 1960s air photos showed a high density of road debris slides contributing sediment to streams in the Grasshopper Creek PWS. The debris slides fanned out over the channel, forcing the stream to meander around the slide mass. Meandering channel patterns returned to a more lineal pattern through 1984 and more so by 1999.

Channel disturbance in Franchini Creek decreased from 90 to approximately 50 percent from 1984 to 1999-2000, and in the lower reach of Grasshopper Creek disturbance decreased from 50-75 percent to 25 percent.

The planning watershed has a road density of 7.0 miles per mi^2 representing a total of 63 miles of roads. Approximately 41 miles (65%) of the total road network is on Forest property and the road density for the property is 6.6 miles per mi^2. It is estimated that 81 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008).

The culvert at the base of Franchini Creek appears to be a low-flow fish migration barrier and should be prioritized for restoration implementation and replaced with a bridge. Juvenile steelhead were found above log jams in Franchini and Grasshopper Creeks. The jams do not currently appear to be barriers to migration but should be monitored over time.

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

Buckeye Creek

Buckeye Creek is a 3rd order stream with approximately 3.0 miles of Class I stream, of which 2.7 miles (88%) split into two reaches by Soda Springs Park are on the Forest ownership. Kelly Road follows the stream channel along the south side of the upper reach. This portion of the Buckeye main-stem is primarily low gradient (0-1%) but is interspersed with higher gradient (1-2%) reaches consisting of coarser cobble-boulder substrate.

The water temperatures within the reach of Buckeye Creek in the Grasshopper PW tend to be higher and moderately unsuitable for salmonids (19.0°C to 19.4°C). Pool frequency is limited with no primary pools (> 3 ft.) and only 27 percent of the monitoring reach consisting of > two (2) ft. pools. Large wood abundance is below preferred levels with eight (8) pieces per 1,000 ft. and a volume level of 944 ft^3. Center of channel canopy density is above target levels at 89 percent. Steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007). In June 2013, snorkel surveys were conducted on 1,000 ft. of Buckeye Creek pools above the Buckeye crossing leading to Franchini Creek. Steelhead juveniles in all age classes were present (1,103 young of the year, 82 1+, 6 2+ and 1 3+)(GRWC, 2013).

GRWC has two temperature monitoring sites (#670, #601). Current temperatures (MWAT 19.4°C and 18.4°C) are moderately unsuitable for salmonids.

Location Description

The legal description of Buckeye Creek at the downstream (property-line) end is T10N R14W S1 and its NAD 83 coordinates are 38.7422 north latitude and 123.3691 west longitude. Elevations at the property line range from about 250 feet at the downstream end to 280 feet at the upstream end according to the USGS Annapolis and Gube Mountain 7.5-minute quadrangles.

Monitoring Sites

The GRWC has one (1) monitoring reach (#670) for Buckeye Creek within the planning watershed baseline data were collected in 2006. Temperature data (#670 & #601) collection started in 2005 and the latest data sets are 2011 and 2012.

Grasshopper Creek

Grasshopper Creek is a 1st order stream with approximately 3.0 miles of Class I stream of which 1.0 miles of the upper third of Grasshopper Creek is on the Forest ownership.

The 1965 photos show extreme stream channel aggradation in Grasshopper Creek. The stream patterns through the logged areas show either channels meandering through wide, flat areas of sediment fans in low gradient steps, or stream deflections around fresh debris slides. Over the past years, much of this sediment has been moving out of system.

The water temperatures in Grasshopper Creek are fully suitable for salmonids (14.5°C). Pool frequency and depth are limited within the monitoring reach (22%). Large wood abundance is high with 190 pieces per 1,000 ft. and a volume level of 8,000 ft^3 but the wood pieces are concentrated in a few large log jams. Center of channel canopy density is above target levels at 88 percent. Steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007) in the monitoring reach, therefore the log jams do not appear to be limiting salmonid migration.

During the Preservation Ranch Limiting Factor Analysis conducted by Stillwater Sciences, the density of young of the year steelhead increased from later winter/early spring to early summer, but generally declined from early summer to early fall throughout the property, with the exception of Grasshopper Creek, where early fall densities increased. This increase may be a result of a redistribution of fish from warmer reaches to cooler reaches better able to support juvenile steelhead growth.

Location Description

The legal description of Grasshopper creek at the downstream (property-line) end is T10N R13W S8 and its NAD 83 coordinates are 38.7317 north latitude and 123.3328 west longitude. Elevations at the property line range from about 620 feet at the downstream end to 820 feet at the upstream end according to the USGS Annapolis 7.5-minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#696) and two proposed reaches (#669 and #668). Baseline data at #696 were collected in 2006. Temperature data (#696) were collected in 2009.

<u>Franchini Creek</u>

Franchini Creek is a 1st order stream with approximately 1.5 miles of Class I stream, all on the Forest ownership. Stream classification is based on 2005 habitat typing data but anadromy is most likely limited to the first mile of stream due to higher gradients in the upper watershed.

Water temperatures in Franchini Creek are fully suitable for salmonids (13.9°C). Pool frequency and depth is near target levels (>33%). Large wood abundance is near old growth target levels with 150 pieces per 1,000 ft. and a volume level of 4,627 ft^3 and as in Grasshopper Creek wood pieces are concentrated in large log jams. Center of channel canopy density is above target levels at 97 percent. Steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007) and up to 3,400 ft. above the confluence during habitat typing surveys. Large log jams (6 ft. tall) above 3,500 ft. may be limiting anadromy.

During the Limiting Factor Analysis permeability studies found Franchini Creek has the highest average steelhead egg survival to emergence (51%) for streams within the property (GRWC, 2014).

Location Description

The legal description of Franchini Creek at the downstream (property-line) end is T10N R14W S1 and its NAD 83 coordinates are 38.7422 north latitude and 123.3691 west longitude. Elevations at the property line range from about 250 feet at the downstream end to 490 feet at the upstream end according to the USGS Annapolis and Gube Mountain 7.5-minute quadrangles.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#667) and baseline data were collected in 2006. Temperature data (#667) started to be collected in 2005 and remains consistent (5-year average is 14.7) with little variation.

<u>Soda Springs Creek</u>

Soda Springs Creek is a 1st order stream with approximately 0.5 mile of Class I stream on the Forest ownership. As with most of the streams in the Buckeye Creek sub-basin, during mid-20th-century tractor operations a streamside road and landings were built next to the creek, pushing road fill into the creek. Within a relatively short period (1964 to 1973), most of the Soda Springs Creek watershed had been logged.

The water temperatures in Soda Springs are fully suitable for salmonids (15.6°C). Pool frequency and depth is limited within the monitoring reach (24%). Large wood abundance does not meet old growth target levels with 102 pieces per 1,000 ft. and a volume level of 2,391 ft^3. Average volume levels suggest most of the wood pieces are relatively small. Center of channel canopy density is above target levels at 94 percent. A few steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007) in the monitoring reach.

Location Description

The legal description of Soda Springs Creek at the downstream (property-line) end is T10N R13W S6 and its NAD 83 coordinates are 38.7470 north latitude and 123.3489 west longitude. Elevations at the property line range from about 380 feet at the downstream end to 580 feet at the upstream end of anadromy according to the USGS Annapolis 7.5-minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#671) and baseline data were collected in 2005. Temperature data (#671) collected in 2006 had a higher MWAT of 17.9°C. Subsequent MWATs were 15.1 in 2010 and 15.6 in 2011.

<u>Harpo Reach CalWater Planning Watershed</u>

Harpo Reach PWS is a 4.3 mi^2 (2,722-acre) sub-watershed that drains 10.5 miles of blue line stream of which approximately 3.4 miles are Class I streams. Anadromous habitat is found in the North Fork Buckeye Creek main-stem. The Forest ownership is 786 acres, or 29 percent, of the basin, and includes 2.4 miles (71%) of the Class I streams within the planning watershed.

Steelhead trout and coho salmon were reported in the North Fork Buckeye in 1964. A 1982 survey found pools at 25-40 percent of the stream. Steelhead trout comprised 40 percent of fish observed, among high water temperatures, algae blooms, and lack of cover. A 1995 survey showed 20 percent pools.

The area was tractor logged during the 1950s, with some areas entered lightly due to terrain and poor quality of the timber stands. Uncontrolled installation of fills, failure to remove fills, and lack of erosion control facilities has caused several landslides and locally severe erosion.

The planning watershed has a road density of 5.2 mi^2 representing a total of 22 miles of roads. It is estimated that 44 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008). Approximately 7.4 miles (33%) of the total road network is on the Forest property.

One of the few remaining old growth stands within the Gualala River watershed is within the Harpo Reach planning watershed on the Howlett Ranch. The old growth region adjoins the Forest property along the North Fork Buckeye Creek drainage. Special consideration should be given to forest management planning and restoration along the lower tributary.

In 2006, 2,680 ft. of the lower reach were habitat typed by Kleinfelder, Inc. Habitat typing was stopped due to a large log jam and landslide on the property. The report also states that "no fish noted" at the end of the survey. The landslide and log jam area and upstream of the jam should be evaluated for fish migration and possible restoration implementation.

There is one 0.5 mile unnamed tributary that flows on both the Forest and the Howlett tract properties to the North Fork. A portion was habitat typed in 2006 and steelhead were found up to 1,500 ft. above the confluence. The survey was halted due to a log jam but slope considerations most likely limit anadromy to the 1,500 ft.

In general, the top priority restoration recommendations for the watershed include implementation of road related sediment source reduction strategies, assess salmonid migration barriers, improve large wood abundance within the North Fork Buckeye Creek main-stem, and identify and implement late seral management strategies to augment existing stands.

North Fork Buckeye Creek

North Fork Buckeye is a 2nd order stream with approximately 3.2 miles of Class I stream within the planning watershed of which 2.4 miles (75%) are on the Forest ownership. This portion of the North Fork Buckeye main-stem is primarily low gradient (0-1%).

In 2005, the GRWC installed a monitoring reach (#702) at the confluence of the North Fork with Buckeye Creek. Water temperatures within the reach are moderately unsuitable for salmonids (17.3°C) but tend to be lower than the Buckeye main-stem. Pool frequency meets target levels with 44 percent of the stream reach containing two (2) ft. or greater pools. Large wood abundance is below preferred levels with 12 pieces per 1,000 ft. and a volume level of 771 ft^3. Center of channel canopy density is meeting target levels at 82 percent.

During historic surveys coho salmon were found to inhabit the North Fork, steelhead young of the year were found during ocular surveys in 2005 and 2006 (Kleinfelder, 2007).

Location Description

The legal description of North Fork Buckeye Creek at the downstream (property-line) end is T11N R13W S31 and its NAD 83 coordinates are 38.7599 north latitude and 123.3432 west longitude. Elevations at the property line range from about 280 feet at the downstream end to 480 feet at the upstream end according to the USGS Gube Mountain 7.5-minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#702) and baseline data were collected in 2005. Temperature data (#702) were collected in 2008 and 2009.

<u>Flat Ridge Creek CalWater Planning Watershed</u>

Flat Ridge Creek (PWS) is a 10.2 mi^2 (6,529-acre) sub-watershed that drains 19.8 miles of blue line stream of which approximately 8.9 miles are Class I streams. Anadromous habitat is found in the Buckeye main-stem and Flat Ridge Creeks. The Forest ownership is 4,063 acres or 62 percent of the basin, and includes 6.3 miles of the Class I streams (71%) within the planning watershed.

Watercourse areas in the basin were heavily cut during the late 1950s tractor operations. Extensive grassland areas with more open riparian zones exist from older attempts at rangeland conversion.

The planning watershed has a road density of 5.2 miles per mi^2 representing a total of 53 miles of roads. Approximately 40 miles (75%) of the total road network is on Forest property. Road density for the property within the planning watershed is 6.4 miles per mi^2. It is estimated only 14 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008).

In 2006, 7,970 ft. of Buckeye Creek and 2,684 ft. (to the property line) of Flat Ridge Creek were habitat typed by Kleinfelder, Inc. Although water temperatures range from moderately unsuitable to fully unsuitable (18°C to 21.5°C) in the two creeks within the planning watershed, during salmonid ocular surveys in the monitoring reaches on the property both the Buckeye main-stem and Flatridge Creeks had some of the highest counts of steelhead young of the year (Kleinfleder, 2006).

In general, the top priority restoration recommendations for the watershed include: improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate, implement road related sediment source reduction strategies on the property.

<u>Buckeye Creek</u>

Buckeye Creek is a 1st order stream in this area of the watershed, with approximately 3.5 miles of Class I stream all are on the Forest ownership. This upper portion of the Buckeye main-stem changes to a higher gradient (1-2%) with intermittent areas of three (3) to four (4) percent gradient reaches. Rosgen channel type is B4.

In 2005, the GRWC installed two monitoring reaches (#672 & #673) along the upper Buckeye Creek reach. Water temperatures within the reaches are moderately unsuitable for salmonids (19.7°C & 18.0°C). Pool frequency and depth is limited with 17 percent of the stream reach containing two (2) ft. or greater pools. Large wood abundance is below preferred levels with an average between both reaches of 13 pieces per 1,000 ft. and a volume level of 279 ft^3. Center of channel canopy density is low at an average of 31 percent reflecting the change from conifer forest to the much more open oak woodland vegetation.

Steelhead young of the year and older were found during ocular surveys and habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007).

Location Description

Buckeye Creek – Flat Ridge PWS sub-section: The legal description at the downstream (property-line) end is T11N R13W S31 and its NAD 83 coordinates are 38.7599 north latitude and 123.3432 west longitude. Elevations at the property line range from about 280 feet at the downstream end to 820 feet at the upstream end of anadromy according to the USGS Gube Mountain and Annapolis 7.5-minute quadrangles.

Monitoring Sites

The GRWC has two (2) installed monitoring reaches (#672 & #673) and baseline data were collected in 2005. Temperature data at site #672 were collected in 2005, 2006 and 2013. Temperature data at site #673 were collected in 2006 and 2013.

<u>Flat Ridge Creek</u>

Flat Ridge Creek is a 1st order stream with approximately 3.6 miles of Class I stream of which 2.5 miles is on the Forest ownership. The gradient increases at the confluence with the Buckeye mainstem to over one (1) percent slope with some interspersed reaches with steepening valleys increasing the gradient to over two (2) percent. The Rosgen channel type is B4. Kelly Road follows the stream channel on the south side of the channel.

In 2005, the GRWC installed a monitoring reach (#602) at the confluence of Flat Ridge with Buckeye Creek. Water temperatures within the reach are the highest recorded for the Buckeye Creek SPWS and unsuitable for salmonids (MWAT 20.5°C). The daily maximum (Max) exceeded the lethal limit of 23.9°C (cold water fish rearing) with a reading of 26.0°C in 2013. Maximum temperatures remained lethal for a number of hours a day during a five-day heat spell. Pool frequency is below target levels with 20 percent of the stream reach containing two (2) ft. or greater pools. Large wood abundance is below preferred levels with 16 pieces per 1,000 ft. and a volume level of 1,173 ft^3. At 11 percent, the center of channel canopy density falls far below target levels.

During habitat typing surveys in 2006, damage caused by wild pigs to the riparian corridor was noted as impacting the stream channel. Despite the high temperatures, steelhead young of the year and older were found during ocular surveys in 2005 and 2006 (Kleinfelder, 2006).

Location Description

The legal description of Flat Ridge Creek at the downstream (property-line) end is T11N R13W S33 and its NAD 83 coordinates are 38.7542 north latitude and 123.3077 west longitude. Elevations at the property line range from about 420 feet at the downstream end to 510 feet at the upstream end according to the USGS Gube Mountain 7.5-minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#602) and one (1) proposed monitoring reach for Flat Ridge Creek (#674). Baseline data was collected in 2005. Temperature data (#602) have been collected since 2000, the latest data set was 2013 (MWAT 20.5°C).

Wheatfield Fork SPWS

The 112 mi^2 (71,492-acre) Wheatfield Fork basin drains 246 miles of "blue line" streams and five (5) major tributaries: Fuller Creek, Haupt Creek, House Creek, Wolf Creek and Tombs Creek. Elevations range from about 80 feet at the mouth to 2,469 feet in the House Creek headwaters area according to the USGS Stewart's Point, Annapolis, Plantation, Tombs Creek and Big Foot Mountain 7.5-minute quadrangles. Steelhead are present in the watershed and historically coho salmon were known to spawn in the system.

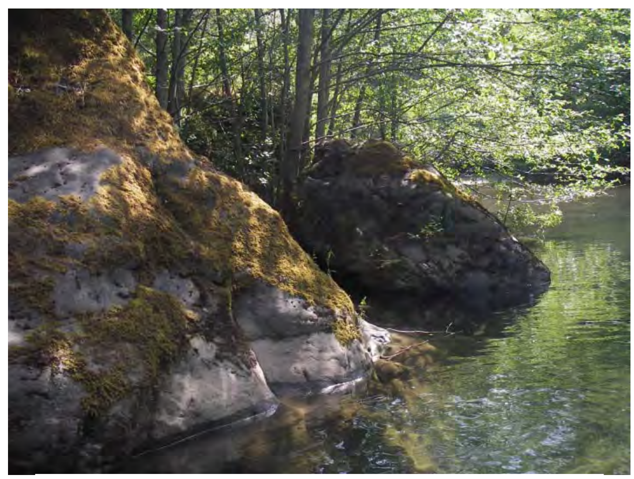


Figure 4-10: Upper Wheatfield Fork of the Gualala River. Photo by Gualala River Watershed Council.

Forest ownership is 8,281 acres approximately 12 percent of the Wheatfield Fork SPWS. The ownership spans the center of the watershed with acreage in Fuller Creek, Tobacco Creek and Wolf Creek PWS.

The Wheatfield Fork SPWS has 476 miles of private roads. Road density is 4.3 miles per mi^2 within the basin. Within the watershed the Forest the road network encompasses 80.4 miles of road with a density of 6.24 mi. per mi^2. Road restoration efforts in the Fuller Creek watershed have lowered the ownership road density to 5.6 mi. per mi^2.

The soils and bedrock in the eastern headwaters of the basin are derived from the Franciscan Complex and over 60 percent of the basin has a high to very high landslide potential rating. Landslides represent the major source area for stream sediment in most planning watersheds with the exceptions of Fuller and Annapolis PWS where sediment from poorly constructed ranch and timber roads is the major contributing factor.

In the eastern portion of the watershed, the Tombs Creek Fault has influenced channel formation causing a zigzag pattern in the main channel in response to faulting. In the lower reaches of the sub-basin, streams are mainly bedrock controlled within moderately steep valleys. The narrow floodplain is limited to the lower two (2) miles.

Approximately 10 percent of the blue line streams were exposed to solar radiation in 1942; these areas were restricted to wide stream channels subject to alluvial deposition and stream channel migration. By the end of the tractor-harvesting era in 1968, approximately 45 percent of the blue line streams were exposed bank-to-bank. Bank-to-bank over-story exposure for 2000 shows improvement compared to 1968, reflecting riparian in-growth since the late 1960s. By 2000, canopy closure improved with approximately 30 percent of blue line streams exposed bank-to-bank.

With the building of the Annapolis Road along the main-stem Wheatfield Fork, large tracts of coniferous forests were tractor cleared during the late 1950s throughout the lower and middle reaches of Fuller, Haupt, and Tobacco Creeks. Approximately 13 miles of historic logging roads built in or along the streambed in the lower Wheatfield simplified pool structure and complexity throughout the lower basin.

The 1970s and 1980s were a period of low timber harvest activity due to depletion of the timber base in previous decades. In the central and eastern regions of the watershed ranching became a more dominant land use. Vegetation analysis in 1996 typed 6,004 acres of grazing lands (8.4 percent of the sub-basin). Timber harvest operations increased in the 1990s in response to improving markets. Vineyard development also accelerated. Currently, vineyards comprise 2.5 percent (706 acres) of the watershed.

Timber production and grazing remain the dominant land uses in the Wheatfield Basin. Additionally, a number of rural subdivisions have been developed in the past 40 years, primarily centered near the Annapolis area. Four timber companies own 41 percent of the basin: Soper-Wheeler, LLC (17%), The Conservation Fund (12%), Mendocino Redwood Company (10%) and Gualala Redwoods, Inc. (3%).

Lower reaches of the Wheatfield Fork main-stem contain stands of Redwood and Douglas fir with a mixed-hardwood and forb understory. The main tributary watercourses are largely covered with coniferous canopy cover, and include redwood, Douglas-fir, sugar pine, ponderosa pine, California nutmeg, tanoak, Pacific madrone, vine and big-leaf maple, alder and willow. Upslope vegetation in the Wheatfield Basin is determined by the elevation, soil type, available water and proximity to salt air from the ocean. The highest elevation areas contain a combination of oak woodland and open grasslands. Oak woodland and willow provide riparian structure in sub-basins which remain free from grazing.

Stream channel morphology in the Wheatfield Fork sub-basin shows improvement of in-stream channel conditions between 1984 and 2000 as evidenced by a reduction in the percentage of channel length that is affected by excess sediment storage or sediment sources (Klamt et al, 2002).

GRWC has thirty-two (32) temperature monitoring sites throughout the basin with temperature data from 1994 to 2013. Recent temperature data show that the forks, North and South, to Fuller Creek are the only tributaries with fully suitable temperatures for salmonids (MWAT 13.2°C to 16.7°C). The main-stem sites vary from moderately suitable to moderately unsuitable for summertime rearing (MWAT 17.1°C to 24.2°C). Overall, 41 percent of the temperature sites within the watershed exceed basin plan lethal maximums (23.9°C) for intervals during the reporting period. Of the twelve (12) main stem sites, 67 percent exceed the maximum.

2001 CDFW habitat inventory data was limited in scope; only 45 percent of the basin was surveyed. 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 central and upper reaches of the watershed.

The lower Wheatfield Fork, Fuller Creek and Haupt Creek watersheds are considered "Phase I Expansion Area" for salmonid restoration efforts in the Gualala River watershed (NMFS, 2012 and CDFW, 2002). Key limiting factors and basin recommendations are similar to the watershed as a whole, with more emphasis on inadequate riparian composition and density in the main-stem and some tributaries. 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).

The GRWC has partnered with several landowners in the basin to assess, design and implement up-slope and in-stream restoration projects. Sediment source work has been implemented to hydrologically disconnect 11 percent of the 475.6 miles of road in the Wheatfield basin, mainly in the Annapolis and Fuller Creek sub-basins. The GRWC partnered with GRI and MRC in 2005 to install 82 pieces (170 cubic meters) of large wood in Fuller Creek. Additionally, Gualala Redwoods, Inc. placed 18 cubic meters of large wood in the main-stem Wheatfield Fork in 2009 and 27 cubic meters in 2013.

Fuller Creek CalWater Planning Watershed

Fuller Creek (PWS) is a 11 mi^2 (7,039-acre) sub-watershed that drains 22 miles of blue line stream of which approximately 10.8 miles are Class I streams. Anadromous habitat is found in the Fuller Creek mainstem, Lower Sullivan Creek and the North and South Forks of Fuller. The Forest ownership is 3,370 acres or 48 percent of the headwaters of the basin, and includes 4.5 miles (42%) of the Class I streams within the planning watershed.

The Fuller Creek sub-basin consists of steep, deeply incised terrain, with upper reaches characterized by inner gorge ravines. In the lower reaches, there has been deep downcutting by Fuller Creek between plateau areas of moderate to near level terrain upslope.

Historically, inner riparian areas were the central locations for road building, tractor yarding, and timber removal. In the steep, deeply incised Sullivan and Fuller Creek canyons, the entire road network was built along the creek at the base of steep ravines. As a result, 1965 aerial photo analysis found that high runoff from the 1964 storms incised in-stream landings and undercut streamside roads, collapsing sections into creeks. The roads concentrated runoff triggering debris slides into watercourses.

The planning watershed had a road density of 6.7 miles per mi^2 representing a total of 74 miles of roads. Twenty-two (22) miles of road have been hydrologically disconnected (13 miles GRWC Cooperative effort, eight (8) miles previous owners of Forest, one (1) mile Mendocino Redwood Company) and the effective road density has been lowered to 4.7 mi^2. Approximately 39 miles (53%) of the total road network is on Forest property. Road density for the property within the planning watershed before upgrading was 7.4 miles per mi^2; effective road density after upgrading is 5.8 miles per mi^2. It is estimated that 74 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008).

In 1989, a population estimate was calculated for one station located on the main-stem of Fuller Creek just upstream of the entrance road from the Hollowtree store. The steelhead trout juvenile population of Fuller Creek was estimated at 62 with a standard error of 8.6.

In 1995 Fuller Creek was habitat typed by CDFW and in 2006, 3,696 ft. of the South Fork Fuller Creek, from the property line upstream was habitat typed by Kleinfelder, Inc. Ocular salmonid surveys were conducted in the monitoring reach on South Fork Fuller Creek in 2005, and in 2006 by Stillwater Sciences, Inc. implemented snorkel surveys in Fuller Creek and the North Fork Fuller Creek. Steelhead were present during all surveys.

Water temperatures range from fully suitable to moderately unsuitable (14.2°C to 19.1°C) within the planning watershed, and Fuller Creek is considered one of the most important refugia planning watersheds within the Wheatfield Fork.

In general, the top priority restoration recommendations for the watershed include: continue to implement road-related sediment source reduction strategies on the property, improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate.

South Fork Fuller Creek

South Fork Fuller is a 2nd order stream and within Fuller Creek PWS has approximately 5.5 miles of Class I streams, of which 4.0 miles are on the Forest ownership. The Rosgen channel type is F4; the average bank-full width is 18 feet. The stream gradient is between one and two percent with interspersed reaches with gradients over two percent.

In 2005, the GRWC installed a monitoring reach (#663) along the upper South Fork Fuller reach. The reach is above the upper fork of the channel, and the stream at this point is considered to be a 1st order stream. Pool frequency and depth is close to target levels with pools equal to or greater than one (1) ft. comprising 36 percent of the reach length. Large wood abundance is below preferred levels with 59 pieces per 1,000 ft. and a volume level of 4,327 ft^3. The GRWC has installed three (3) air and water temperature monitoring sites along the South Fork.

Water temperatures within the reach are suitable in the headwaters (14.2°C) but appear to warm downstream at the confluence with the North Fork to moderately unsuitable for salmonids (average MWAT 18.4°C). Steelhead young of the year and older were found during ocular surveys and habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007).

Location Description

The legal description of South Fork Fuller Creek at the downstream (property-line) end is T10N R13W S15/16 and its NAD 83 coordinates are 38.7077 north latitude and 123.3043 west longitude. Elevations at the property line range from about 550 feet at the downstream end to 750 feet at the upstream end according to the USGS Annapolis 7.5-minute quadrangle.

Monitoring Sites

Temperature data at site #663 were collected in 2009, at site #662 in 2004 and at site #618 2000 through 2009; The GRWC has two (2) monitoring reaches, one proposed (#662) and one installed (#663); baseline reach data was collected in 2005 by the GRWC.

North Fork Fuller Creek

North Fork Fuller is a 2nd order stream and has approximately 1.7 miles of Class I streams of which 0.5 mile is on the Forest ownership. The stream gradient is between one and two percent with interspersed reaches with gradients over two percent.

In-stream data is limited for the North Fork of Fuller Creek. However, GRWC has two water and air temperatures sites (#619 and #665). Most recent water temperatures at the two (2) sites were found to be fully suitable (MWAT 16.3°C and 16.6°C) for salmonids.

Location Description

The legal description of North Fork Fuller Creek at the downstream (property-line) end is T10N R13W S15/16 and its NAD 83 coordinates are 38.7164 north latitude and 123.3043 west longitude. Elevations at the property line range from about 620 feet at the downstream end to 510 feet at the upstream end according to the USGS Annapolis 7.5-minute quadrangle.

Monitoring Sites

The GRWC Cooperative Monitoring Program has one (1) proposed reach (#665) and two (2) temperature sites. Temperature data at site #619 were collected 2005, 2006 and 2009 and at site #665 in 2004.

Tobacco Creek CalWater Planning Watershed

Tobacco Creek (PWS) is a 12.6 mi^2 (8,061-acre) sub-watershed that drains 29 miles of blue line stream of which approximately 10.8 miles are Class I streams. Anadromous habitat is found in the Wheatfield Fork main-stem and its tributary Elk Creek. The Forest ownership is 2,174 acres (27%) and has 1.5 miles (13%) of Class I streams within the planning watershed.

The planning watershed has a road density of 4.1 miles per mi^2 representing a total of 61.4 miles of private timber roads. Approximately 19.4 miles (32%) of the total road network is on Forest property. Road density for the property within the planning watershed is 5.7 miles per mi^2. It is estimated that 45 percent of the total erosion yield within the watershed is road-related (O'Connor Environmental, 2008).

Bank-to-bank canopy exposure is evident along all of the Wheatfield Fork main-stem in the planning watershed. In-stream data is limited for this specific section of the Wheatfield Fork. However, GRWC has two (2) temperature sites on the main-stem and one (1) site on Elk Creek. Water temperatures on the Wheatfield Fork main-stem are fully unsuitable; Elk Creek temperatures are in the moderately unsuitable range.

In general, the top priority restoration recommendations for the watershed include: improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and implement road related sediment source reduction strategies on the property.

Wheatfield Fork

The Wheatfield Fork is a 4th order stream with approximately 10.5 miles of Class I stream of which 0.8 mile are on the Forest ownership. This portion of the main-stem is primarily low gradient (0-1%) and Skaggs Springs Road (Sonoma County Road) follows the channel on the south side through this portion of the property.

Current in-stream data is limited for this section of the Wheatfield Fork. The reach was habitat typed in 2001 and data show habitat deficiencies related to canopy cover, pool frequency/depth, and shelter cover in the main-stem throughout the basin. GRWC has three (3) temperature monitoring sites (#620, #707 and #708). Current temperatures (MWAT 21.8°C, 23.4°C and 23.4°C) are fully unsuitable for salmonids. Sites #620 and #707 have recorded temperatures above the basin plan lethal maximum (MAX) limit of 23.9°C.

Location Description

The legal description of the Wheatfield Fork at the downstream (property-line) end is T10N R13W S25/26 and its NAD 83 coordinates are 38.6730 north latitude and 123.2655 west longitude. Elevations at the property line range from about 260 feet at the downstream end to 350 feet at the upstream end according to the USGS Annapolis and Tombs Creek 7.5-minute quadrangles.

Monitoring Sites

The GRWC has one (1) proposed monitoring reach for the Wheatfield Fork (#647) and one (1) proposed for a non-anadromous stream, Crocker Creek. Neither reaches are on Forest property. Temperature data (#620, #707 and #708) were collected in 2000 through 2013.

Elk Creek

Elk Creek is a 1st order stream with approximately 0.7 mile of Class I stream, all on the Forest ownership. The bottom low gradient (0-1%) reach increases to one percent for with three-quarters of the Class I reach.

Elk Creek was heavily impacted by tractor operations in the 1950s and 1960s. Upper segments of Elk Creek were used as skid trails with in-stream landings at road crossings, and logging debris and soil was placed in streambeds. Elk Creek was used historically for livestock grazing (the Tabor Ranch). Mixed conifer/hardwood stands developed in response to clearing and burning operations with the intent to convert to rangeland.

In-stream data is limited. GRWC has one (1) temperature monitoring site above the confluence with Wheatfield Fork (#706). Current temperatures (MWAT 17.2°C) are moderately unsuitable for salmonids. In 2005, the site registered a moderately suitable MWAT of 16.3°C.

Some road-related sediment reduction work has been completed on the property but it is not known to what extent this work conforms to current standards (Coastal Forestlands, Ltd., 1997).

Location Description

The legal description of Elk Creek at the downstream (property-line) end is T10N R13W S25 and its NAD 83 coordinates are 38.6757 north latitude and 123.2549 west longitude. Elevations at the property line range from about 260 feet at the downstream end to 400 feet at the upstream end according to the USGS Annapolis and Tombs Creek 7.5-minute quadrangles.

Monitoring Sites

The GRWC has one (1) temperature site (#706); data were collected in 2009, 2006 and 2005.

<u>Wolf Creek CalWater Planning Watershed</u>

Wolf Creek (PWS) is a 15.8 mi^2 (10,101-acre) sub-watershed that drains 36 miles of blue line stream of which approximately 18.1 miles are Class I streams. Anadromous habitat is found in the Wheatfield Fork main-stem and its main tributaries Wolf Creek, Tombs Creek and Redwood Creek. The Forest ownership is 2,733 acres (27%) of the 15.8 mi^2 basin and has 3.8 miles (21%) of Class I streams within the planning watershed.

The planning watershed has a road density of 3.5 miles per mi^2 representing a total of 59 miles of roads. Approximately 22 miles (38%) of the total road network is on Forest property. Road density for the property within the planning watershed is 5.1 miles per mi^2. It is estimated that 31 percent of the total erosion yield within the watershed is road-related (O'Connor, 2008).

In 2001, the lower section of the Wheatfield Fork within the planning watershed was habitat typed by CDFW and in 2006, 7,837 ft. of the Redwood Creek was habitat typed by Kleinfelder, Inc. Ocular salmonid surveys were conducted in the monitoring reaches on Wheatfield Fork above and below Tombs Creek and in Redwood Creek in 2005. In 2006 Stillwater Sciences, Inc. implemented snorkel surveys in Upper Wheatfield Fork, Tombs Creek at the confluence with Wheatfield Fork and Redwood Creek. Steelhead were present during all surveys. Water temperatures range from moderately unsuitable to fully unsuitable (19.7°C to 20.9°C) within the planning watershed.

In general, the top priority restoration recommendations for the watershed include: continue to implement road-related sediment source reduction strategies on the property, improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate.

<u>Wheatfield Fork</u>

The Wheatfield Fork is a 4th order stream with approximately 9.3 miles of Class I stream of which 3.3 miles are on the Forest ownership. This portion of the Wheatfield main-stem is low gradient (0-1%) with some interspersed reaches with steepening valleys increasing the gradient to over one percent.

In 2005, the GRWC installed two (2) monitoring reaches (#651 and #652) on the upper Wheatfield above and below the confluence of Tombs Creek. Pool frequency and depth are below target levels with pools equal to or greater than three (3) ft. comprising an average of 16 percent of the two reaches. Large wood abundance is non-existent with only one (1) piece per 1,000 ft. and an average volume of 59 ft^3. Canopy in the center of the channel at site #651 is 18 percent and 63 percent at site #652.

Within the reaches, the GRWC has installed two (2) air and water temperature monitoring sites. Water temperatures within the reaches are moderately unsuitable at site #651 (19.9°C) and fully unsuitable (20.9°C) with daily temperatures (25.2°C) exceeding the Basin Plan lethal maximums of 23.9°C at site #652.

Notwithstanding the high temperatures, steelhead young of the year and older were found during ocular surveys and steelhead were documented during habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007). Stillwater Sciences, Inc. found somewhat low steelhead densities (fish/m^2) in the upper Wheatfield reach (#652) during the Limiting Factors Analysis (Stillwater Sciences, 2008).

Location Description

The legal description of the Wheatfield Fork at the downstream (property-line) end is T10N R12W S19/30 and its NAD 83 coordinates are 38.6933 north latitude and 123.2279 west longitude. Elevations at the property line range from about 390 feet at the downstream end to 550 feet at the upstream end according to the USGS Tombs Creek 7.5-minute quadrangle.

Monitoring Sites

The GRWC has two (2) installed monitoring reaches (#651 and #652) and one proposed reach (#648); baseline data were collected in 2006. Temperature data (#680 & #683) were collected in 2006 and 2009.

<u>Redwood Creek</u>

Redwood Creek is a 1st order stream with approximately 0.5 mile of Class I stream all on the Forest ownership. The creek is high gradient (2-3%) with some interspersed reaches with steepening valleys increasing the gradient to over six (6) percent.

In 2006, the GRWC installed a monitoring reach (#704) in Redwoods Creek. Pool frequency and depth do not meet target levels with pools equal to or greater than 1 ft. comprising 24 percent of the reach length. Large wood abundance is close to preferred levels with146 pieces per 1,000 ft. and a volume level of 5,442 ft^3 with wood concentrated in large log jams.

The GRWC installed one (1) air and water temperature site within the monitoring reach. Water temperatures within the reach are moderately unsuitable (MWAT 19.7°C).

Location Description

The legal description of Redwood Creek at the downstream (property-line) end is T10N R13W S12 and its NAD 83 coordinates are 38.7299 north latitude and 123.2507 west longitude. Elevations at the property line range from about 550 feet at the downstream end to 1,360 feet at the upstream end according to the USGS Tombs Creek and Annapolis 7.5-minute quadrangle.

Steelhead young of the year and older were found during ocular surveys and steelhead were documented during habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007).

Monitoring Sites

The GRWC has one (1) monitoring reach (#704); baseline data was collected in 2006. Temperature data (#704) were collected in 2006.

4.4.3 Aquatic Species Affecting Management

As mentioned previously, the focus of this IRMP 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, 2014).

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 4-4). 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, 2014).

Table 4-4: 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 ST
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 (*Actinemys marmorata*)	CDFW: SSC
Western aquatic garter snake (*Thamnophis couchi*)	
Amphibians	
Coastal (Pacific) giant salamander (*Dicamptodon tenebrosus*)	
Southern torrent salamander (*Rhyacotriton variegatus*)	CDFW: SSC
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.

Within the property, coho salmon were last observed from bank observations during a stream survey on the main-stem of Buckeye in 1964 and in Franchini Creek in 1970 (Klamt et al., 2002).

Neither accurate nor credible coho salmon population estimates have been conducted in the Gualala River watershed (Klamt et al., 2003). Electrofishing (10 Pool Protocol) data from 2001 indicated that coho salmon were absent and possibly extirpated from the Gualala basin (CDFW, 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 (CDFW, 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 (CDFW, 2004).
- 2004: juvenile coho were found in upper Dry Creek during snorkel surveys (CDFW, 2004).

- <u>2005 to 2012</u>: comprehensive surveys and/or studies that would lead to coho observations or population assessments were not conducted in the watershed during this period.
- <u>2013</u>: in partnership with NCRWQCB, NMFS and CDFW, the GRWC implemented a three-year program to conduct snorkel surveys within coho habitat in the North Fork basin. No juvenile coho were found during the snorkel surveys in 2013.

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 existed in the Gualala until 2004.

Steelhead Trout (*Oncorhynchus mykiss*)

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

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.

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. The respective 95 percent confidence limits were 799-5,165 and 571-9,535. In 1974-75, CDFW estimated the adult steelhead population was 7,608, with a 95 percent confidence interval of 6,126-10,379. In 1975-76 the population was estimated at 6,300. In 1977, CDFW estimated the winter steelhead population at 4,400 (GRWC, 2014).

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.

The Stillwater Sciences (2008) study found that although spawning gravels and water temperatures were not optimum, the spring, summer, and fall fish surveys indicated that juvenile steelhead are common to abundant in Buckeye Creek and Wheatfield Fork within the property. The report findings are summarized into four categories:

- Steelhead production remains sufficient to maintain a population although at a substantially reduced level compared to historical conditions.
- Summer survival of steelhead appears limited by warm water temperatures, a limitation that may be caused by a change in vegetation patterns from conifer to oak woodland in the upper portions of the Study Area.

- Reduction in the frequency of deep pools, caused by LWD removal and a reduction in streamside recruitment may also have reduced the carrying capacity of juveniles.
- Overwintering habitat, in particular cobble-boulder habitat complexes, is scarce and likely limits survival and production of age 1+ and older steelhead smolts.

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, 2014).

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, 2014).

4.4.4 Existing Road Conditions

Erosion control and erosion prevention work is the first and perhaps the most important step to protecting and restoring watersheds and their anadromous fish populations. This is especially true for the Gualala River watershed. Unlike many watershed improvement activities, erosion prevention and "storm-proofing" has an immediate benefit to the streams and the aquatic habitat of the basin. Roads are a major source of erosion and sedimentation on most managed forest and ranch lands (Weaver et al., 2014).

In 2003 the Gualala River Watershed Technical Support Document for Sediment (TSD) estimated the Gualala River watershed's present erosion rate was 1,220 tons/mi^2/yr, with a background erosion rate of 380 tons/mi^2/yr. Newer sediment source assessments conducted at the scale of planning watersheds in the Gualala are consistent with the TSD findings. The goal of the Gualala TSD and the GRWC is to lower anthropogenic sediment loads to 25 percent above the background erosion level (475t/mi^2/yr). The TSD states road erosion accounted for 58 percent of the total estimated watershed erosion rate and 85 percent of the human-caused (controllable) portion of the estimated erosion rate.

The National Marine Fisheries Service (1996) guidelines for salmon habitat characterize watersheds with road densities greater than three (3) miles of road per square mile of watershed area (mi/mi^2) as "not properly functioning," while "properly functioning condition" was defined as less than or equal to two (2) miles per mi^2, with no or few stream side roads. The Final Recovery Plan for Central California Coast coho salmon states that road density and streamside road density are the greatest overall source of impairment to watershed processes (NMFS, 2012). The Forest road network has an overall road density of 6.6 miles per mi^2. For the purposes of project planning, sub-basins and their road networks are prioritized based on sediment source analysis, road densities, roads proximate to streams, and potential salmonid habitat. The existing transportation network and known rock pit locations on the Forest are shown in Figure 2-1: Conservation Easement Boundary/Transportation Network and Rockpits.

Table 4-5: Forest Road Density by Planning Watershed

CalWater Planning Watershed	**Gualala Watershed Total Road Network (mi.)**	**Forest Road Network (mi.)**	**Forest Percent PWS**	**Forest Road Density (mi/mi^2)**	**Forest Road Upgraded (mi.)**	**Forest Effective Density Following Upgrades (mi/mi^2)**
Gualala River HSA (w/o coastal WS)	1,532	203.6	13.3%	6.6	9.6	6.3
Rockpile SPWS	169					
Lower Rockpile PWS	29.9	6.8	22.7%	7.8	0.3	7.8
Redrock PWS	21.0	6.1	29.0%	6.0	0.0	6.0
Middle Rockpile Cr.	70.4	2.8	4.0%	7.8	0.0	7.8
Buckeye SPWS	251					
Little Creek PWS	80.8	19.3	23.9%	9.8	0.0	9.8
Grasshopper Cr. PWS	62.8	40.5	64.5%	6.8	1.0	6.6
Harpo Reach PWS	22.2	7.4	33.3%	6.0	0.2	5.9
Flat Ridge Cr. PWS	53.1	40.4	76.1%	6.4	0.0	6.4
Wheatfield Fork SPWS	476					
Fuller Creek PWS	74.0	38.9	52.6%	7.4	8.1	5.8
Tobacco Creek PWS	61.4	19.4	31.6%	5.7	0.0	5.7
Wolf Creek PWS	57.8	22.0	38.1%	5.1	0.0	5.1

By following the protocols developed by Weaver et al. (2014) roads can be 95 percent hydrologically disconnected from streams, reducing delivery of sediment from road sources by as much as 95 percent and potentially decreasing the human-caused erosion by 80 percent.

The sediment source assessment completed on the road networks within the Forest in 2007 focused on access roads to the proposed vineyard tracts (Kent & Associates, 2007). Phase I of the Gualala River Hydrologic Subarea (HSA) (without coastal watersheds) restoration plan concentrates on main haul roads and ridge-tops roads. The plan should be reviewed to develop additional assessment mileage for each planning watershed with a focus on roads proximate to streams and mid-slope roads, which normally have the highest potential sediment yields.

4.5 Archaeology and Cultural History

A California Historic Resources Information System (CHRIS) property-wide records search was requested by SCI from the Northwest Information Center (NWIC) at Sonoma State University on January 14, 2014. Appropriate NWIC base maps, referencing cultural resources records and reports, historic-period maps, and literature for Sonoma 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 66 previous surveys covering roughly 50 percent of the Forest (NWIC, 2014). 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 (2014) report included 52 recorded Native American cultural resources in or adjacent to the Forest. Two Native American villages and three campsites were referenced in the ethnographic literature in or near the Forest. People living in the general area of the Forest at the time of Euro-American contact spoke Southern Pomo, one of seven Pomoan languages (NWIC, 2014).

Within this region of Sonoma County, Native American resources have typically been found along creeks and rivers, on midslope terraces above waterways, and along trending ridges. The report also includes the mid-slope terraces above these waterways and several major trending ridges. Based on these environmental factors, the NWIC indicates there is a high potential for identifying unrecorded Native American resources within the Forest (NWIC, 2014).

4.5.2 Historic-Period Cultural Resources

NWIC base maps identified 32 previously recorded historic era archaeological resources located within the Forest. 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 1875 to 1882 show several houses and trails within the project area. Given these factors, the NWIC (2014) report indicated a high potential for identifying unrecorded historic-period archaeological resources within the Forest.

The Plantation 1921 USGS 15' topographic quadrangle map shows Tabers Ranch with two associated buildings within the Forest. If the buildings or structures shown on the 1921 Plantation map still exist, there is the potential for meeting the Office of Historic Preservation's minimum age for buildings or structures 45 years or older (NWIC, 2014).

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's resources to ensure sustainability and fulfill the overall project purpose. These policies and strategies are derived from the IRMPs for the other North Coast forests and from interim management policies set forth in the North Coast Forest Conservation Program Policy Digest (see Appendix D), as defined by the Fund from 2010 through 2014. Per the CE Section 5.2.2, the goal of forest management is to:

i. "Grow large, high quality trees while ensuring an ecologically healthy and diverse forest ecosystem characterized by a complex forest structure and composition with a multi-story canopy, numerous large diameter trees, a diversity of age classes including late seral, a natural mix of native species vegetation in the understory and on the forest floor, and a variety of standing hard and soft snags and large and small downed logs, and healthy streamside vegetation;
ii. Enhance and protect (a) forest and riparian habitat for native plant and animal species found on the Property [Forest], including non-listed, sensitive, rare, and/or endangered species, (b) critical habitat and spawning areas for fisheries and other aquatic species; (c) connectivity and wildlife corridors on the Property [Forest] and between the Property [Forest] and other nearby protected areas; and (d) water quality on the Property [Forest] including within all rivers, creeks, and waterways; and
iii. Provide for economically and ecologically sustainable forest management, including long-term harvest of valuable forest products."

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 or in the event salvage logging is necessary due to catastrophic event such as fire, disease or insect infestation. Group selection or variable retention will likely be used on Douglas-fir sites in the future where in the opinion of the project forester single tree selection will result in excessive blowdown. Silviculture will reflect on the ground stand conditions, market conditions, and logging system feasibility.
- The Forest must generate sufficient revenue for PRI payments, and to the extent consistent with the overall project purposes, investment in restoration and enhancement measures (e.g. restoration projects, road upgrades).

- Harvest levels will be significantly less than growth rates over the next few decades so as to increase timber inventory and carbon storage.
- Special attention will be given to developing and retaining critical wildlife habitat features, such as snags, downed wood, and trees of significant size.
- While the Forest presently contains smaller trees and more hardwoods than would have occurred naturally, over time the selected silvicultural methods are intended to ensure the Forest more closely approximates natural conditions.
- There are no 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 where possible [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].
- SCI has obtained, and will continue to maintain, certification under the FSC and SFI standards.
- SCI will continue to report carbon sequestration through CAR or the CARB.

5.1.2 High Conservation Value Feature Protection

Most of the forest management policies are intended to guide the management of those areas of the Forest 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 wherever possible. Where these vegetation communities grade into adjoining conifer forest, the surrounding forest will 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 will 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). Inactive nest sites will be protected (because of the likelihood of repeat nesting).

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

5.1.3 Harvest Levels

Harvest levels will remain significantly less than growth until an average residual volume of 25 mbf/acre is attained. Harvest will be limited to no more than 33 percent of standing inventory in any decadal period and harvests will not accumulate into another decadal period. For the Forest, SCI anticipates incidental harvesting of approximately 1.5 mmbf/year; timber harvest plans will include measures to upgrade forest roads and reduce erosion, as well as generate a small amount of revenue.

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. Individual large trees characteristic of late seral forests will be retained across the forest. Trees exhibiting valuable wildlife characteristics will be identified by field foresters during timber marking as wildlife trees, or retention trees, and marked with a "W" to exclude them from timber harvest. "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. In time, certain stands primarily within the WLPZ of Class I streams may be excluded from harvest, to the extent feasible, so as to fully return to old growth conditions, once they are on an appropriate trajectory.

For additional information on silviculture decisions, THP development, harvest operations, and contractor selection please see the Fund's Forest Management Supplemental Information in Appendix D.

5.1.5 Harvest Retention Requirements and Guidelines

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

Within a harvest area, SCI will permanently retain or recruit downed wood, snags, and certain 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. [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. Because a harvest can include many retention trees, they are not mapped or recorded unless they are suspected NSO nest trees. The marking of retention trees will be visible throughout the effective period of the THP they are marked in, but may not be visible in future harvests, which may be decades later. To the extent that previously marked trees can be identified, in future harvests SCI will seek to retain the same trees that were retained in previous harvests in order to promote late seral characteristics. However, in cases where previously marked trees are surpassed in wildlife value or late seral characteristics by other trees, previously marked trees may be harvested and those other trees may instead be retained. And while maintaining trees with high wildlife value is important, it is also critical to recognize the wildlife value of the surrounding stand and the conserved landscape, and not expect the harvest stand to mimic or contain all features which may be better represented in other areas of the property.

Downed Wood

Target: five pieces per acre average (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, where possible, 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: at least four per acre on average across stand which may be composed of any combination of mandatory retention trees and recruitment trees.

Criteria for mandatory retention:

- Snags (all should be retained where possible and as excepted for fire and safety hazard reduction, but only those greater than 18-inch DBH and 20 foot height shall count towards retention targets);
- 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;
- Tanoak over 20 inches DBH and all true oaks (*Quercus* spp.), pacific madrone, chinquapin, California bay and red or white alder are to be retained wherever possible, except where removal is required for safety concerns or necessary for yarding corridors, road or skid trail construction; Murrelet habitat trees (low elevation old-growth and mature conifers, multi-layered canopies, mistletoe, other deformations or damage present for nest platforms);

- Den trees (partially live trees with elements of decay which provide wildlife habitat);
- 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) should be retained wherever possible.

Actions:

- Retain all mandatory trees and snags where possible and as excepted for fire hazard reduction and where necessary to fall for operation and operator safety. 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 applies 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. Such amendment will be subject to approval by SCAPOSD. Because of 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 anything 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; achieving some of these targets will likely take more than one entry. These distribution and size targets are not expected to be the ultimate value but merely what is appropriate to select and recruit in the next twenty years; the development of late-seral habitat elements is a long-term process and will be shaped over several harvest entries. In addition, it is unclear how the establishment of Sudden Oak Death (SOD), more widespread on the Forest than the GRF and GuRF, will ultimately affect the Forest.

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. Ideally, 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.

Because of the thousands of individual judgment calls made while marking a stand, even individual foresters with the same objective would inevitably make slightly different decisions. The general goal of timber marking by SCI is relatively simple: current (pre-harvest) conditions should be improved by the time of the next entry (typically ten to twenty years) while also increasing net growth. “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.

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

5.1.7 Hardwood Management

Hardwood species, including tanoak, pacific madrone, chinquapin, and alder, are an important ecological component of North Coast forests. However, past management practices have resulted in an unnaturally high abundance of tanoak in many areas historically dominated by conifers. Hardwoods account for 54 percent of the basal area on the Forest; in some stand types tanoak is as high as 82 percent. 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 more than 98 percent of the forested acres on the Forest.

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 Forest, since tanoaks have effectively no commercial value (it costs more to log and deliver than they are worth as firewood). The long-term goal is to maintain an appropriate level of tanoak and other hardwoods (probably around ten percent on average). To achieve these objectives, the following management measures will be implemented:

- All true oak (*Quercus* spp.) woodlands, individual true oaks, pacific madrone, chinquapin, California bay, and red or white alder are to be retained where 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. SCI currently does not have a written implementation plan to address Douglas-fir encroachment into oak woodlands. However, SCI will partner with other organizations, as opportunities arise, to develop and implement a viable strategy to address this issue using the best available science.

- 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 to the extent feasible. 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 (selective falling), clumps of hardwoods and individual hardwoods which do not compete with desirable conifers will be left alone.
- There are many stands where selective hardwood felling would not be sufficient to meet the desired level of conifer site occupancy. In these situations, a more aggressive treatment will be utilized through an herbicide treatment that kills a majority of the tanoak to release either existing conifers or seedlings planted shortly before or after the hardwood treatment. Even within these prescriptions, smaller areas of intact hardwoods would be intentionally retained (for biodiversity reasons). Preference for hardwood retention will be given to large trees (greater than 20 inches), true oaks, chinquapins and madrones, and groups of hardwoods. Rehabilitation treatments (including the use of herbicides) are intended to be one-time interventions and should not need to be repeated because of the decreased openings and ground disturbance associated with subsequent harvests.
- The only herbicide to be used in hardwood control treatments currently is imazapyr (trade name Arsenal). Only licensed and insured contractors with a good track record for safety and compliance may apply herbicides. Additionally, licensed SCI personnel may also 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. Monumented plots will allow for long-term evaluation of effectiveness but the initial impressions are the logging method resulted in increased cost and site disturbance (exposed soil and damage to the residual stand). That said, a commercial market for tanoak would be pursued if it develops. Areas with well-established and good quality hardwoods will likely be managed for mature hardwoods instead of attempting to re-establish conifer.

- There will be no 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).
- The location and extent of appropriate herbicide treatment of tanoak is not yet known; the acreage, timing, and spacing of herbicide treatment will be determined by field conditions and funding.
- 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 will likely also be used to control certain exotic invasive plants, primarily scotch broom, barbed goat grass, and yellow star thistle. No other uses of herbicides or pesticides are anticipated.

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 G) 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.

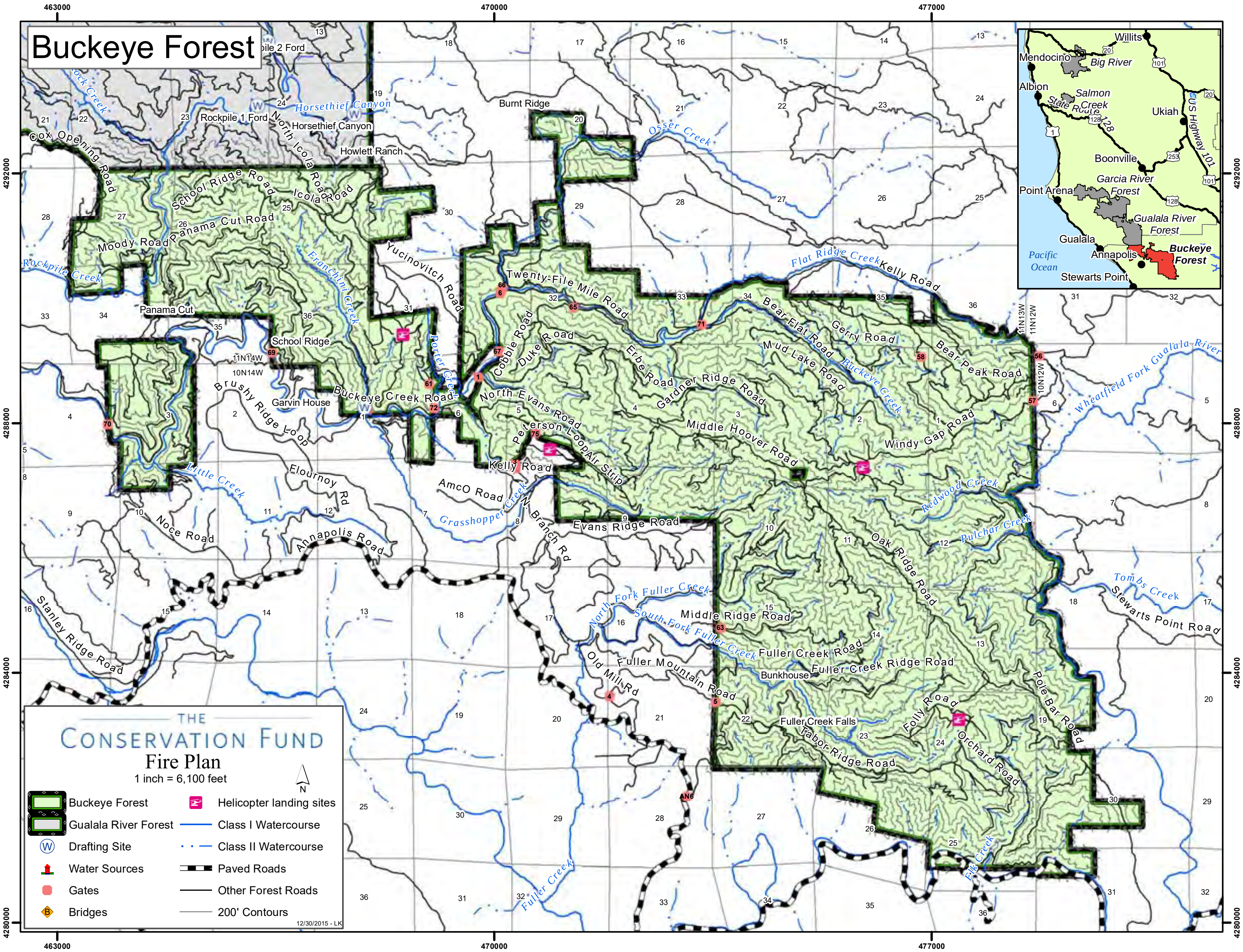
5.1.9 Monitoring and Forest Certification

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.

5.1.9.1 Short-term Harvest Monitoring

Because of 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 following a timber harvest to ensure it is completed in accordance with the Fund’s management policies, including 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, including summaries of harvest volumes and mill receipts, are available from the Fund staff by request.


Buckeye Forest
THE CONSERVATION FUND
Fire Plan
1 inch = 6,100 feet
N
Buckeye Forest
Gualala River Forest
Drafting Site
Water Sources
Gates
Bridges
Helicopter landing sites
Class I Watercourse
Class II Watercourse
Paved Roads
Other Forest Roads
200' Contours
12/30/2015 - LK
463000
470000
477000
4292000
4288000
4284000
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Willits
Mendocino
Big River
Albion
Salmon Creek
State Route 128
Ukiah
US Highway 101
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Gualala
Pacific Ocean
Annapolis
Buckeye Forest
Stewarts Point
Cox Opening Road
School Ridge Road
Icola Road
North Icola Road
Panama Cut Road
Moody Road
Rockpile Creek
Panama Cut
School Ridge
Brushy Ridge Loop
Garvin House
Buckeye Creek Road
Yucinovitch Road
Franchini Creek
Porter Creek
Horsethief Canyon
Rockpile 1 Ford
Howlett Ranch
Burnt Ridge
Osser Creek
Flat Ridge Creek
Kelly Road
Twenty-File Mile Road
Cobble Road
Duke Road
Erbe Road
Gardner Ridge Road
Bear Flat Road
Mud Lake Road
Gerry Road
Buckeye Creek
Bear Peak Road
Wheatfield Fork Gualala River
North Evans Road
Peterson Loop
Air Strip
Middle Hoover Road
Windy Gap Road
Redwood Creek
Pulchar Creek
Little Creek
Elournoy Rd
AmcO Road
Grasshopper Creek
N. Branch Rd
Evans Ridge Road
Noce Road
Annapolis Road
Oak Ridge Road
Tombs Creek
Stewarts Point Road
Stanley Ridge Road
North Fork Fuller Creek
South Fork Fuller Creek
Middle Ridge Road
Fuller Creek Road
Fuller Creek Ridge Road
Bunkhouse
Fuller Mountain Road
Old Mill Rd
Fuller Creek Falls
Folly Road
Orchard Road
Pole Bar Road
Tabor Ridge Road
Fuller Creek
Elk Creek
11N14W
10N14W
11N13W
11N12W
10N12W

5.1.9.2 Long-term Forest 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. Because of 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	7.6	25+	Net Scribner log scale, average across all forested acres
Conifer growth	Board feet/ acre/year	325	1,000+	Average across all acres pre-harvest
Snags	Average Number/acre	0.7	>2	All species, >18” DBH
Downed logs	Average Number/acre	6.3	>5	All species, Minimum size 18” DBH,10’ long
Hardwood competition	Percent basal area	54	<15	Average across all acres, all diameters
Harvest volume	Percent of inventory	1.1	<2.0	Across all acres, averaged for 10-year rolling window

According to the most recent cruise data, collected in 2013, it is estimated that there are approximately 409 conifers greater than or equal to 48” dbh on the Forest. The individuals sampled during the cruise range from 48” to 80” dbh. The number will increase with time as new retention trees and trees within the no harvest buffer of Class I and Class II watercourses grow into this diameter class. Future inventories will identify the number of conifer trees greater than 48”dbh so that progress toward late seral conditions can be measured within the relative accuracy of the respective inventories. .

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 the accreditation firms Scientific Certification Systems and NSF International Strategic Registrations. These broad-ranging standards are intended to ensure all forest management activities are planned and conducted to meet the established sustainability criteria which include hundreds of individual indicators, covering everything from water quality protection and biodiversity conservation to worker training and community involvement. Re-certifications are scheduled to occur every five years with surveillance audits annually. The standards are publicly available at: www.fscus.org and www.sfiprogram.org; the reports of the Fund's auditors are available at www.scscertified.com or from the Fund's North Coast office.

The Forest is also undergoing verification as a forest offset project under the California Air Resources Board US Forest Project Protocol. This protocol requires SCI to quantify and publicly report on our greenhouse gas emission reductions generated as a result of the improved forest management on this property. As part of the annual audits for this program, independent auditors review the forest inventory system, the growth and yield modeling, and greenhouse gas reporting system. Forest Project Protocol information is online at: http://www.arb.ca.gov/cc/capandtrade/offsets/offsets.htm. Specific project details are available: https://thereserve2.apx.com/mymodule/reg/prjView.asp?id1=1013.

This rigorous system of third-party audits is intended to help land managers evaluate and improve their practices and communicate their success. SCI 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 Forest is 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 generally 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. Pacific Watershed Associates (PWA) conducted three road assessments on the Forest from 2005 to 2006 when the property was known as Preservation Ranch. Each assessment included detailed road logs and maps describing recommended site and road drainage improvements. These assessments and recommendations have informed SCI's road management implementation plan. Additional road assessments within the Forest are underway, and a road management data gap analysis is currently being compiled by SCI to prioritize future road improvements within the Forest. The road assessments utilize the CDFW-approved "Upslope Assessment and Restoration Practices" methodologies described in the California Salmonid Stream Habitat Restoration Manual (Flosi, et al, 2010). 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 SCI's ongoing maintenance, as workload and budget allows, and as part of larger initiatives identified in the erosion control and erosion prevention plan described above. SCI 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 20 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 where feasible and outsloped to relieve surface runoff. Where possible, watercourse crossings will be designed such that road grades dip into the crossing and then climb out of the crossing eliminating the need for abrupt critical dips.

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

<u>Seasonal Roads:</u> Roads used primarily during the dry season but to a limited extent during wet weather shall be designed, constructed, reconstructed, and upgraded to provide permanent watercourse crossings - either culverts or rock armored fill crossings and road surface drainage structures. Roads will 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 will receive annual maintenance to the extent possible.

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 after installation. Inspections of these roads will occur for three years after use. Ordinary maintenance will be performed when the road is opened for use.

Because the location of planned roads is not known at the time of this IRMP, SCAPOSD approval will be obtained prior to the construction of any new roads, per CE Section 5.4.5. "The Handbook of Forest, Ranch, and Rural Roads" prepared by Weaver et al. (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 will consist of mapping and tracking watercourse crossings using GIS in which each crossing will be mapped with Global Positioning System (GPS) tools and the condition of the crossing shall be noted. Any changes made and the year they were made shall also be noted in the GIS database. Over time a complete inventory of all road watercourse crossings will exist in the GIS database. The data can then be used to detail annual or cumulative sediment reduction activities on the forest.

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 Forest.

As stated above, improvement of spawning and migration habitat for salmonid species is a key management goal for SCI 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, followed by comprehensive property-wide road assessments to identify and prioritize sites with sediment delivery potential (the treatment of which will occur over the next 10 to 20 years at an estimated expense of over $5 million). 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 Forest 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

Class I Watercourses:

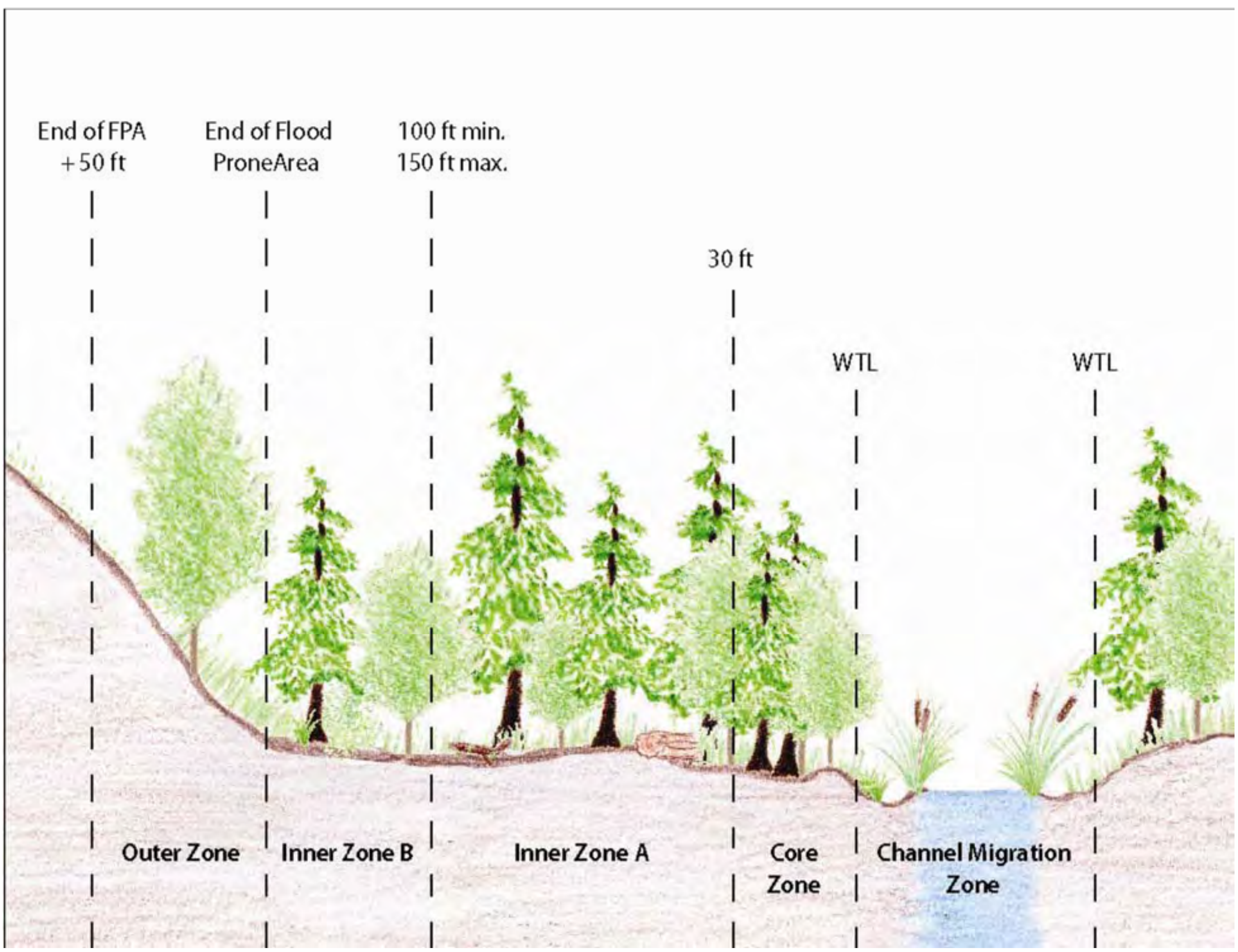
Timber operations within the Class I WLPZ have been designed and will be conducted to protect, maintain, and contribute to restoration of properly functioning salmonid habitat and listed salmonid species. To achieve this goal, timber operations will attempt to:

- Prevent significant sediment load increase to a watercourse system or lake
- Prevent significant instability of a watercourse channel or of a watercourse or lake bank.
- Prevent significant blockage of any aquatic migratory routes for any life stage of anadromous salmonids or listed species.
- Prevent significant adverse effects to stream flow.

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

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

Figure 5-3: Profile View of Class I WLPZ in Flood Prone Areas and Channel Migration Zones (not to scale)



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

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

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

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

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

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

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

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

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

Outer Zone:

1. Post-harvest stand shall have a minimum 50% overstory canopy cover. The post-harvest canopy may be composed of both conifers and hardwood species and shall have at least 25% overstory conifer canopy.

2. Priority shall be given to retain wind firm trees.

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

1. Preflagging or marking of any skid trails before the preharvest inspection;

2. Heavy equipment should be limited to slopes less than 35% with low or moderate erosion hazard rating (EHR);

3. Use feller bunchers or hydraulic heel boom loaders which do not drag/skid logs through the zone;

4. Minimize turning of heavy equipment which would result in increased depth of ground surface depressions; and

5. Use mechanized harvesting equipment which delimb harvested trees on pathway over which heavy equipment would travel.

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

Slope Class	Class II-S WLPZ Zone Width (feet) Core/Inner Zones	Class III ELZ Width (feet)	Wet Area ELZ Width (feet)
0 - 30%	25 / 35	30	30
30 - 50%	25 / 60	50	50
>50%	25 / 85	50	50

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

Class II Large:

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

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

Class II Standard:

Core Zone: 25 feet in which no harvest may occur.

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

Class III streams: Using the variable width Equipment Limitation Zone (ELZ) defined by the FPR, where there are no overstory retention requirements under the FPR, SCI will retain at least 50 percent canopy and a minimum of 25 percent overstory conifer. The retention within Class III ELZ's will reflect the surrounding silviculture and will have a minimum basal area of 75 sq. ft. per acre when selection is used and 50sq. ft. per acre when variable retention is used.

[Note: conformance with all canopy requirements will be measured as an average across not less than a 200-foot lineal WLPZ segment—the same as the FPR.]

5.3.2 Aquatic Habitat Restoration

Aquatic habitat degradation has resulted from increased bedload and excess stream siltation caused by erosion, and increased water temperature caused by pool filling and a reduction in riparian vegetation. Aquatic habitat restoration includes reducing sediment inputs and increasing shade canopy as described in the previous sections. Baseline data that will be used to measure anticipated improvements in aquatic habitat include stream habitat surveys and spawning surveys conducted by CDFW 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 will be the introduction of LWD in small order Class I channels where the likelihood of success is high. Carah et al. (2014) demonstrated cost-effective aquatic habitat improvement and wood retention through unanchored LWD placement in six Mendocino County coastal watersheds. Results of the study show the potential to increase the pace and scale of stream restoration through use of unanchored LWD (Carah et al., 2014). All necessary permits will be obtained for any instream placement of LWD, and SCAPOSD approval will be obtained prior to any restoration and enhancement activities that involve excavating or removing soil, sand, gravel, rock, peat, or sod, per CE Section 5.5.2. 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. The removal of gravel will be performed in accordance with the CE and the baseline report conditions. SCAPOSD approval will be obtained prior to any instream gravel extraction, per CE Section 5.5.2.

5.3.3 Aquatic Habitat Restoration Monitoring

Habitat improvements in the stream environment will likely be monitored using stream habitat data derived from the habitat sampling methodology found in the California Salmonid Steam Habitat Restoration Manual (Flosi et al., 2010) currently in use by CDFW. Some baseline data exists for many coastal streams from CDFW stream surveys conducted in the past ten years.

Another available stream habitat sampling method adopted by the U.S. EPA is the Environmental Monitoring and Assessment Program (EMAP) methodology. Both methods are acceptable; however, since baseline data exists in the California Salmonid Steam Habitat Restoration Manual protocol, SCI has elected to continue with that sampling methodology for now. As a complement to either system, it will be important to maintain the network to monitor instream temperature with remote water and air temperature sensing probes (HOBO temps), as GRWC has established. Additionally, since a principal objective of this Plan is to increase salmonid populations and productivity, SCI will seek to expand on the CDFW spawner survey reaches as the program develops.

SCI expects positive changes from the road and stream practices mentioned in the previous sections. However, instream habitat is slow to respond to even the best intended management practices. Therefore, measuring stream habitat SCI will partner with the Gualala River Watershed Council (GRWC) to monitor our streams in the Gualala watershed; TCF/SCI is already a member of the GRWC Cooperative Monitoring Program. The GRWC currently has 35 stream monitoring sites in the Gualala Basin with plans to install another 35 sites in the watershed within the next decade. Each monitoring site is a minimum of 1,000 feet long in which the stream thalweg elevations, cross section elevations, riparian vegetation, canopy density, substrate size and composition, water and air temperature and instream large wood abundance are measured. The frequency of monitoring after the sites are established will be variable and subject to environmental changes such as flood or fire and planned habitat changes such as LWD enhancement projects in which pre- and post-treatment habitat may be monitored. In any case, a portion of the monitoring sites are re-measured annually as the budget allows. See the GRWC website at http://www.grwc.info/ for additional information. The North Fork and Rockpile Creek Stream Assessments conducted by CDFW in 2003 are available at the CDFW Coastal Watershed Program website:
http://coastalwatersheds.ca.gov/Watersheds/NorthCoast/Gualala/GualalaBasin/GualalaAssessmentProducts/tabid/103/Default.aspx.

Figures 5-4 and 5-5 (courtesy of GRWC) illustrate road locations, culvert sizing, and California watershed planning boundaries for Rockpile and Buckeye creeks and the Wheatfield Fork, respectively.

INSERT FIGURE 5-4

INSERT FIGURE 5-5

5.4 Invasive Weed Management

Species that have caused high degrees of infestation on other land tracts managed by the Fund in Northern California, such as jubata grass (*Cortadaria jubata*) and French broom (*Genista monspessulana*) have had a far lesser degree of impact on the Forest. Observations of jubata grass were occasional and small with little evident recruitment of young plants. French broom infestations were observed to be slightly more common and populations of small to moderate size.

Invasive species of greater concern are: Scotch broom (*Cytisus scoparius*), barbed goat grass (*Aegilops triuncialis*), yellow star thistle (*Centaurea solstitialis*), and a number of grasses that have invaded grasslands and forest glades. Barbed goat grass is a California Invasive Plant Council (Cal-IPC) rated “high” invasive. It was identified as occurring on the Forest as identified in the plant list provided by Kjeldsen et al. (2006); however, no location information was provided in the report. The presence of this plant on the property is of high ecological concern. It has the potential to displace native and less-noxious non-native species and become dominant in a few short years. This species is expanding throughout northern California and quickly creates a devastating monoculture that diminishes species diversity, forage quality and wildlife habitat. It has the ability to proliferate in varying types of conditions including serpentine soils. It grows in dense stands with a deep and rapidly establishing root system that makes it extremely competitive (ANR, 2008). Should this species be observed on the Forest, every effort should be made to isolate and eradicate it. Yellow star thistle occupies roadsides and openings where it encroaches on grasslands and glades. Roads serve as a vector for this plant introducing it into new areas where it gradually moves into grasslands and alters ecological function. It correlates with areas of vehicle traffic and high feral pig disturbance.

Invasive plants, with the help of pig disturbance, and likely historical grazing have altered the grasslands of the Forest. In many cases, species diversity has been replaced by a stronghold of invasive and non-native grasses. These include dominant slender oat grass (*Avena barbata*) and rip-gut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), and red brome (*Bromus rubens*). Pig disturbance has created opportunities for annual grasses with high seed production to replace native annuals while perpetuating native geophytes, small bulbs that benefit from disturbance. These include both the native yellow and white mariposa lily (*Calochortus luteus* and *C. vestae*) as well as harvest brodiaea (*Brodiaea elegans*).

Appendix A includes a detailed discussion of invasive weed management from botanists Geri Hulse-Stephens and Kerry Heise for the Forest. Invasive species management will initially focus on the control of the species described above.

SCI 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. Addionally, licensed SCI staff may apply herbicides. All herbicide application must be in conformance with label guidelines and applicable laws.

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

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

5.4.1 Invasive Weed Monitoring

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

5.5 Role of Forests and the Atmosphere

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

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

As a conserved working forest, the Forest 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

Because SCI recognizes that action to address climate change is needed, the Forest is in the process of being verified as a forest carbon offset project under the Air Resources Board US Forest Project Protocol. 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). SCI's annual reports for ARB, as well as descriptions of the project qualifications and implementation methodology, are publicly available online via the offset registry at 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.
4. Fires, both natural and human-caused, will likely increase in frequency and severity. SCI will need to maintain the capacity and expertise gained during previous fire seasons.

6. Community Use and Involvement

Public access to the Forest or portions thereof is an important objective of the Conservancy and SCAPOSD. To this end, the CE requires the development of a Recreational Use Plan, within 2 years of Easement recordation, to provide for safe, feasible public access for low-intensity outdoor recreation on the Property, including making the Forest available for guided public tours open to groups of at least 25 people no less than six times per year. The conservation easement acknowledges that legal access to the Forest is limited and may be insufficient to provide public access. Issues have arisen which have complicated SCI's ability to safely provide these tours. Therefore, SCI, the District, and the Conservancy have entered into a Memorandum of Understanding ("MOU", Attachment H) which temporarily suspends SCI's requirement to provide tours and develop a Recreational Use Plan while SCI works cooperatively to identify, evaluate and, if feasible, implement alternative safe and legal public access to the Forest.

6.1 History of Community Use and Involvement

Beginning in the 1850s and continuing until purchase by SCI, the Forest 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 following are SCI'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, SCI will first seek to resolve the dispute through open communication, prior to more formal dispute resolution through mediation or litigation.
- When and where legal and feasible, provide THP tours either before or shortly after submission of harvest plans to CAL FIRE, and again following completion of the operation. SCI 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.

- Build partnerships with local organizations that are mutually beneficial.
- SCI will work with the District, the County, and Kelly Road LLC to identify and implement feasible and mutually acceptable means of resolving questions about public access. In the meantime, SCI has been advised that it does not have a clear legal right to use the Kelly Road for public tours.
- 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

Public access to the Forest or portions thereof is an important objective of the Conservancy and SCAPOSD. To this end, the CE requires the development of a Recreational Use Plan, within 2 years of Easement recordation, to provide for safe, feasible public access for low-intensity outdoor recreation on the Property, including making the Forest available for guided public tours open to groups of at least 25 people no less than six times per year. The conservation easement acknowledges that legal access to the Forest is limited and may be insufficient to provide public access. Issues have arisen which have complicated SCI's ability to safely provide these tours. Therefore, SCI, the District, and the Conservancy have entered into a Memorandum of Understanding ("MOU", Attachment H) which temporarily suspends SCI's requirement to provide tours and develop a Recreational Use Plan while SCI works cooperatively to identify, evaluate and, if feasible, implement alternative safe and legal public access to the Forest.

6.3.2 Unauthorized Activities

SCI 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

SCI will conduct limited guided tours of timber harvest areas, road improvements, restoration projects, and native plant interpretive walks to the extent feasible. 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. SCI has also benefited in the past from generous time donations by local naturalists that have resulted in tours focused on such topics as native plants, giving participants a solid connection with the natural world.

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

6.5 Monitoring Strategies for Community Involvement

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

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 H for detailed definitions

PLUGS: seedling stock grown in nursery styrofoam containers.

POLES: trees 4"-11" DBH

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

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

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

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

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

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

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

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

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

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

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

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

SAPLINGS: trees 1"-4" DBH

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

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

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

SEEDLINGS: trees less than 1" DBH

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

SILVICULTURE: the care and cultivation of forest trees; forestry

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

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

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

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

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

SNAG: dead standing tree

SPAWNING: to produce or deposit eggs

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

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

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

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

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

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

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

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

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

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

THRIFTY: describes a healthy and fast-growing tree

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

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

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

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

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

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

WHITE WOODS: grand fir and hemlock.

WORKING FOREST: forest managed for or including timber production

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

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APPENDIX A

Botanical Resources of the Buckeye Forest: An Assessment

Sonoma County, California

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Table of Contents

INTRODUCTION

The information in this report documents the Buckeye Forest's floristic diversity as currently known, specifically its vascular plants, bryophytes, lichens, algae, as well as fungi. These biotic elements form the basis of the areas diversity and in a broader sense the communities, vegetation, and habitat that support them. Geologic, topographic, and hydrologic influences greatly shape the pattern of vegetation and composition of plant communities across the 19,000 acres of the Buckeye Forest, however historic disturbance from timber harvest and to a lesser extent small scale agriculture have left the most visible and ecological impact.

Once identified and described the Buckeye Forest's botanical resources can be evaluated so that those with conservation value can be considered in future management plans. For example, at least 8 vascular plant species and 1 lichen considered rare have been found on the Buckeye Forest (see rare species section below). Additionally, some of the habitat that supports these species, as well as other assemblages of native species are considered locally rare such as serpentine barren and mesic grass/forb meadow. Equally important are those elements that pose threats to native plant diversity such as invasive species or forest pathogens capable of displacing native species and whole communities, often very rapidly. These concerns are addressed here along with recommendations to insure the botanical resources of the Buckeye Forest are managed sustainably.

Our current knowledge of the Buckeye's Forest floristic diversity is largely due to the intensive botanical surveys conducted a decade ago. These were focused primarily on ridgetops where forest to vineyard conversion was proposed. These investigations only covered 12% of the property; nevertheless a good cross-section of the habitat diversity found across the Buckeye Forest was sampled during these efforts (Kjeldsen et al 2006; KBC and RCA 2009). We have adopted some of the place names used in the 2006 Kjeldsen report to indicate more specific locations (Fig. 1). Additionally, site visits conducted by the authors in 2014 contributed a significant number of new species to the list including 2 rare taxa, along with a better understanding of vegetation type composition, and documentation of potentially damaging invasive species.

As a result of these investigations two areas of high conservation value stand out: The serpentine barrens and associated grasslands and seeps of Big Rock along the Windy Gap road east of the cell tower, and the mesic grasslands of the Stanley Meadow complex perched above Buckeye Creek in the southwestern-most portion of the property (Fig. 1). These two sites are exceptionally rich in native plant diversity and support 7 out of the 9 rare plants documented on the Buckeye Forest.

Pre-Survey Scoping

<u>CEQA Requirements Regarding Rare Plants</u>

The California Department of Fish and Wildlife (CDFW) has jurisdiction over the conservation, protection and management of native plants and habitat necessary to maintain biologically sustainable populations. CDFW as the trustee agency under The California Environmental Quality Act (CEQA) makes protocols regarding potential negative impacts to those resources held in trust for the people of California. Botanical surveys provide information used to determine the potential environmental effects of proposed projects on all special status plants and natural communities as required by law [ie. CEQA, the California Endangered Species Act (CESA), and the federal Endangered Species Act (ESA)].

Special status plants include all plant species that are protected under ESA, CESA and the California Native Plant Protection Act and plants that meet the definition of rare and endangered under CEQA. CEQA provides protection not only for State-listed plant species, but also for any species, which can be shown to meet the criteria for State listing. CDFW recognizes that California Rare Plant Ranks (CRPR) 1A (presumed extinct in California), 1B (Rare or endangered in California and elsewhere), and 2A (Presumed extirpated or extinct in California, but not elsewhere), and 2B (Rare, threatened, or endangered in California but not elsewhere) of the California Native Plant Society (CNPS) *Inventory of Rare and Endangered Plants* consist of plants that, in a majority of cases, would qualify for listing, and it is mandatory that they be addressed in environmental documents related to development, resource extraction, and restoration projects.

In addition, although few of the plants of CRPR 3 (plants about which more information is needed, a review list) and CRPR 4 (plants of limited distribution, a watch list) are eligible for state listing, many of them are significant locally and therefore the CDFW recommends but does not require those species be evaluated for consideration in preparation of CEQA documents. However, these species are more likely to become rarer over time from habitat loss and the associated impacts of climate, so it is important to consider these plants during preliminary investigations and field surveys.

CDFW and the CNPS considers any plant or community with local as well as ecological and biological significance to be worthy of protection and warrant consideration as a special status plant species or community. A locally significant species is one that is not rare from a statewide perspective but is rare or uncommon in a local context such as within a county or region or is so designated by local or regional plans or policies (Lepig and White 2006).

METHODOLOGY

Pre-Survey Investigations

Laying the groundwork of a successful and effective plant survey involves conducting preliminary investigations of the habitats and blooming times of special status plant species known to occur or with the potential to occur within a large buffer area surrounding the Buckeye Forest survey area. The California Department of Fish and Wildlife (CDFW) and the California Native Plant Society (CNPS) recommend that the buffer be a minimum of 9 USGS quadrangles with the survey area located in the central quad. For the survey of the Buckeye Forest a much broader area was adopted acknowledging that rare species, by their nature, often show patchy and sometimes disjunct patterns of rarity across relatively large ranges. This is partly due to large scale habitat fragmentation, along with narrow habitat specificity, and limited survey access. A list of potential rare plants helps investigators focus or concentrate their efforts on locations and site characteristics of a core of locally occurring rare species, however it is recognized that rare or even restricted species are commonly found outside their known ranges and habitat preferences and therefore surveys should not focus primarily on these species or the habitats they are found in, but instead be floristic in nature, accounting for all species across all habitats present.

These investigations consisted of two stages: First, an initial query was conducted from the most recent CNPS Inventory of Rare and Endangered Plants (CNPS 2014), The most current Special Vascular Plants, Bryophytes, and Lichens List (CDFW&CNDDB 2014) and the California Natural Diversity Database (CNDDB) for a large buffer surrounding the study site as described above. A list was developed of all rare plants with California Rare Plant Ranks (previously known as CNPS Lists) of 1A, 1B, 2A, 2B, 3, and 4 with current threat rankings for each taxon across all natural communities within Sonoma and Mendocino Counties (Appendix A). For a description of the California Rare Plant Ranking system and the NatureServe Global and State Ranking system adopted by the California Natural Diversity Database (CNDDB) see Appendix D.

Additionally the following sources were investigated to better familiarize us with these potentially occurring rare species. Potential habitat and vegetation types within the survey area were identified in: A Manual of California Vegetation (Sawyer et al, 2009). Sensitive species habitat information was investigated in the Inventory of Rare and Endangered Plants of California, the CNPS on-line 8th edition of the Inventory, and the Consortium of California Herbaria, and CNDDB. Plant morphology and current taxonomic status was investigated from the 2nd edition Jepson Manual (Baldwin et al. 2012).

Rare bryophytes and lichens have only recently been included in CNPS or CNDDB lists of rare species with potential to occur. This understudied group of non-vascular plants is well-documented from previous surveys (Kjeldsen et al 2006; KBC and RCA 2009) within the Buckeye Forest and addressed by the authors as well during field surveys conducted in 2014. Generally, we directed our surveys to areas that had not been the focus of earlier efforts. As a consequence openings along ridgetops, primarily the vineyard study blocks of 2005, 2006, and 2009 surveys received light coverage. Exceptions to this were areas that had documented high rare plant diversity and therefore required additional site information, such as the grasslands along the Lower Easy Road and the mesic glade in “Stanley Meadow” in the far southwestern portion of the Buckeye Forest.

<u>Survey Methodology</u>

Field surveys in 2014 were conducted March 12, 13; April 10, 11; and May 23, 24. The field surveys were floristic in nature and included all vascular plants, bryophytes, and lichens encountered. Generally, plant phenology dates for potentially occurring rare species are used to determine the timing and frequency of surveys. Taking into account the low water year our site visits were conducted from early spring to early summer, a period broad enough to include known blooming and fruiting times of potentially occurring rare species, but also encompassing the blooming period of early annuals, wetland plants, and late blooming herbaceous perennial species. The level of effort required per given area and habitat was dependent upon the vegetation and its overall diversity and structural complexity. For example, densely forested areas with little understory require far less effort to survey than open herb or grass dominated areas.

Coordinates of rare species and communities were obtained with GPS, photo-documented, and described in detail regarding topography, landform, soil, vegetation alliance, associated species, and potential threats. Additionally, all information was obtained at the site sufficient to fill out a

CNDDB Rare Plant Survey Form. Other notable or unusual habitat features, such as rocky outcrops, serpentine-influenced sites, springs, and waterfalls that were encountered were documented in the same manner.

RESULTS

Physical Description

The Buckeye Forest is located in the northwestern corner of Sonoma County within portions of the Annapolis, McGuire Ridge, Stewarts Point, Tombs Creek, and Gube Mountain USGS quads. Factors responsible for the natural structure and composition of the vegetation include climate, topography, soils, and natural disturbance such as fire. Recent human disturbance from logging, livestock grazing, road building, and small scale agriculture have shaped the current structure and composition of the property. Located near the eastern edge of the coastal fog belt, the climate across the Buckeye Forest is intermediate between the cool, moist maritime conditions of the coast and the extremes of the more continental climate of the inland valleys. These factors have produced a rich flora and a diverse mix of vegetation types and plant communities including mixed conifer forest, mixed conifer-hardwood forest, oak woodland, mixed hardwood forest, chaparral, serpentine barrens, serpentine grasslands, riparian and other wetland habitat.

Elevations at the Buckeye Forest range from 120 ft where Rockpile and Buckeye Creeks exit the property to the west, up to 2,300 ft along Middle Hoover Road at the cell tower in the central portion of the property. The topography is complex with steep, mountainous uplands and intervening valleys, ridges, and drainages. The Wheatfield Fork of the Gualala River and its Pulchar, Redwood, and Fuller Creek tributaries drain much of the southern half of the property. Buckeye Creek along with its many tributaries including Flat Ridge, Porter, and Franchini Creeks drain much of the northern portion of the Buckeye Forest, while a small portion of the Rockpile Creek watershed courses through the far northwestern section of the property.

The geology of the Buckeye Forest is largely Late Cretaceous Franciscan Assemblage composed of graywacke-type sandstone and shale with minor greenstone, conglomerate, chert, and limestone. Soils supporting conifer and hardwood stands are predominately well-drained loams of the Hugo, Maymen, and Josephine Series, which are underlain by fine-grained sandstone and shale. Only a few hundred acres of deep fine sandy loam of the Goldridge series occurs on the Buckeye which coincidentally supports the Stanley Meadow complex in the southwestern portion of the property. This seasonally wet meadow supports several of the Buckeye's Forest's rare species and native grasses. Another notable area influenced by its geology is the 62 acres of Montara Cobbly Clay Loam at Big Rock on Windy Gap Road. Here, barren serpentine outcrops, openings of coarse serpentine gravels, and serpentine grasslands support unusual plant communities. These rich habitats are described in the vegetation section below.

Vegetation

<u>Coniferous Forest</u>

The coniferous forest across the Buckeye Forest is comprised largely of Douglas fir (*Pseudotsuga menziesii*) and tanoak (*Notholithocarpus densiflorus*). Redwood (*Sequoia sempervirens*) is widespread but found in abundance only on some north-facing slopes and deep canyons where fog drip and generally moister conditions are more prevalent, especially on the

western end of the property. Size classes are in the smaller range of 12-24 inches dbh, typical of North Coast coniferous forests, and there are no existing stands of old-growth.
North-facing slopes vary in composition but along with the dominants Douglas fir and tanoak, Garry (*Quercus garryana*), black oak (*Q. kelloggii*), canyon live oak (*Q. chrysolepis*), California nutmeg (*Torreya californica*), bay (*Umbellularia californica*), and madrone (*Arbutus menziesii*) start to become more important. The understory of north-facing stands is typically richer; plants include toyon, (*Heteromeles arbutifolia*), poison oak (*Toxicodendron diversilobum*), California huckleberry (*Vaccinium ovatum*), bracken fern (*Pteridium aquilinum var. pubescens*), trailing snowberry (*Symphoricarpos mollis*), redwood sorrel (*Oxalis oregano*), California bedstraw (*Galium californicum*), modesty (*Whipplea modesta*), western heart's ease (*Viola ocellata*), pine grass (*Calamagrostis rubescens*), sword fern (*Polystichum munitum*), Purdy's iris (*Iris purdyi*), and Douglas iris (*Iris douglasiana*).

Woodland

Mixed hardwood forest and woodland is patchy across the property but becomes more prevalent on the eastern half where conditions are drier. Oregon white oak (*Quercus garryana*) is a ubiquitous component on north slopes usually in combination with various other hardwood species such as black oak (*Q. kelloggii*), coast live oak (*Q. agrifolia*) , madrone (*Arbutus menziesii)*, and tan oak (*Notholithocarpus densiflorus*), these forming dense closed canopies, with pockets of redwood and Douglas fir scattered throughout. In dryer sites, areas with gentle topography, and along the margins of serpentine, scattered clumps of valley oak (*Quercus lobata*), coast live oak (*Q. agrifolia*), bay (*Umbellularia californica*) and common manzanita (*Arctostaphylos manzanita*) form open woodland and savanna.

Native bunchgrasses and forbs are most abundant under these canopies and include California fescue (*Festuca californica*), Geyer's melic (*Melica geyeri*), blue wildrye (*Elymus glaucus*), yellow sanicle (*Sanicula crassicaulis*), western buttercup (*Ranunculus occidentalis*), shooting star (*Primula hendersonii*), and woodland star (*Lithophragma affine*). Canyon live oak (*Quercus chrysolepis*) is common on rocky soils and outcrops on steep north-facing slopes. On east and west facing slopes tree diversity increases to include Oregon oak (*Quercus garrayana*), valley oak (*Quercus lobata*), Shreve oak (*Quercus parvula* var. *shrevei*), coast live oak (*Quercus agrifolia*), California Bay (*Umbellularia californica*), and buckeye (*Aesculus californicus*). Blue oak (*Quercus douglasii*) is sparse on the property and mainly found on south and east facing slopes in the eastern portion of the property. Hardwood canopies thin out on south-facing slopes and valleys forming woodlands of coast live oak, Shreve oak, valley oak, and Oregon oak within a matrix of annual-dominated grassland.

Shrubland

Shrublands and chaparral are confined to mostly steep, south-facing slopes and along some ridgetops where removal of native vegetation has permanently changed the plant community. We observed very little scrub-dominated vegetation with the exception of coast whitethorn (*Ceanothus incanus*), however, Sonoma Vegmap crews have mapped three preliminary shrubland alliances on the Buckeye Forest; one location of *Ceanothus oliganthus*, hairy leaf ceanothus chaparral, one provisional alliance of *Ceanothus foliosus*, wavy-leaf ceanothus chaparral in the Rockpile Creek watershed, and four provisional alliances of *Ceanothus incanus*, coast whitethorn chaparral along the ridge extending southeast of the cell tower.

Kjeldsen et al. (2006) noted that chaparral was limited within their study areas on the Buckeye Forest and largely dominated by manzanita *(Arctostaphylos*). We observed one site of 1-2 acres in size at the confluence of Pulchar and Wheatfield Fork Gualala (N38.72499, W123.24794) that supports an open *Arctostaphylos manzanita* subsp. *glaucescens* community where the relative cover of manzanita is greater than 50%. Additionally, in some disturbed sites such as old logging landings we observed small patches of mixed scrub vegetation supporting *Arctostaphylos columbiana,* Eastwood manzanita (*A. glandulosa),* common manzanita (*A. manzanita),* wavy-leafed ceanothus (*Ceanothus foliosus),* and blue blossom *(C. thyrsiflorus*). We were not able to gather sufficient field data on these tentative alliances therefore they are not treated further in this report.

<u>Riparian</u>
Riparian vegetation is well-developed along the entire lengths of the main streams draining the Buckeye Forest, notably Buckeye, Wheatfield Fork Gualala, Fuller, and Rockpile Creeks. Overall, we observed high bank stability from well anchored vegetation and rocks, and little evidence of stream bed dissection. Narrow gorges with steep cross-sections occur along the lower Buckeye with large areas of exposed bedrock and mature white alder (*Alnus rhombifolia)* and the only location of red alder (*A. rubra*) that we observed clinging to steep banks. Broader reaches such as the Wheatfield Fork Gualala near the confluence of Pulchar Creek have cobbly channels with white alder-lined banks, sparse clumps of Sitka willow (*S. sitchensis*) and torrent sedge (*Carex nudata*). Typically California bay (*Umbellularia californica*) and canyon live oak (*Quercus chrysolepis*) grow along toe slopes providing deep shade.

Smaller tributary creeks such as upper Buckeye Creek above the Flat Ridge Fork confluence are densely shaded with willow and white alder along with large deep-rooted deciduous trees such as big leaf maple (*Acer macrophyllum*), Oregon ash (*Fraxinus latifolia*), and buckeye (*Aesculus californica*). Ocean spray (*Holodiscus discolor*), arroyo willow (*Salix lasiolepis*), chain fern (*Woodwardia frimbriata*), elk clover (*Aralia californica*), Durango root (*Datisca glomerata*), scarlet monkey flower (*Mimulus cardinalis*), Coltsfoot (*Petasites frigidus* var. *palmatus*), common scouring rush (*Equisetum hymale* ssp. *affine*), and leather root (*Hoita macrostachya*), occupy banks and adjacent terraces, while tussocks of torrent sedge (*C. nudata*) and Pacific rush (*Juncus effusus*) are common within boulder studded channels.

<u>Non-native Annual Dominated Grasslands</u>
Grasslands are varied across the Buckeye Forest due to local site conditions, severity of historic disturbance, and more recent impact from feral pigs. The larger grasslands such as those on Bear Ridge in the northeastern portion of the property are dominated by annual species such as slender oats (*Avena barbata*), large quaking grass (*Briza maxima*), and *Bromus* spp.

Some grassland patches with rich native forb components were observed in the upper Buckeye canyon and lower Redwood Creeks. These supported the usual assortment of non-natives such as *A. barbata, B. diandrus, B. hordeaceus*, star thistle (*Centaurea solstitialis*), and the native forbs *Lupinus* spp., *Clarkia purpurea* ssp. *quadrivulnera,* lacepod (*Thysanocarpus curvipes*), popcorn flower (*Plagiobothrys nothofulvus*), and soap plant *(Chlorogalum pomeridianum).*

Serpentine grasslands

Grasslands on weak serpentine soils such as those found on the edges of Big Rock have a rich component of native forbs and grasses. Some isolated patches appear undisturbed and support mostly native species such as blue wildrye (*Elymus glaucus*), purple needlegrass (*Stipa pulchra*), soap plant, and yampah (*Perideridia kelloggii*), others were observed composed of meadow barley (*Hordeum brachyantherum* ssp. *brachyantherum*), *Festuca microstachys*, and goldfields (*Lasthenia californica*). However, most grassland patches had both non-native and native components such as Big squirrel tail grass (*Elymus multisetus*), purple needlegrass (*Stipa pulchra*), goldfields (*Lasthenia californica*), blue dicks (*Dichelostemma capitata*), blue-eyed Mary (*Collinsia sparsiflora*), and Q-tips (*Micropus californicus*), along with slender oats and large quaking grass.

Moist Meadows

Within grasslands mesic swales provide habitat for wetland plants. Small rivulets running through the semi-serpentine grasslands of Big Rock east of the Lookout support white brodiaea (*Triteleia hyacinthina*), Italian rye (*Festuca perenne*), nutsedge (*Cyperus eragrostis*), and common rush (*Juncus patens*). Natives such as common monkeyflower (*Mimulus guttatus*), water chickweed (*Montia fontana*), spike bentgrass (*Agrostis exerata*), California skullcap (*Scutellaria californica*) and foothill sedge (*Carex tumulicola*) co-occur with non-natives that include common velvet grass (*Holcus lanatus*) and pennyroyal (*Mentha pulegium*).

Stanley Meadow – Unique habitat supporting several rare species
SM-1: N38.74939, W123.41228
SM-2: N38.74931, W123.41458
SM-3: N38.74911, W123.41580

Stanley Meadow with *Deschampsia cespitosa*, Photo: K. Heise 2014

Stanley Meadow, located above Buckeye Creek (Fig. 2) is a moist open glade surrounded by Douglas fir, redwood, and sugar pine and supports a unique assemblage of native bunchgrass and several rare herbaceous species including Pacific hairgrass (*Deschampsia cespitosa* subsp. *holiformis*), Bolander's reedgrass (*Calamagrostis bolanderi*), thin-lobed horkelia (*Horkelia tenuiloba*), and Harlequin lotus (*Hosackia gracilis*). The mesic openings are surrounded by Douglas fir and redwood forest with some oak, madrone and sugar pine, rimmed with chaparral species that include chaparral pea, hairy manzanita and California huckleberry. Native herbaceous associates include death camas (*Toxicoscordion micranthus*), Purdy's iris (*Iris purdyi*), narrow leaved mule's ear (*Wyethia angustifolia*), and bracken fern (*Pteridium aquilinum* var. *pubescens*). Pacific hairgrass is the dominant grass in both openings.

Western dog violet (*Viola adunca*) also occurs within the meadow complex and is the larval food plant for 3 federally endangered or threatened butterflies (USFWS 2003).

In terms of native plants, the unique assemblage of rare species, and the habitat supporting this diversity, the Stanley Meadow complex is an exceptional site. It also appears to be very vulnerable to disturbance, especially to soil compaction, so we strongly recommend that all future activity here be kept to a minimum while more formal management recommendations are being considered. For now this would entail keeping heavy equipment out of the openings and restricting ATV use to existing tracks. This rare plant community is discussed further in the rare plant section describing the rare taxa that occur here.

Serpentine Barrens and Outcrops

N38.73516° W123.27605°

Scattered throughout Big Rock (Fig. 3) are many large outcrops and debris fields of fractured serpentinite and shale. Some areas where unfractured boulders of serpentinite parent material is dominate, plant cover is sparse to non-existent, but as materials get finer and the serpentine less inhospitable associations of species tolerant of these conditions appear. This unique serpentine plant community includes red maids (*Calandrinia ciliata*), big squirreltail grass (*Elymus multisetus*), soap plant (*Chlorogalum pomeridianum*), dense lace fern (*Aspidotis densa*), *Claytonia gypsophiloides*, coast range stonecrop (*Sedum radiatum*), sickle-leaf onion (*Allium falcifolium*), and Morefield fire evax (*Hesperavax acaulis* var. *ambusticola*), in very strong serpentine conditions. Where soil is slightly better developed and the serpentine influence weaker other species become more common such as brewer's milk vetch (*Astragalus breweri*), hill morning glory (*Calystegia subacaulis*), goldfields (*Lasthenia californica*), toyon (*Heteromeles arbutifolia*), *Festuca microstachya*, and *Agoseris heterophylla*.

Serpentine field with lace fern (*Aspidotis densa*) Photo: K. Heise 2014

In contrast to serpentine, non-serpentine outcrops represent a community microcosm, supporting a multi-layered canopy and providing habitat for a diverse suit of species. The large outcrops on the perimeter of Big Rock are associated with California bay (*Umbellularia californica*), ocean spray (*Holodiscus discolor*), toyon (*Heteromeles arbutifolia*), poison oak (*Toxicodendron diversilobum*), licorice fern (*Polypodium glycyrrhiza*), coffee fern (*Pellaea andromedifolia*), rock sword fern (*Polytrichum imbricans*), mountain dandelion (*Agoseris grandiflora*), Hardford's melic (*Melica hardfordii*), Torrey's melic (*M. torreyana*), sticky monkey flower (*Mimulus aurantiacus*), and California pink (*Silene laciniata* subsp. *californica*), and spike moss (*Selaginella bigelovii*). Mosses are abundant and include *Pseudobraunia californica, Amphidium californicum, Grimmia trichophylla, Anacolia menziesii, Hedwegia detonsa,* and *Isothecium* sp.

Because of the novel and rich assemblage of species including one rare taxa (*A. breweri*), the entire Big Rock serpentine site should be considered an area of high conservation concern. The site is especially vulnerable to excavation activities and should not be considered a borrow site.

Vegetation Alliances

Sonoma Veg Map is a 5-year program to map Sonoma County's topography, physical and biotic features, and diverse plant communities and habitats. It is a joint program of the Sonoma County Agricultural Preservation and Open Space District and the Sonoma County Water Agency. Some preliminary mapping has been conducted on the Buckeye Forest through the efforts of the Sonoma County Vegetation and Lidar Program. Their field mapping crews worked summer through fall in 2013 doing rapid assessments in support of their mapping and classification effort. Their assignments here as well as our own are preliminary as additional refinement is needed while the vegetation classification is developed. The following list of vegetation alliances follows the classification outlined in Sawyer et al. (2009).

***Sequoia sempervirens* Forest Alliance- Redwood Forest**

The dominant tree in this series is redwood. Associate species on the Buckeye Forest typically consist of Douglas-fir, Tanoak (*Notholithocarpus densiflorus*), Pacific madrone (*Arbutus menziesii*), and California bay (*Umbellularia californica*). Other conifers generally found with redwood just to the north in the Garcia River watershed include grand fir (*Abies grandis*) and western hemlock (*Tsuga heterophylla*) which were not encountered on the Buckeye Forest. Patchy redwood stands were observed along Buckeye Creek west of Gate 72 and extending upstream to the confluence of Flat Ridge Creek, and also along the lower reach of Osser Creek. The following species have been documented on the Buckeye Forest and expected within the Redwood Forest Alliance.

Associated shrubs include western raspberry (*Rubus leucodermis*), California blackberry (*Rubus ursinus*), thimbleberry (*Rubus parviflorus*), blue blossom (*Ceanothus thysirflorus*), California huckleberry (*Vaccinium ovatum*), and wood rose (*Rosa gymnocarpa*). Composition of the herbaceous layer varies with aspect and available light. In litter-rich soils in more open canopy, modesty (*Whipplea modesta*), Douglas iris (*Iris douglasii*), evergreen violet (*Viola sempervirens*), redwood ivy (*Vancouveria planipetala*), milk maids (*Cardamine californica*) and western trillium (*Trillium ovatum*) are common. In dense shady canopy, fetid adders tonque (*Scoliopus bigelovii*), spotted coralroot (*Corallorhiza maculata*), little prince's pine (*Chimaphila menziesii*), wild ginger (*Asarum caudatum*), and redwood sorrel (*Oxalis oregana*) are typical plants of low light conditions.

Understory ferns include sword fern (*Polystichum munitum*), common maidenhair (*Adiantum jordanii*), bracken fern (*Pteridium aquilinum* var. *pubescens*), sword fern (*Polystichum munitum*). In more open canopy a variety of native grasses and sedges occur such as western fescue (*Festuca occidentalis*), sweet vernal grass (*Anthoxanthum occidentalis*), common brome

(*Bromus vulgaris*), slender hairgrass (*Deschampsia elongata*) as well as round-fruit sedge (*Carex globosa*).

Pseudotsuga menziesii-Lithocarpus densiflorus **Forest alliance,** Douglas fir-tanoak forest
Membership rules for this alliance require that Douglas fir and tanoak together comprise 30 to 60 percent of the relative cover in the tree canopy (Sawyer et al, 2009). This is the most common forest Alliance across the Buckeye Forest as observed by vegetation mapping crews and our own observations in the field. Stand characteristics including relative cover of dominants and composition of associated species varies considerably across different sites.

Stand conifers include Douglas fir (*Pseudotsuga menziesii*), sugar pine (*Pinus lambertiana*), redwood (*Sequoia sempervirens)* and to a lesser degree (ponderosa pine (*Pinus ponderosa*). Hardwoods include tanoak (*Notholithocarpus densiflorus*), Pacific madrone (*Arbutus menziesii*), golden chinquapin (*Chrysolepis chrysophylla*), and Pacific bay (*Umbellularia californica*).

Lithocarpus densiflorus **Forest Alliance**, Tanoak forest
In this type of forest tanoak comprises greater than 60 percent of relative cover in the tree layer (Sawyer et al, 2009). Tanoak (*Notholithocarpus densiflorus*) can dominate some forest stands, especially on south-facing slopes. For most stands observed the understory cover was very sparse, sometimes consisting of only one or two species such as bracken fern, California huckleberry, toyon, manzanita, or saplings of tanoak. Note that *Notholithocarpus densiflorus* is now the recognized name for this species.

The water mold fungus, *Phytophthora ramorum*, which is responsible for SOD (Sudden Oak Death) has infected some tanoak forest as well as scattered individuals across the Buckeye Forest. Within the current range of *P. ramorum* which extends from Monterey County north along the Coast Ranges to Southwestern Oregon, tanoak exhibits little resistance to the pathogen. Although central coastal California has been the hardest hit numerous computer models indicate that Mendocino, Humboldt, and Del Norte counties are at a high risk of SOD infection (Kliejunas 2010).

Observed in south and south-west facing stands north of Windy Gap Road at eastern end of property; along the ridge dividing the Fuller and Wheatfield Fork creek watersheds; and west-facing slopes above Buckeye Creek below confluence of Osser and Flat Ridge Creeks.

Quercus garryana Woodland Alliance, Oregon white oak woodland
This alliance is comprised of greater than 30 percent relative cover in the tree canopy or greater than 25 percent absolute cover of Oregon oak where an appreciable conifer cover is lacking (Sawyer et al, 2009). Patches of Garry oak woodland represent islands of important wildlife habitat and high native plant diversity and should be excluded from hardwood removal practices.

Many stands in the eastern portion of the Buckeye Forest meet the requirements for the *Quercus garryana* Woodland Alliance (QGWA), such as those that support >25% absolute cover of Q. garryana and lacking any appreciable conifer cover, otherwise they are considered associates of a Douglas fir Alliance (Sawyer et al 2009). The QGWA is considered rare in California

(NatureServe rank S3) and is a unique vegetation type commonly supporting a rich suite of native understory grasses, forbs, and shrubs.

Associated trees include Black oak (*Quercus kelloggii*), Coast live oak (*Q. agrifolia*), Shreve oak (*Q. parvula var. shrevei*), Douglas fir, large leaf maple (*Acer macrophyllum*), madrone (*Arbutus menziesii*), and California bay (*Umbellularia californica*). Shrub canopy was not well-developed, occasionally toyon (*Hetermeles arbutifolia*), however a rich herbaceous layer was often associated with these stands including California fescue (*Festuca californica*), blue wildrye (*Elymus glaucus*), California brome (*Bromus carinatus*), gamble weed (*Sanicula crassicaulis*), Geyer's melic (*Melica geyeri*), hedgenettle (*Stachys ajugioides*), woodland tarweed (*Anisocarpus madioides*), California bedstraw (*Galium californicum*), western buttercup (*Ranunculus occidentalis*), and Japanese hedge-parsley (*Torilis arvensis*).

Large stands were observed on east-facing slopes above the eastern end of the Windy Gap Road, north and east-facing slopes within the Redwood and Pulchar Creek watersheds, north-facing slopes below Windy Gap Road just east of the Lookout, north-facing slopes above Flat Ridge Creek near Gate 65, and n-facing slopes above south-fork Flat Ridge Cr. east of Gate 71.

It is likely that this is the dominant broadleaf forest Alliance in the eastern half of the Buckeye Forest.

Garry oak and Douglas fir, Photo: K. Heise 2014

***Quercus agrifolia* Woodland Alliance,** Coast live oak woodland

In this Alliance coast live oak is dominant or co-dominant and contributes at least 50% relative cover to the tree canopy (Sawyer et al. 2009). Coast live oak is a common associate of the Oregon white oak woodland and also found among black oak and madrone in openings within Doug fir/tan oak forests.

Sonoma Vegmap crews have mapped preliminary alliances of this type on the property, one in the upper S. Fork Fuller watershed and the other on the edge of Big Rock east of the Lookout (N38.73345, W123.27562). The site at Big Rock consists of mature trees on gently slope ground with Garry oak (*Quercus garryana*), Pacific madrone (*Arbutus menziesii*), Douglas fir (*Pseudotsuga menziesii*), California fescue (*Festuca californica*), Hardford's melic (*Melica hardfordii*), Geyer's melic (*M. geyeri*), California brome (*Bromus carinatus*), California bedstraw (*Galium californicum*), gamble weed (*Sanicula crassicaulis*), Sweet cicely (*Osmorhiza* *berteroi*), soap root (*Chlorogalum pomeridianum*), and woodland tarweed (*Anisocarpus madioides*).

***Acer macrophyllum* Forest Alliance, Bigleaf maple forest**
N38.74788, W123.26480
In this alliance bigleaf maple is dominant or co-dominant and contributes at least 25% relative cover to the tree canopy. Co-dominants on the Buckeye Forest include white alder (*Alnus rhombifolia)*, Oregon white oak (*Quercus garryana*), and Douglas fir (*Psuedotsuga menziesii*). The alliance is considered rare in California, but more secure outside of the state; the element ranking is G4 S3.

Some preliminary mapping of this forest alliance has been done on the Buckeye Forest high in the Flat Ridge Creek watershed in the northeastern portion of the property, in the Franchini Creek watershed near School Ridge, and other possible stands of large-leaf maple-dominated stands in upper Pulchar Creek observed in 2014, although further investigations may show it as an associate of other forest alliances. The site indicated here, north of the Windy Gap Road, was a densely canopied, west-facing dry gully draining a moderately steep slope. Large-leaf maple (*Acer macrophyllum*) was the dominant tree in the stand along with Douglas fir, deer brush (*Ceanothus integerrimus*), elk clover (*Aralia californica*), western raspberry (*Rubus leucodermis*), common rush (*Juncus patens*) and chain fern (*Woodwardia fimbriata*).

***Alnus rhombifolia* Forest Alliance**, White alder groves
This Alliance consists of a plant community comprising a tree canopy greater than 10% absolute cover of white alder trees (Sawyer et al, 2009). Sitka willow (*Salix sitchensis*), and Pacific willow (*S. lasiandra*), arroyo willow (*S. lasiolepis*), large leaf maple (*Acer macrophyllum*), canyon live oak (*Quercus chrysolepis*), and California bay (*Umbellularia californica*). Giant chain fern (*Woodwardia fimbriata*), Durango root (*Datisca glomerata*) and giant horsetail (*Equisetum telematiea*) also commonly occur along the waters edge. Mossy riverside banks host herbaceous natives that include western brookfoam (*Boykinia occidentialis*), alum root (*Heuchera micrantha*), Merten's saxifrage (*Saxifraga mertensiana*), and smooth trisetum (*Trisetum canescens*).


White alder on Wheatfield Fork Gualala, Photo: K. Heise 2014

The herbaceous stratum is rich with natives that include Torrent sedge (*Carex nudata*) which is conspicuous along the cobbled channel bottom and in some places forming a dense cover across the width of the channel. Ferns include California polypody (*Polypodium californicum*), sword fern (*Polystichum californicum*), and gold-back fern (*Pentagramma* *triangularis* subsp. *triangularis*), forbs: Durango root , fawn lily (*Erythronium californicum*), fetid adder's tongue (*Scoliopus bigelovii*), redwood ivy (*Vancouveria planipetala*), western brookfoam, small-flowered tonella (*Tonella tenella*), Geyer's oniongrass (*Melica geyeri*), and scarlet monkeyflower (*Mimulus cardinalis*). Rich in bryophytes, mosses here include *Scleropodium obtusifolium*, *Grimmia lisae* and *G. laevigata, Leucolepis acanthoneuron* and *Kindbergia praelonga*.

Locations are widespread across the property along active channels including the Wheatfield Fork Gualala, and its tributaries Redwood and Pulchar Creeks; South Fork Flat Ridge Creek east of Gate 71; upper reaches of Buckeye Creek and its two large tributaries Osser and Flat Ridge Creeks; and Rockpile Creek in the far northwest section of the property. Note: Red alder (*Alnus rubra*) was only observed on Buckeye Creek near the western boundary of the property.

***Aesculus californica* Woodland Alliance,** California Buckeye Groves
N38.75998, W123.29947
In this Alliance California buckeye is dominant or co-dominant and contributes at least 50% relative cover to the tree canopy (Sawyer et al. 2009). The occurrence was adjacent to the Kelly Road approximately .5 miles northeast of Gate 71on a north-facing slope, within a shady concavity. This vegetation alliance has a rarity ranking of G3 S3 and is considered rare and threatened throughout its range (Sawyer et al. 2009).

Only one site was observed that met the conditions for a buckeye grove, however the associated hardwood trees are novel and include Garry oak (*Quercus garryana*), black oak (*Q. kelloggii*), and coast live oak (*Q. agrifolia*). Other trees observed were California bay (*Umbellularia californica)* and Douglas fir (*Psuedotsuga menziesii*). Additionally, the general description for this Alliance notes that a shrub layer is common; the herbaceous layer sparse or grassy. However, we noted a highly diverse, native plant-dominated forb layer with such species as goldenback fern (*Pentagramma triangularis*), California bedstraw (*Galium californicum*), common maidenhair (*Adiantum jordani*), western buttercup (*Ranunculus occidentalis*), milk maids (*Cardamine californica*), baby blue eyes (*Nemophila menziesii*), *N. heterophylla*, Henderson's shooting star (*Primula hendersonii*), gamble weed (*Sanicula crassicaulis*), red larkspur (*Delphinium nudicaule*), and Geyer's melic (*Melica geyeri*).

***Stipa pulchra* Herbaceous Alliance**, purple needle grass grassland
This alliance is comprised of greater than 10% cover of purple needle grass in the herbaceous layer (Sawyer et al, 2009). Purple needlegrass grasslands are generally represented as areas of concentration where purple needlegrass is greater than 10 % relative cover within larger wild oat grasslands. Purple needlegrass grassland occurs as low to moderate, to high-density stands within the larger wild oat grassland communities. Currently most of the purple needle grass grasslands exhibit disturbance by wild pigs. The alliance is considered rare in California, but more secure outside of the state; the element ranking is G4 S3.

Stipa pulchra 1 (Lower Easy Road): N38.75521, W123.36315
Stipa pulchra 2 (Lower Easy Road): N38.75461, W123.36275
Stipa pulchra 3 (Lower Easy Road): N38.75456, W123.36158
Stipa pulchra 4 (Evans Ridge): N38.73567, W123.33721

The above grasslands were mapped by Kjeldsen et al. (2006) and KBC&RCA (2009) but no description of the community was provided. Our own site visits to the Lower Easy grasslands indicate a more diverse assemblage of species, therefore it is uncertain if these stands meet the criteria for membership into the *Stipa pulchra* Herbaceous Alliance. Until further field investigations can be conducted these are treated as preliminary alliances. Species observed in 2014 include purple needlegrass (*Stipa pulchra*), California oatgrass (*Danthonia californica*), blue wildrye (*Elymus glaucus*), Idahoe fescue (*Festuca idahoensis*), California brome (*Bromus carinatus*), blue eyed grass (*Sisyrinchium bellum*), self-heal (*Prunella vulgaris* var. *lanceolata*), English plantain (*Plantago lanceolata*), narrow-leaf mule ears (*Wyethia angustifolia*), *Juncus tenuis*, and common rush (*J. patens*). The rare *cordylanthus tenuis* ssp. *brunneus* is present in the Lower Easy grasslands but was not observed in 2014 (see Fig. 4, pg. 81).

***Avena* (*barbata, fatua*) Semi-Natural Herbaceous Stands**, Wild oat grasslands.
N38.75199, W123.26791
This alliance is comprised of greater than 50% relative cover by *Avena* spp. and less than 10% cover by native herbs in the herbaceous layer (Sawyer et al, 2009). Further field investigations are required to map the extent of this alliance on the Buckeye Forest but it may be the most common herbaceous type. This site is located at the west end of the long Bear Ridge 1 study area (Fig. 1, pg. 78).

Slender oats (*Avena barbata*) is the dominate species, occasionally big quaking grass (*Briza maxima)* is a co-dominant in these grasslands along with a suite of non-native grasses that include soft chess (*Bromus hordeaceus*), ripgut brome (*B. diandrus*), red brome (*B. rubens*), nitgrass (*Gastridium phleoides*), hedgehog dogtail (*Cynosurus echinatus*) and medusahead (*Elymus caput-medusae*). Occasional stands of native blue wildrye (*Elymus glaucus*) occur on the edges of grassy openings along with California brome (*Bromus carinatus*). Non-native forbs include *Tolpis barbata, Logfia gallica*, broadleaf filaree (*Erodium botrys), Soliva sessilis,* and smooth cat's ear (*Hypochaeris glabra*).

In spite of the degraded nature of the plant community there are many native forbs present such as harvest brodiaea (*Brodiaea elegans*), *Clarkia purpurea* ssp. *quadrivulnera*, yellow mariposa lily (*Calochortus luteus*), white mariposa lily (*C. vestae*), *Navarretia intertexta*, skunk weed (*N. squarrosa),* Q-tips (*Micropus californicus*), *Acmispon americanus*, California poppy (*Eschscholzia californica*), vinegar weed (*Trichostema lanceolatum*), and *Sidalcea diploscypha.*

Non Serpentine Native bunchgrass grasslands
The following native grassland occurrences are under an acre in size but from a compositional point of view meet the requirements for membership into the following alliances (Sawyer et al. 2009).

***Danthonia californica* Herbaceous Alliance, California oat grass prairie**
N38.72499, W123.24794
One area was identified as a possible *Danthonia californica* Herbaceous Alliance within a small patch of seasonally moist ground in an opening among mixed oak woodland of Oregon white oak (*Quercus garryana*), Shreve oak (*Q. parvula* var. *shrevei*), valley oak (*Q. lobata*), and common manzanita (*Arctostaphylos manzanita* ssp. *glaucescens*) near the confluence of Pulchar

and Wheatfield Fork Gualala. Another patch of *Danthonia* grassland was mapped along the Lower Easy Road east of Franchini Creek by Kjeldsen (2006), however it was later mapped as a *Stipa pulchra* herbaceous alliance (KBC&RCA 2009.) The alliance is considered rare in California, but more secure outside of the state; the element ranking is G4 S3.

<u>*Deschampsia cespitosa* Herbaceous Alliance, tufted hair grass meadows</u>
N38.74949, W123.41214
A small occurrence of *D. cespitosa* dominated grassland was observed in the Stanley Meadow complex at the far southwestern corner of the property. The site is described in detail in the rare plant section under "*Horkelia tenuiloba*" which is an associated species along with death camus (*Toxicoscordion micranthum*), and bentgrass (*Agrostis* spp.).
D. cespitosa is found in dense patches scattered throughout the three openings which make up the complex.

<u>*Festuca idahoensis* Herbaceous Alliance, Idahoe fescue grassland</u>
N38.73615, W124.27793
Several small patches of dense Idahoe fescue (*Festuca idahoensis*) up to 20sq. meters in size where observed at the lower edge of Big Rock (Fig. 3, pg. 80) occurring in swales between serpentine fields. Associated species include yampah (*Perideridia kelloggii*), one-sided bluegrass (*Poa secunda*), and Ithuriel's spear (*Triteleia laxa)*. The alliance is considered rare in California, but more secure outside of the state; the element ranking is G4 S3.


Patch of Idahoe fescue in Big Rock, Photo: K. Heise 2014

<u>RARE SPECIES SECTION</u>

Laws Governing the Protection of Locally Rare Species – adapted from CNPS Rare Plant Program ~ http://www.cnps.org/cnps/rareplants/locally_rare.php

Floristic botanists prefer to look at natural distribution patterns and influences when studying the range, distribution, and population characteristics of a species; however, few of our laws follow or consider the natural environment. Rather, our laws are made and enforced according to political boundaries, such as states, counties, and cities, and conservation efforts must therefore also work within those political boundaries. Because many laws, including CEQA, are implemented at the local level (county or city), it is not always appropriate to limit oneself to a statewide perspective on rarity. Use of the CNPS Inventory as part of the project impact assessment has become routine; however, it is also important to take into consideration those plants that are rare at the local level.

CEQA is one environmental law that is extremely important in rare plant conservation, including the conservation of species that are considered locally rare. While CEQA has rarely been used to date for the protection of locally rare plant populations, Article 9 of CEQA states that "special emphasis should be placed on environmental resources that are rare or unique to that region." For this reason, it is important to provide agencies with local conservation tools so that project-related impacts on the flora within their jurisdiction and region can be better assessed.

Monitoring Considerations for Special Status Plants and Rare Communities
Rare plants are by definition of limited distribution or population size. Whether broadly distributed, though occurring infrequently and in small populations, or narrowly distributed and locally abundant, or locally rare occurring along the periphery of their range (Lepig and White 2006), each rare plant has optimal conditions that allow for its continued survival. Some plants are sensitive to disturbance and some plants are disturbance dependent such as the Santa Cruz clover (*Trifolium buckwestiorum*). It is important to have such information when making management decisions. Knowledge of these conditions is foundational to an informed management strategy for each species found on the Buckeye Forest. Monitoring plans should be recommended for those taxa with strategies developed specifically for each species and adapted over time based on the results of monitoring.

*CNDDB defines a rare plant occurrence (an "Element Occurrence" or "EO") as a population (or group of populations) of plants separated by at least ¼ mile from another population(s). NDDB will map separate populations in detail, but will consider them all one EO if they occur within ¼ mile of each other.

Rare Plant Taxa on the Buckeye Forest (2014 additions in bold)
Brewer's milkvetch (*Astragalus breweri*) CRPR 4.2 S3.2 G3
Bolander's reed grass (*Calamagrostis bolanderi*) CRPR 4.2 S3.2 G3
Serpentine bird's beak (*Cordylanthus tenuis* subsp. *brunneus*) CRPR 4.3 S3.3 G4G5T3
Thin-lobed Horkelia (*Horkelia tenuiloba*) CRPR 1B.2 S2.2 G2
Harlequin lotus (*Hosackia gracilis*) CRPR 4.2 S3.2 G4
White-flowered rein orchid (*Piperia candida*) CRPR 1B.2 S2 G3?
California pine foot (*Pityopus californica*) CRPR 4.2 S3.2 G4G5
Santa Cruz clover (*Trifolium buckwestiorum*) CRPR 1.B.1 S2 G2
Long beard lichen (*Usnea longissima*) CRPR 4.2 S4 G4

Note: Refer to Appendix E, pg. 75 for Rare Plant Coordinates and Fig. 1, pg. 78 for map

1) Brewer's milk-vetch, *Astragalus breweri* A. Gray
Brewer's milk-vetch is an annual herb, a member of the Pea Family, *Fabaceae* and a California endemic.

Rarity Rank: CRPR: 4.2 (G3 S3.2)

Known Range: The known range of Brewer's milk-vetch is made up of coastal and inland counties north of the San Francisco Bay Area. These include Lake, Mendocino, Marin, Napa, Sonoma and Yolo counties at elevations from 90 to 730 m. According to the CNPS on-line inventory (8th edition), "populations have been lost to development and road construction and threatened by non-native plants." Many occurrences in Lake County and eastern Sonoma County are now presumed extinct.

Siting: Brewer's milk-vetch was observed on April 11, 2014 by Heise and Hulse-Stephens on serpentinite soils above the access road to the quarry area (N38.73451, W123.27832; 1,684 ft.) on a north facing exposed rocky slope (Fig 3, pg. 80).

Brewer's milk vetch in serpentine soil at Big Rock
Photo: K. Heise 2014

Plant Description: Brewer's milk-vetch is an annual plant that is sparsely leafy with small scattered hairs. The **stems** are few and slender, 4-30 cm. long. The **leaf** is 1.5-7.5 cm with 7 to 13 narrow to roundish leaflets with notched tips. **The Inflorescence** is head-like with 4-10 ascending, spreading flowers. The **flowers** are pale yellow to white, sometimes streaked with lavender. The banner is recurved 7.8 to 11.4 mm long. The **fruit** is ascending and spreading, 5-10 mm long and 2.5-4 mm wide with a spine-like beak mostly equal to the body.

Site Characteristics and Associate Species: Brewer's milk vetch grows on open slopes, grassy areas commonly but not exclusively on serpentine. It was observed in an exposed, north-facing site with serpentinite soils that displayed no disturbance by feral pigs. Associate species include native herbs and grasses, slender cottonweed (*Micropus californicus*), blue dicks (*Dichelostemma capitatum* subsp. *capitatum*), deer vetch (*Acmispon brachycarpus*), hill morning glory (*Calystegia subcaulis*), Nuttall's fescue (*Festuca macrostachya*), blue-eyed grass (*Sisyrinchium bellum*), common sandweed, (*Athysanus pusillus*) and red maids (*Calandrinia ciliata*). Non-native invasive grasses, slender wild oat (*Avena barbata*) and big quaking grass (*Briza maxima*) make up a small component of this fairly pristine area.
Recommendation: Brewer's milk-vetch is a CNPS Rank 4, (watch list) plant and therefore not subject to CEQA regulations. However, since the presence of Brewer's milk-vetch is an indicator of the health of the serpentinite grassland monitoring of this species is recommended.

2) Bolander's reed grass, *Calamagrostis bolanderi* Thurb
Bolander's reed grass is a perennial grass, a member of the Grass Family, *Poaceae,* and a California endemic.

Rarity Rank: CRPR 4.2 (G3 S3.2)

Known Range: The known range of the Bolander's reed grass is restricted to sites from sea level to 500 m, near the coast, in Humboldt, Mendocino and Sonoma counties. According to the CNPS on-line inventory (8th edition), it is "possibly threatened by vehicles, logging, development and grazing."
Siting: Bolander's reed grass was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys in the vicinity of the Stanley 1.0 study area.

Bolander's reed grass Photo: K. Heise 2008

Plant Description: Bolander's reed grass is a perennial grass that grows from slender rhizomes. **Stems** are erect reaching a height of 3 to 4.5 feet, generally with 4 nodes. **Leaves** are flat and nearly smooth with blades 3-10 mm wide, evenly distributed along stems. **Inflorescence** is a more or less open panicle, 10 to 25 cm long, with spreading branches, the lower ones as much as 8 cm long, all arranged in whorls. **Spikelets** have smooth glumes, 3-4 mm long, with short stiff hairs on the keels.

Lemmas are more or less equal to the glumes with short stiff hairs throughout. The anthers are 2/3s the size of the lemma. The awn is attached near the base of the lemma, abruptly bent and exserts beyond the lemma about 2 mm. The hairs at the base of the floret are short (more or less 1 mm) and tufted.
Site Quality and Associated Species: Bolander's reed grass occurs in North Coast coniferous forests and broad-leaf upland forests as well as coastal scrub in mesic sites. Generally, associate species include California wax myrtle (*Myrica californica*), thimbleberry (*Rubus parviflorus*), poison oak (*Toxicodendron diversilobum*) and lady fern (*Athyrium felix-femina*) as well as native grasses, slender hairgrass (*Deschampsia elongata*) and *Bromus vulgaris*.
Recommendation: Bolander's reed grass is a CNPS Rank 4, (Watch List) plant and therefore not subject to CEQA regulations. No monitoring of this species is recommended at this time.

3) Serpentine bird's beak, *Cordylanthus tenuis* A. Gray **subsp. *brunneus*** (Jeps) Munz
Serpentine bird's beak is an annual plant, a member of the Broomrape Family, *Orobanchaceae* and a California endemic.

Rarity Rank: CRPR 4.3 (G4G5T3 S3.3)

Known Range: The known range of the serpentine bird's beak is restricted to California. It has been observed in sites that lie between 475 and 915 m elevation, in Lake, Napa and Sonoma counties. According to the CNPS on-line inventory (8th edition), it is "threatened by development, and road maintenance" and may also be vulnerable to habitat alteration caused by feral pigs.

Siting: Serpentine bird's beak was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys in the mixed woodland/grassland/chaparral habitat in three locations within the Lower Easy 1.0 study area (Fig. 4, pg. 81).

Serpentine bird's beak,   calphoto

Plant Description: Serpentine bird's beak is an annual hemiparasitic plant. **Stems** are much branched and are gray or yellow-green, often becoming red-purple, with sparsely glandular. **Leaves** generally folded and thread-like. The **inflorescence** has loose clusters of 1-4 flowers, outer bracts are entire, and thread-like; inner bracts are sparsely glandular hairy. **Flowers** are 12-15 mm long.

Site Characteristics and Associated Species: Serpentine bird's beak grows in mixed-evergreen forest and in chaparral, generally on serpentinite soils. The Lower Easy occurrence represents an uncommon but not unknown occurrence on non-serpentinite soils.

Recommendation: Serpentine bird's beak is a CNPS Rank 4, (watch list) plant and therefore not subject to CEQA regulations. No monitoring of this species is recommended at this time.

4) Thin-lobed horkelia, *Horkelia tenuiloba* (Torr.) A. Gray
Thin-lobed horkelia is a perennial plant, a member of the Rose Family, *R*osaceae and a California endemic.

Rarity Rank: CRPR 1B.2 (G2 S2)

Known Range: Thin-lobed horkelia is known to occur in parts of Mendocino, Marin and Sonoma counties.

Thin-lobed horkelia was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys and by Heise and Hulse-Stephens in a follow-up survey March 13, 2014 in the Stanley Meadow complex (Fig 2, pg. 79). In areas where moist bare ground was greater than 30% it was often the dominant herbaceous plant. The openings are surrounded by Douglas fir, redwood, Shreve oak (*Quercus parvula* var *shrevei*) and madrone bordered by a narrow ecotone of hairy manzanita (*Arctostaphylos columbiana*) and other shrub species. These fragments of coastal prairie are vernally moist meadows and support western dog violet (*Viola adunca* subsp *adunca*), which is the larval food supply for 3 federally endangered butterflies, and native Pacific hairgrass (*Deschampsia californica*).

Thin-lobed horkelia, Photo: V. Smith 2009

Plant Description: Thin-lobed horkelia is a perennial plant that is loosely matted and generally green. **Stems** are less than 40 cm with spreading hairs. **Leaves** are 5-15 cm long often more or less cylindric. Leaftets are generally crowded 8 to 15 per side and are 3 to 10 mm long, divided greater than half way to the base with 3-8 narrow lobes. The **inflorescence** has few to many flowers on 1-6 mm pedicels. The flower bowl (hypanthium) is 3-4.5 mm wide and greater than 2 times the height, inner wall is generally hairy, bractlets are 0.5-1,wide, sepals are 3-5 mm; petals 4 mm, white.

Site Characteristics and Associate Species: Thin-lobed horkelia is a perennially green herbaceous plant that grows in dense clusters on the wetter sides of the openings where disturbance has been minimal. Where the road bisects the meadows thin-lobed horkelia is sparse to absent. It shares the fragile openings with California hairgrass that is dominant in parts, and *Agrostis* sp. and non-native and invasive velvet grass (*Holcus lanatus*). Thin-lobed horkelia is often the dominant forb in the wetter parts of the meadow. Non-native herbaceous associates include occasional bull thistle (*Cirsium vulgare*), and hairy cat's ears (*Hypochaeris radicata*). Surrounding the opening is a Douglas fir and redwood forest rimmed with hairy manzanita, California huckleberry (*Vaccinium ovatum*) and chaparral pea, (*Pickeringia montana*).

Recommendation: Stanley meadow is a remnant of a sensitive natural community that supports native vegetation in a rich and complex mosaic. Encroachment of young Douglas-fir and madrone saplings were observed in the meadow. This kind of meadow is an early successional habitat that without disturbance would gradually become forested. Over 90% of rare species are disturbance dependant and require management to maintain habitat (Imper, 2013). It is recommended that woody encroachment be regularly removed to maintain the light resources and hydrology that supports this plant community.

The Stanley Meadow complex is host to a unique assemblage of rare and native plants and represents a sensitive botanical resource on the Buckeye Forest. Monitoring using the releve method would provide an assessment of absolute cover by species over a representative area of the openings, which would provide a baseline to track the changes in this site so that management decisions can be made to promote the health of this habitat. After baseline data is collected monitoring is recommended every 2 to 5 years.

5) Harlequin lotus, *Hosackia gracilis* Benth.
Harlequin lotus is an annual plant and a member of the Legume Family, *Fabaceae*.

Harlequin lotus Photo: G. Hulse-Stephens 2012

Rarity Ranking: CRPR 4.2 (G4 3.2)

Known Range: The known range of the Harlequin lotus extends from Canada to Washington, to Oregon and California. It is endangered in Canada. In California it is restricted to sites from sea level to 700 m, in Del Norte, Humboldt, Marin, Mendocino, Monterey, San Benito, San Francisco, Santa Cruz, San Luis Obispo, San Mateo, and Sonoma counties. According to the CNPS on-line inventory (8th edition), it is "threatened by development, grazing, feral pigs, habitat alteration and competition" and is "thought to be a larval food plant of the Federally Endangered lotis blue butterfly (*Lycaeides argyrognomon* subsp. *lotis*)."

Siting: Harlequin lotus was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys in two locations: within and around Stanley 1.0 study area and the northern margin of the School 1.0 study area (See Appendix E, pg. 75 for coordinates).

Plant Description: Harlequin lotus is an annual plant that spreads mostly by stolons and rhizomes. **Stems** are smooth, sprawling to ascending and the base of the plant is often spongy. **Leaves** are made up of 3-7 elliptic leaflets, 6-20 mm long. Stipules are large, triangular, thin and translucent. The **inflorescence** has 3-9 flowers with a three parted subtending bract just below the flowering head. The flower is 10-16 mm with a yellow banner and pink-purple wings. The calyx is 5-6 mm with lobes approximately as long as the flower tube. The **fruit** is smooth and linear 1.5-3.5 cm long and 2-3 mm wide. **Seeds** are few.

Site Characteristics and Associated Species. Harlequin lotus grows in moist meadows, wetlands and roadsides. It is generally found in mesic grassland. Common associates include non-native velvet grass (*Holcus lanatus*), sweet vernal grass (*Anthoxanthum odoratum*) and hedgehog dogtail grass (*Cynasurus echinatus*). Common native graminoids associates include California oat grass (*Danthonia californica*), and foothill sedge (*Carex tumulicola*). Non-native forbs commonly associated with harlequin lotus are little hop clover (*Trifolium dubium*), hairy cat's ear (*Hypochaeris radicata*) and English plantain (*Plantago lanceolata*).

Recommendation: Harlequin lotus is a CNPS Rank 4, (watch list) plant and therefore not subject to CEQA regulations. No monitoring of this species is recommended at this time.

6) White-flowered Rein Orchid, *Piperia candida* R. Morgan & J. Ackerman
White-flowered Rein Orchid is a perennial herb and a member of the Orchid Family (*Orchidaceae*). It is a California endemic.

Rarity Rank: CRPR 1B.2 (G3G4 S3.2)

Known Range: The known range of the white-flowered rein orchid in California is along the west coast from south of the San Francisco Bay Area in Santa Cruz and San Mateo counties northward through northwestern California occurring in Mendocino, Humboldt, Trinity, Del Norte and Siskiyou counties. The range continues into Oregon, Washington, B.C. and Alaska.
Siting: White-flowered rein orchid was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys in seven locations: Evans Ridge 2.0, Moody 1.0, Moody 2.0, School 1.0, Bear Ridge 1.0 and Stanley 1.0 and study areas (see App. E, pg. 75).


White rein orchid Photo: K. Heise 2014

Plant Description: White-flowered rein orchid is a perennial herbaceous plant growing from tubers. The **stem** has less than 6 bracts. The **leaves** are basal, usually singular or in pairs, 5 to 18 cm. long and 11—35 mm. wide. The **inflorescence** is 10 to 30 cm tall and one-sided. **Flowers** are white with upper sepals and petals generally pointing forward. The lip is 2 to 3 mm and recurves toward the spur which is 1.5 to 3.5 mm and points downward.
Site Characteristics and Associate Species: White-flowered rein orchids are generally found growing on shady ground in low to moderate numbers (1-18 individuals) primarily on old skid trails, along the margins of seasonal and permanent logging roads, and on road banks. The vegetation type for this species is redwood and Douglas fir forest with mixed hardwoods and conifer including tanoak, madrone, canyon live oak, and sugar pine. The evergreen huckleberry is a common associate brush species, though generally in low densities (less than 25% cover). Other common understory associates include wood rose (*Rosa gymnocarpa*) and thimbleberry (*Rubus parviflorus).* Herbaceous plants commonly associated with white-flowered rein orchid include: Pacific starflower (*Trientalis latifolia)*, redwood sorrel (*Oxalis oregana)*, hawkweed (*Hieracium albiflorum*) redwood ivy (*Vancouveria planipetala*), modesty (*Whipplea modesta*), and *Carex globosa.*

Recommendation: Based on these habitat preferences observed on the Garcia River Forest (Heise and Hulse-Stephens 2013), we have developed a set of mitigation guidelines that can be applied to known occurrences of white-flowered rein orchid elsewhere. These recommendations will also be applicable to any new populations that are observed in future years.

1. At least 75% of the known occurrences (equaling 95% of individual plants) of *P. candida* within a plan area shall be avoided. In areas where occurrences cannot be

avoided due to location within skid trails, yarder roads, or truck roads, GPS coordinates will be taken and these locations will be monitored for the presence of *P. candida* in future years.
2. A shade buffer will be placed around all occurrences within group harvest areas in which all trees greater than 6” DBH shall be retained. The buffer area will be composed of all trees with crowns shading the population, generally about 50 feet. Retention trees will be marked with orange paint.
3. No chemical hardwood reduction treatment will occur within the shade buffer or within 50 feet of any known occurrences of *P. candida*.
4. Skid trails with populations of *P. candida* will be avoided whenever possible. In tractor units where *P. candida* is present all trails will be flagged prior to harvest and equipment operators will be informed to use only those trails that have been flagged.
5. Skid trails where populations have been observed will not be slash packed prior to harvest. Slash shall not be piled on any areas where *P. candida* has been observed.
6. Populations of *P. candida* located off of the running surface of roads and skid trails will be flagged and equipment operators will be notified to avoid these locations during harvest operations.

7) California pinefoot, *Pityopus californicus* (Eastw.) H.R. Copel
California pinefoot is a perennial achlorophyllous herb and a member of the Heath Family, *Ericaceae.*

Rarity Rank: CRPR 4.2 (G4G5 S3.2)
Known range: The known range of the California pinefoot in California is northern coastal and central California including Del Norte, Fresno, Humboldt, Mendocino, Mariposa, Marin, Napa, Siskiyou, Sonoma, Trinity and Tulare counties. The range continues into Oregon and Washington.


California pine foot Photo: B. Rice 2009

Siting: California pinefoot was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys in five locations: Evans Ridge 2.0, Moody 1.0, School 2.0, Bear Ridge 1.0, and Icola 1.0 study areas (see App E, pg. 75).
Plant description: California pinefoot is a perennial, non-green, fleshy plant with brittle roots. It has no stem or leaves. The **infloresense** is a raceme 1 to 10 cm. tall, cream to yellow that emerges from the ground erect. It does not persist after seed dispersal. The **flowers** are cylindric, cream colored and the outside smooth and the inside densely airy.
Recommendation: California pinefoot is a CNPS Rank 4, (watch list) plant and therefore not subject to CEQA regulations. No monitoring of this species is recommended at this time.

8) Santa Cruz Clover, ***Trifolium buckwestiorum*** Isely

Santa Cruz clover is an annual herb, a member of the Legume Family, *Fabaceae* and a California endemic.

Santa Cruz clover   Photo: K. Heise 2007

Rarity Rank: CRPR 1B.1   (G1 S1.1)

Known Range: The known range of the *T. buckwestiorum* is restricted to Mendocino, Monterey, Santa Cruz and Sonoma counties. This species according to the CNPS on-line inventory (8th edition) is "known from fewer than 15 very small occurrences; only one fully protected. Others threatened by land clearing, non-native plants, and possibly road maintenance". Recent findings since 2005 indicate substantially larger occurrences in the northern part of its range in Mendocino County (Heise and Hulse-Stephens 2013).

Siting: Santa Cruz clover was observed in the Lower Easy Ridge area within redwood/Douglas fir forest on the roadbed with hedgehog dogtail grass (*Cynosurus echinatus*) and California oat grass (*Danthonia californica*) on May 23, 2014. Two populations were recorded; one with approximately 200 plants distributed over a rarely traveled roadbed (N38.75496, W123.36327) and the second with only 25 plants (N38.75506, W123.36643). The presence of these occurrences indicates that there is potential for a much greater distribution on the Buckeye Forest that will be discovered and documented during studies preparatory to timber harvest and road improvement projects.

Plant Description: Santa Cruz clover is an annual plant that displays several growth habit phases. In more impoverished soils where moisture is limited to brief accumulations following spring storms the plant grows to about 2cm and develops sessile non-involucred heads of 1 or 2 flowers, followed by seed set before desiccation. If moisture availability is extended by cool temperatures, spring rains, or available ground water the plant gradually produces a well-developed involucre with conspicuous tooted lobes that subtend a head of a few to many flowers.

Stems range from 2cm to more than 20cm. and are decumbent to ascending. **Leaves** occur along the stems and stipules have bristle-tipped teeth. Leaflets are .5 to 1.5 cm, round to elliptic and finely serrate. **Inflorescence** can range from a singular flower without an involucre to a head of flowers, 5 to many, nested in a bowl-shaped involucre that is irregularly toothed and cut. **Flowers** consist of a calyx tube 4-5mm, 10 veined with lobes smaller than the tube. Each lobe has 3 to 5 tiny lateral teeth ending in a 1-1.5 red bristle. The corolla is 6-7mm pale pink or white. **Seed:** 1 (2).

Site Quality and Associated Species:
The site quality for these occurrences was good though populations were relatively small. The vegetation type for this species is the redwood (*Sequoia sempervirens)/*Douglas fir *(Pseudotsuga menziesii)* forest. The forest includes hardwood species such as: tan oak (*Notholithocarpus densiflorus*), California bay (*Umbellularia californica*), and madrone (*Arbutus menziesii*); shrubs include: California wax myrtle (*Myrica californica*), coyote brush (*Baccharis pilularis*), *Arctostaphylos columbiana*, thimbleberry (*Rubus parviflorus*), blue blossom (*Ceanothus thrysiflorus*) and western blackberry (*Rubus leucodermis*); ferns include western sword fern (*Polystichum munitum*) and bracken fern (*Pteridium aquilinum*).

Other roadbed species associated with the Santa Cruz clover include native grasses: slender hairgrass (*Deschampsia elongata*) and *Bromus vulgaris*; non-native grasses: common velvet grass (*Holcus lanatus*), six weeks fescue (*Vulpia bromoides*) and silver European hairgrass (*Aira caryophyllea*); native herbs: miniature lotus (*Lotus micranthus*), Spanish clover *(Lotus purshianus var. purshianus*), white-topped clover (*Trifolium varigatum),* tomcat clover *(T. willdenovii),* pinole clover (*T. bifidum),* and small-headed clover (*T. microcephalum)*. Non-native herbs include hairy cat's ears (*Hypochaeris radicata*) smooth cat's ear (*H. glabra*), little hop clover (*Trifolium dubium*), and *Soliva sessilis*.

Discussion
This rather atypical habitat for a rare plant, its diminutive size, brief blooming period, and resemblance to other clovers has resulted in a species that is likely more widespread than previously believed and frequently overlooked by botanists in the field. This survey further adds to our knowledge of the distribution of Santa Cruz clover on The Conservation Fund lands. The abundant occurrences already documented across the Garcia River Forest have already served as significant additions to known numbers of individuals worldwide. The Santa Cruz Clover is well suited to disturbed site conditions. These site conditions are not unique in the North Coast coniferous forests of NW California rather they are widespread as documented from previous surveys conducted between 2006 and 2014 on the Garcia River Forest (Heise and Hulse-Stephens 2013).

Recommendation:
From observations and yearly monitoring conducted by Heise and Hulse-Stephens on the Garcia River forest some patterns are emerging regarding the establishment and distribution of *T. buckwestiorum*. It has become increasingly apparent that it likely requires a narrow range of environmental conditions to persist as seasonal variation from site to site and between years is high. These include timing and amount of spring precipitation, road surface topography, and type and timing/frequency of road maintenance activity. We still know very little about its habitat requirements and types and degree of disturbance that could negatively affect populations; as an annual species it's a very unpredictable plant. Its tolerance and long-term viability to management activities such as road grading, watering, rocking and chemical application are slowly coming to light, thanks to the commitment of TCF to this monitoring effort (Heise and Hulse-Stephens, 2013).

9) Methuselah's beard lichen, *Usnea longissima* Ach.
Methuselah's beard lichen is an epiphytic fruticose lichen and a member of the Parmeliaceae Family.


Methuselah's beard lichen   Photo: K. Heise 2007

Rarity Rank: CRPR 4.2   (S4 G4)

Known Range: Distribution of Methuselah's beard lichen extends from Alaska to California to the Western Cascades. In California it has been documented in Del Norte, Humboldt, Mendocino, Santa Cruz, San Mateo and Sonoma counties.
Siting: Methuselah's beard lichen was observed by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys. Thirty three occurrences were recorded. See Appendix E, page 75 for coordinates.

Site Quality and Associate Species: "The Methuselah's beard lichen is present in scattered locations in and around the study areas. This lichen is a tree canopy lichen that propagated by wind-blown fragments that resume growth where entangled. This lichen is present on Douglas-fir trees, madrone trees, tanoaks, interior live oaks, manzanita and residual fruit trees. The presence on the property is near the south end of its known range. Several potential source trees (trees with a relatively high cover class for this lichen and which are located in areas that could support or continue to support future distribution and colonization of this species) have been identified in several" vineyard blocks including: middle Hoover 1.0, Fuller Creek 4.0 and Stanley 1.0" (Kjeldsen/RCA, 2009). According to Macrolichens of the Pacific Northwest, McCune and Geiser, 2000, "*U. longissima* is threatened or extirpated throughout most of its world range…Its highly local distributions suggest dispersal limitations that will impede its recovery from disturbances to its habitat."

Recommendation: "*U. longissima* is one of the most pollution-sensitive lichens. Its presence can be used as an indication of pure air, just as its disappearance indicates deteriorating air quality" (Brodo, et al. 2000). Protection from air pollution will largely be accomplished by the large contiguous preserve of which it is a part. However localized aggravations from heavy equipment use may be detrimental to the health of this population. At least a 100 m protection buffer is recommended to prevent disturbance to the forest composition, airflow or canopy composition all of which may be factors in the marginal success of this vestigial population.

Recommendation: "U. longissima is one of the most pollution-sensitive lichens. Its presence can be used as an indication of pure air, just as its disappearance indicates deteriorating air quality" (Brodo, et al, 2000). Protection from air pollution will largely be accomplished by the large contiguous preserve of which it is a part. However localized aggravations from heavy equipment use may be detrimental to the health of this population. At least a 100 m protection buffer is recommended to prevent disturbance to the forest composition, airflow or canopy composition all of which may be factors in the marginal success of this vestigial population.

Note: As mentioned above in the description of the Stanley Meadow complex, the **Western dog violet, *Viola adunca* subsp. *adunca*** was observed on March 13, 2014 by Heise and Hulse-Stephens and by Kjeldsen/Redwood Coast Associates during Preservation Ranch botanical surveys at Stanley 1.0 study area. "It is a host plant for the federally listed Behren's silverspot butterfly (*Speyeria zerene behrensii*) (BSSB). The range of the BSSB in Mendocino County is currently considered to be within one mile of marine waters from Laguna Point in Mckerricher State Park north of Fort Bragg, south to the Sonoma County border. In Sonoma County the range continues south to the Russian River mouth and also includes all areas within one mile of marine waters. In the Point Arena area of Mendocino County the range extends further inland because the mostly non-forested coastal slope extends further inland.

Within the range, habitats considered potentially suitable for BSSB can be variously described as grasslands, coastal prairie, coastal scrub, openings in coastal coniferous forest and sand dunes" (USFWS, 2003). Stanley 1.0 study area is located approximately 15 miles south of Point Arena and 4.4 miles inland from marine waters. While the habitat, "openings in coastal forests", appropriately describes Stanley 1.0 study area the distance from marine waters may be too great to support BSSB. Only field surveys can determine the viability of this site as BSSB habitat. The qualifications of botanists or butterfly surveyors should be submitted to AFWO for approval prior to any surveys. Failure to obtain pre-approval may result in rejection of habitat assessments or butterfly survey results (USFWS 2003).

Invasive Species

Best practice land management requires a vigilant approach to invasive plants. The introduction of foreign species into new landscapes can cause ecological chaos by altering natural processes and reducing biodiversity. In their home environment plant populations are regulated by slowly-evolving natural controls, but in lieu of these, introductions into a novel environment can result in an invasive plant response. Climate change adds a further dimension to the problem of invasive plant encroachment. Naturalized exotic species may prove more successful in adapting to changing environmental conditions, becoming more invasive, and furthering displacement of native species. For these reasons regular, early control of small noxious plant infestations is of prime importance. Large well-established populations will take a longer-term commitment, more resources, as well as an effective management plan to get under control.

Species that have caused high degrees of infestation on other land tracts managed by TCF in Northern California, such as jubata grass and French broom have had a far lesser degree of impact on the Buckeye Forest. Observations of jubata grass were occasional and small with little evident recruitment of young plants. French broom infestations were observed to be slightly more common and populations of small to moderate size. An area observed along Buckeye Creek supported a roadside population that extended less than 0.1 mile (N38 44.526 W123 21.746). A somewhat longer roadside infestation was observed west of the School 1.0 study area (Fig. 1) that persists for approximately .25 miles. Though larger infestations may occur on the Buckeye Forest none were observed during the six days of botanical investigation in the spring of this year in preparation for this report. Never-the-less French broom has a high invasive potential in interior coastal Sonoma County.

Invasive species of greater concern are Scotch broom, barbed goat grass, yellow star thistle and a number of grasses that have invaded grasslands and forest glades. Scotch broom was observed in an opening just north of the Buckeye Forest boundary on Lower Easy Road where it forms a dense infestation of more than one acre and serves as a vector for distribution along the Buckeye Forest Roads. The road west of Franchini Creek has several continuous stands of Scotch broom. This plant is well adapted to the conditions of interior coastal Sonoma County and has high invasive potential.

Barbed goat grass is a Cal-IPC rated “high” invasive. It was identified as occurring on the Buckeye Forest as identified in the plant list provided by Kjeldsen and Redwood Coast Associates (2006) during their Preservation Ranch botanical surveys; however, no location information was provided in the report. The presence of this plant on the property is of high ecological concern. It has the potential to displace native and less-noxious non-native species and become dominant in a few short years. This species is expanding throughout northern California and quickly creates a devastating monoculture that diminishes species diversity, forage quality and wildlife habitat. It has the ability to proliferate in varying types of conditions including serpentine soils. It grows in dense stands with a deep and rapidly establishing root system that makes it extremely competitive (ANR 2008). Should this species be observed on the Buckeye Forest every effort should be made to isolate and eradicate it. This species has proved difficult to control, however, carefully timed fire across successive seasons has shown to be effective (DiTomaso et al. 2001)

Yellow star thistle occupies roadsides and openings where it encroaches on grasslands and glades. Roads serve as a vector for this plant introducing it into new areas where it gradually moves into grasslands and alters ecological function. It correlates with areas of vehicle traffic and high pig disturbance and has encroached on the serpentine opening on Middle Hoover Road at the top of the ridge (N38 44.075 W123 16.668). Another infestation was observed on a south-facing slope on the east side of the property above Redwood Creek (N38 43.886 W123 15.322) in a grassland with a rich complement of native species that include blue dicks, western buttercup, (*Ranunculus occidentalis*), bi-colored linanthus (*Leptosiphon bicolor*), blue dicks, (*Dichelostemma capitatum* subsp. *capitatum*) and fringe pods (*Thysanocarpus cuvipes*). Eradication of this species will take years of consistent treatment and dedication.

Invasive plants, with the help of pig disturbance, and likely historical grazing have altered the grasslands of the Buckeye Forest. In many cases, such as the opening at Bear Ridge, species diversity has been replaced by a stronghold of invasive and non-native grasses. These include dominant slender oat grass and rip-gut brome, soft chess (*Bromus hordeaceus*), and red brome. Pig disturbance has created opportunities for annual grasses with high seed production to replace native annuals while perpetuating native geophytes, small bulbs that benefit from disturbance. These include both the native yellow and white mariposa lily (*Calochortus luteus* and *C. vestae*) as well as harvest brodiaea (*Brodiaea elegans*).

In the serpentine grasslands on Middle Hoover Road slender oat grass (*Avena barbata*) has moved into areas crowding out and replacing serpentine endemics and native species such as *Festuca microstachys*, goldfields (*Lasthenia californica*), hill morning glory (*Calystegia subacaulis*), harvest brodiaea, and meadow barley (*Hordeum brachyantherum* subsp. *brachyantherum*) that are now restricted to refugia at the edges of the opening and areas where serpentinite soils are strongest. On the north side of the road vestigial stands of native purple needle grass (*Stipa pulchra*), meadow barley and Idaho fescue (*Festuca idahoensis*) make up a small but consistent component in the mosaic of native and invasive plants. Invasives include big quaking grass, red brome, slender oat grass and Mediterranean barley. These grasslands are continuously undergoing pressure from feral pigs and invasive species that will continue to degrade native species diversity.

Table 1 below lists plants considered by the California Invasive Plant Counsel (Cal-IPC) to have severe (high) to substantial (moderate) ecological impacts on physical processes, plant and animal communities, and vegetation structure (Cal-IPC, 2014). These plants though rated high or moderate display different degrees of impact/infestation behavior as influenced by soils, climatic conditions and disturbance regimes unique to the Buckeye Forest.

Table 1: Cal-IPC High and Moderate Rated Invasive Plants Observed on the Buckeye Forest

Scientific name	**Common name**	**Cal-IPC rating**	**Habitat**
Aegilops truncialis	barbed goat grass	high	Grassland, roadside
Anthoxanthum odoratum	sweet vernal grass	moderate	Grassland, roadside
Avena barbata	slender oat	moderate	Grassland, roadside
Avena fatua	wild oat	moderate	Grassland, roadside
Bromus diandrus	rip-gut brome	moderate	Grassland, roadside
Bromus madritensis subsp. rubens	red brome	moderate	Grassland, roadside
Carduus pycnocephalus	Italian thistle	moderate	Grassland, woodland, forest, roadside
Centaurea calcitrapa	purple star-thistle	moderate	Grassland, roadside
Centaurea melitensis	Napa thistle, tocalote	moderate	Grassland, roadside
Centaurea solstitialis	yellow star thistle	high	Grassland, woodland edges, roadside
Cirsium vulgare	bull thistle	moderate	Grassland, riparian, roadside
Cortaderia jubata	jubata grass	high	Forest opening, roadside
Cynosurus echinatus	hedgehog-dogtail grass	moderate	Grassland, forest opening, roadside
Cytisus scoparius	Scotch broom	high	Woodland, forest openings, roadside

Elymus caput-medusae	Medusa-head grass	high	Grassland, roadside
Festuca myuros	rattail fescue	moderate	Grassland, roadside
Ficus carica	edible fig	moderate	Riparian woodland
Genista monspessulana	French broom	high	Forest, grassland
Hedera helix	English ivy	high	Forest
Holcus lanatus	Common velvet grass	moderate	Grassland, roadside
Hordeum marinum ssp. gussoneanum	Mediterranean barley	moderate	Grassland, roadside
Hordum murinum ssp. leporinum	hare barley	moderate	Grassland, roadside
Hypericum perforatum	Klamath weed	moderate	Grassland
Mentha pulegium	penny royal	moderate	Grassland, wetlands
Rubus armeniacus	Himalayan blackberry	high	Forest opening, roadside, riparian
Rumex acetosella	sheep sorrel	moderate	Grassland, roadside
Vinca major	Periwinkle	moderate	Riparian, forest edge

Cal-IPC assigns a rating of **high** to species that "*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, 2014).

Cal-IPC assigns a rating of **moderate** to species that "*have substantial and apparent, but generally not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread*" (Cal-IPC, 2014).

Recommendation: Invasive plant species are continuously altering the landscape, lessening species richness and often creating monocultures where there was once species diversity and valuable wildlife habitat. Certain species of concern like Scotch broom, French broom and jubata grass occur infrequently on the Buckeye Forest in stands that are isolated and small enough so they can be treated either chemically or mechanically as part of a regular maintenance program. Any planned roadwork or mechanical disturbance in areas where these invasive plants and their propagules occur should have a plan to treat the infestation as part of the project and follow up annually, over the next five years.

Species such as yellow star thistle, the invasive oat grasses and bromes would require a management plan if it were the goal of The Conservation Fund to control or restore in part the areas these species now dominate.

SUMMARY OF RESULTS FOR THE BUCKEYE FOREST

The total number of vascular plant taxa recorded for the Buckeye Forest is 606 within 89 Families. Of these, 166 taxa are non-native or 27% of the flora. Out of the 166 non-native taxa, 27 are considered invasive, of these, 8 are rated by Cal-IPC to have a "high" potential for ecological impact, displace native plant communities, and change the structure and function of entire ecosystems.

For non-vascular plants - Bryophytes: 44 taxa in 32 Families; Lichens: 62 taxa; Fungi: 72 taxa in 23 Families. This equals a grand total of 783 taxa. There are currently 9 rare plant taxa (8 vascular plants and 1 lichen), additionally 2 habitat types and 6 vegetation alliances are considered rare.

Locally Rare Habitats:

Serpentine area at Big Rock
Stanley Meadow Complex

Rare Vegetation Alliances:

Quercus garryana Woodland Alliance
Acer macrophyllum Forest Alliance
Aesculus californica Woodland Alliance
Stipa pulchra Herbaceous Alliance
Danthonia californica Herbaceous Alliance
Festuca idahoensis Herbaceous Alliance

Rare Plant Taxa:

Brewer's milkvetch (*Astragalus breweri*) CRPR 4.2
Bolander's reed grass (*Calamagrostis bolanderi*) CRPR 4.2
Serpentine bird's beak (*Cordylanthus tenuis* subsp. *brunneus*) CRPR 4.3
Thin-lobed Horkelia (*Horkelia tenuiloba*) CRPR 1B.2
Harlequin lotus (*Hosackia gracilis*) CRPR 4.2
White-flowered rein orchid (*Piperia candida*) CRPR 1B.2
California pine foot (*Pityopus californica*) CRPR 4.2
Santa Cruz clover (*Trifolium buckwestiorum*) CRPR 1.B.1
Long beard lichen (*Usnea longissima*) CRPR 4.2

Invasive Plants with "High" Cal-IPC Rating:

barbed goat grass *(Aegilops truncialis)*
yellow star thistle *(Centaurea solstitialis)*
jubata grass (*Cortaderia jubata)*
Scotch broom *(Cytisus scoparius)*
medusa-headgrass (*Elymus caput-medusae)*
French broom *(Genista monspessulana*
English ivy *(Hedera helix)*
Himalayan blackberry *(Rubus armeniacus)*

CONCLUSION

This assessment of the botanical resources of the Buckeye Forest relied on an assortment of historical documents, including plant lists from past THP surveys, more recent surveys conducted for the Preservation Ranch, information gained from the ongoing Sonoma County Vegetation Mapping Project, and our own field investigations in 2014. We are grateful to TCF staff for their insight into the Buckeye Forest and support with logistics.

Typical of much of the northern coniferous forest in California, the Buckeye Forest is largely a young forest of Douglas fir and tanoak, the result of more than a century of timber extraction resulting in a forest ecosystem compositionally, structurally, and functionally, very different from the original forest. Never-the-less the Buckeye Forest contains a diverse suite of habitats and plant communities supporting a rich native plant flora. Notable are the serpentine grasslands and barrens along the Windy Gap Road which support many native species restricted to this habitat, including 1 rare species. The unique mesic meadow complex of Stanley Ridge which supports no fewer than 5 rare plant taxa. The Garry oak forest patches which represent islands of important wildlife habitat and high native plant diversity, and lastly the native *Stipa pulchra* grasslands and miles of riparian habitat.

These botanical resources, along with others addressed in this report represent areas of high conservation value. A common goal in any natural resource management plan is maintaining the ecological integrity of such areas by preventing and/or reducing impacts that can have negative consequences. This is achievable partly through control of invasive species, including feral pigs, and regular monitoring.

Although the Buckeye Forest has received a lot of attention from various investigators there is still much work to be done. A more extensive baseline survey of the Buckeye Forest is needed to help fill in our gaps of the flora and vegetation alliances across the property, indeed, many corners of the Buckeye Forest are difficult to access and await exploration. Monitoring studies need to be designed for those species and habitat identified here which are vulnerable to impacts such as those from feral pigs, invasive species, and climate change.

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Appendix A: California Native Plant Society - Inventory of Rare and Endangered Plants, 8th Ed. Accessed July 2014
List for all rare plants in Sonoma and Mendocino Counties, not limited by habitat type
Note: Those in bold occur within 9-quad area surrounding the Annapolis USGS quad; those in red occur within Buckeye Forest.

Scientific Name	Common Name	Family	CRPR	S-Rank	G-Rank	CESA	FESA
Abronia umbellata var. breviflora	pink sand-verbena	Nyctaginaceae	1B.1	S1	G4G5T2	None	None
Agrostis blasdalei	**Blasdale's bent grass**	**Poaceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Alisma gramineum	grass alisma	Alismataceae	2B.2	S1S2	G5	None	None
Allium peninsulare var. franciscanum	Franciscan onion	Alliaceae	1B.2	S1	G5T1	None	None
Alopecurus aequalis var. sonomensis	Sonoma alopecurus	Poaceae	1B.1	S1	G5T1Q	None	FE
Amorpha californica var. napensis	**Napa false indigo**	**Fabaceae**	**1B.2**	**S2**	**G4T2**	**None**	**None**
Amsinckia lunaris	bent-flowered fiddleneck	Boraginaceae	1B.2	S2?	G2?	None	None
Angelica lucida	sea-watch	Apiaceae	4.2	S2S3	G5	None	None
Anisocarpus scabridus	scabrid alpine tarplant	Asteraceae	1B.3	S2S3	G2G3	None	None
Anomobryum julaceum	slender silver moss	Bryaceae	2B.2	S2	G4G5	None	None
Antirrhinum virga	twig-like snapdragon	Plantaginaceae	4.3	S3.3?	G3	None	None
Arabis blepharophylla	coast rockcress	Brassicaceae	4.3	S3.3?	G3	None	None
Arabis mcdonaldiana	McDonald's rockcress	Brassicaceae	1B.1	S2	G2	CE	FE
Arctostaphylos bakeri ssp. bakeri	Baker's manzanita	Ericaceae	1B.1	S2	G2T2	CR	None
Arctostaphylos bakeri ssp. sublaevis	**The Cedars manzanita**	**Ericaceae**	**1B.2**	**S2**	**G2T2**	**CR**	**None**
Arctostaphylos canescens ssp. sonomensis	Sonoma canescent manzanita	Ericaceae	1B.2	S2	G3G4T2	None	None
Arctostaphylos densiflora	Vine Hill manzanita	Ericaceae	1B.1	S1	G1	CE	None
Arctostaphylos hispidula	**Howell's manzanita**	**Ericaceae**	**4.2**	**S3.2**	**G3**	**None**	**None**
Arctostaphylos manzanita ssp. elegans	Konocti manzanita	Ericaceae	1B.3	S3	G5T3	None	None
Arctostaphylos nummularia ssp. mendocinoensis	pygmy manzanita	Ericaceae	1B.2	S1	G3?T1	None	None
Arctostaphylos stanfordiana ssp. decumbens	Rincon Ridge manzanita	Ericaceae	1B.1	S1	G3T1	None	None
Arctostaphylos stanfordiana ssp. raichei	Raiche's manzanita	Ericaceae	1B.1	S2?	G3T2?	None	None
Asclepias solanoana	**serpentine milkweed**	**Apocynaceae**	**4.2**	**S3.2**	**G3**	**None**	**None**
Astragalus agnicidus	Humboldt County milk-vetch	Fabaceae	1B.1	S3	G3	CE	None
Astragalus breweri	**Brewer's milk-vetch**	**Fabaceae**	**4.2**	**S3.2**	**G3**	**None**	**None**
Astragalus claranus	Clara Hunt's milk-vetch	Fabaceae	1B.1	S1	G1	CT	FE
Astragalus clevelandii	Cleveland's milk-vetch	Fabaceae	4.3	S3.3?	G3?	None	None
Astragalus rattanii var. jepsonianus	Jepson's milk-vetch	Fabaceae	1B.2	S3	G4T3	None	None

Astragalus rattanii var. rattanii	Rattan's milk-vetch	Fabaceae	4.3	S3.3	G4T3	None	None
Astragalus tener var. tener	alkali milk-vetch	Fabaceae	1B.2	S2	G2T2	None	None
Balsamorhiza macrolepis	big-scale balsamroot	Asteraceae	1B.2	S2	G2	None	None
Blennosperma bakeri	Sonoma sunshine	Asteraceae	1B.1	S1	G1	CE	FE
Blennosperma nanum var. robustum	Point Reyes blennosperma	Asteraceae	1B.2	S2	G4T2	CR	None
Botrypus virginianus	rattlesnake fern	Ophioglossaceae	2B.2	S2	G5	None	None
Brasenia schreberi	watershield	Cabombaceae	2B.3	S2	G5	None	None
Brodiaea leptandra	narrow-anthered brodiaea	Themidaceae	1B.2	S3?	G3?	None	None
Bryoria pseudocapillaris	false gray horsehair lichen	Parmeliaceae	3.2	S2	G3	None	None
Calamagrostis bolanderi	**Bolander's reed grass**	**Poaceae**	**4.2**	**S3.2**	**G3**	**None**	**None**
Calamagrostis crassiglumis	Thurber's reed grass	Poaceae	2B.1	S2?	G3Q	None	None
Calamagrostis foliosa	leafy reed grass	Poaceae	4.2	S3.2	G3	CR	None
Calamagrostis ophitidis	serpentine reed grass	Poaceae	4.3	S3.3	G3	None	None
Calandrinia breweri	Brewer's calandrinia	Montiaceae	4.2	S3.2?	G4	None	None
California macrophylla	round-leaved filaree	Geraniaceae	1B.1	S2	G2	None	None
Calochortus raichei	**The Cedars fairy-lantern**	**Liliaceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Calochortus uniflorus	**pink star-tulip**	**Liliaceae**	**4.2**	**S3**	**G4**	**None**	**None**
Calyptridium quadripetalum	four-petaled pussypaws	Montiaceae	4.3	S3.3	G3	None	None
Calystegia atriplicifolia ssp. buttensis	Butte County morning-glory	Convolvulaceae	4.2	S3	G5T3	None	None
Calystegia collina ssp. oxyphylla	**Mt. Saint Helena morning-glory**	**Convolvulaceae**	**4.2**	**S3.2**	**G4T3**	**None**	**None**
Calystegia collina ssp. tridactylosa	three-fingered morning-glory	Convolvulaceae	1B.2	S1	G4T1	None	None
Calystegia purpurata ssp. saxicola	**coastal bluff morning-glory**	**Convolvulaceae**	**1B.2**	**S2S3**	**G4T2T3**	**None**	**None**
Campanula californica	**swamp harebell**	**Campanulaceae**	**1B.2**	**S3**	**G3**	**None**	**None**
Cardamine pachystigma var. dissectifolia	dissected-leaved toothwort	Brassicaceae	1B.2	S2	Q	None	None
Carex arcta	northern clustered sedge	Cyperaceae	2B.2	S2	G5	None	None
Carex buxbaumii	Buxbaum's sedge	Cyperaceae	4.2	S3.2	G5	None	None
Carex californica	California sedge	Cyperaceae	2B.3	S2?	G5	None	None
Carex comosa	bristly sedge	Cyperaceae	2B.1	S2	G5	None	None
Carex lenticularis var. limnophila	lagoon sedge	Cyperaceae	2B.2	S1	G5T5	None	None
Carex livida	livid sedge	Cyperaceae	2A	SH	G5	None	None
Carex lyngbyei	Lyngbye's sedge	Cyperaceae	2B.2	S2	G5	None	None
Carex saliniformis	**deceiving sedge**	**Cyperaceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Carex viridula ssp. viridula	green yellow sedge	Cyperaceae	2B.3	S1.3	G5T5	None	None
Castilleja ambigua var. ambigua	**johnny-nip**	**Orobanchaceae**	**4.2**	**S3**	**G4T3T4**	**None**	**None**
Castilleja ambigua var. humboldtiensis	Humboldt Bay owl's-clover	Orobanchaceae	1B.2	S2	G4T2	None	None

Castilleja latifolia	**Monterey Coast paintbrush**	**Orobanchaceae**	**4.3**	**S3.3**	**G3**	**None**	**None**
Castilleja litoralis	Oregon coast paintbrush	Orobanchaceae	2B.2	S3	G4G5T4	None	None
Castilleja mendocinensis	Mendocino Coast paintbrush	Orobanchaceae	1B.2	S2	G2	None	None
Castilleja uliginosa	Pitkin Marsh paintbrush	Orobanchaceae	1A	SX	GXQ	CE	None
Ceanothus confusus	Rincon Ridge ceanothus	Rhamnaceae	1B.1	S1	G1	None	None
Ceanothus divergens	Calistoga ceanothus	Rhamnaceae	1B.2	S2	G2	None	None
Ceanothus foliosus var. vineatus	Vine Hill ceanothus	Rhamnaceae	1B.1	S1?	G3T1	None	None
Ceanothus gloriosus var. exaltatus	**glory brush**	**Rhamnaceae**	**4.3**	**S3.3**	**G3G4T3**	**None**	**None**
Ceanothus gloriosus var. gloriosus	**Point Reyes ceanothus**	**Rhamnaceae**	**4.3**	**S3.3**	**G3G4T3**	**None**	**None**
Ceanothus purpureus	**holly-leaved ceanothus**	**Rhamnaceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Ceanothus sonomensis	Sonoma ceanothus	Rhamnaceae	1B.2	S2	G2	None	None
Centromadia parryi ssp. parryi	pappose tarplant	Asteraceae	1B.2	S1	G3T1	None	None
Chlorogalum pomeridianum var. minus	dwarf soaproot	Agavaceae	1B.2	S2	G5T2	None	None
Chloropyron maritimum ssp. palustre	Point Reyes bird's-beak	Orobanchaceae	1B.2	S2	G4?T2	None	None
Chloropyron molle ssp. molle	soft bird's-beak	Orobanchaceae	1B.2	S1	G2T1	CR	FE
Chorizanthe cuspidata var. cuspidata	San Francisco Bay spineflower	Polygonaceae	1B.2	S1	G2T1	None	None
Chorizanthe cuspidata var. villosa	**woolly-headed spineflower**	**Polygonaceae**	**1B.2**	**S2**	**G2T2**	**None**	**None**
Chorizanthe howellii	Howell's spineflower	Polygonaceae	1B.2	S1	G1	CT	FE
Chorizanthe valida	**Sonoma spineflower**	**Polygonaceae**	**1B.1**	**S1**	**G1**	**CE**	**FE**
Cirsium andrewsii	Franciscan thistle	Asteraceae	1B.2	S3	G3	None	None
Clarkia amoena ssp. whitneyi	Whitney's farewell-to-spring	Onagraceae	1B.1	S1	G5T1	None	None
Clarkia gracilis ssp. tracyi	Tracy's clarkia	Onagraceae	4.2	S3.2	G5T3	None	None
Clarkia imbricata	Vine Hill clarkia	Onagraceae	1B.1	S1	G1	CE	FE
Collinsia corymbosa	round-headed Chinese-houses	Plantaginaceae	1B.2	S1	G1	None	None
Collomia diversifolia	serpentine collomia	Polemoniaceae	4.3	S3.3	G3	None	None
Coptis laciniata	Oregon goldthread	Ranunculaceae	2B.2	S3	G4G5	None	None
Cordylanthus tenuis ssp. brunneus	**serpentine bird's-beak**	**Orobanchaceae**	**4.3**	**S3.3**	**G4G5T3**	**None**	**None**
Cordylanthus tenuis ssp. capillaris	Pennell's bird's-beak	Orobanchaceae	1B.2	S1	G4G5T1	CR	FE
Cornus canadensis	bunchberry	Cornaceae	2B.2	S2	G5	None	None
Cryptantha dissita	serpentine cryptantha	Boraginaceae	1B.2	S2	G2	None	None
Cryptantha excavata	deep-scarred cryptantha	Boraginaceae	1B.3	S2.3	G2	None	None
Cuscuta obtusiflora var. glandulosa	Peruvian dodder	Convolvulaceae	2B.2	SH	G5T4T5	None	None
Cuscuta pacifica var. papillata	Mendocino dodder	Convolvulaceae	1B.2	S1	G5T1	None	None
Cypripedium californicum	**California lady's-slipper**	**Orchidaceae**	**4.2**	**S3.2**	**G3**	**None**	**None**
Cypripedium fasciculatum	clustered lady's-slipper	Orchidaceae	4.2	S3.2	G4	None	None
Cypripedium montanum	mountain lady's-slipper	Orchidaceae	4.2	S4.2	G4	None	None

Delphinium bakeri	Baker's larkspur	Ranunculaceae	1B.1	S1	G1	CE	FE
Delphinium luteum	golden larkspur	Ranunculaceae	1B.1	S1	G1	CR	FE
Didymodon norrisii	**Norris' beard moss**	**Pottiaceae**	**2B.2**	**S3S4**	**G3G4**	**None**	**None**
Dirca occidentalis	western leatherwood	Thymelaeaceae	1B.2	S2S3	G2G3	None	None
Downingia pusilla	dwarf downingia	Campanulaceae	2B.2	S2	GU	None	None
Eleocharis parvula	small spikerush	Cyperaceae	4.3	S3.3	G5	None	None
Elymus californicus	California bottle-brush grass	Poaceae	4.3	S3.3	G3	None	None
Entosthodon kochii	Koch's cord moss	Funariaceae	1B.3	S1	G1	None	None
Epilobium nivium	Snow Mountain willowherb	Onagraceae	1B.2	S2.2	G2	None	None
Epilobium oreganum	Oregon fireweed	Onagraceae	1B.2	S2	G2	None	None
Epilobium septentrionale	Humboldt County fuchsia	Onagraceae	4.3	S3.3	G3	None	None
Erigeron biolettii	streamside daisy	Asteraceae	3	S3?	G3?	None	None
Erigeron greenei	Greene's narrow-leaved daisy	Asteraceae	1B.2	S2	G2	None	None
Erigeron robustior	robust daisy	Asteraceae	4.3	S3.3	G3	None	None
Erigeron serpentinus	**serpentine daisy**	**Asteraceae**	**1B.3**	**S2**	**G2**	**None**	**None**
Erigeron supplex	**supple daisy**	**Asteraceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Eriogonum cedrorum	**The Cedars buckwheat**	**Polygonaceae**	**1B.3**	**S1**	**G1**	**None**	**None**
Eriogonum kelloggii	Kellogg's buckwheat	Polygonaceae	1B.2	S2	G2	CE	FC
Eriogonum luteolum var. caninum	Tiburon buckwheat	Polygonaceae	1B.2	S2	G5T2	None	None
Eriogonum nervulosum	**Snow Mountain buckwheat**	**Polygonaceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Eriogonum strictum var. greenei	Greene's buckwheat	Polygonaceae	4.3	S3.3	G5T3Q	None	None
Eriogonum ternatum	**ternate buckwheat**	**Polygonaceae**	**4.3**	**S3.3**	**G4**	**None**	**None**
Eriogonum umbellatum var. bahiiforme	bay buckwheat	Polygonaceae	4.2	S3.2	G5T3	None	None
Eriophorum gracile	slender cottongrass	Cyperaceae	4.3	S3.3	G5	None	None
Eryngium constancei	Loch Lomond button-celery	Apiaceae	1B.1	S1	G1	CE	FE
Eryngium pinnatisectum	Tuolumne button-celery	Apiaceae	1B.2	S2	G2	None	None
Erysimum concinnum	**bluff wallflower**	**Brassicaceae**	**1B.2**	**S3**	**G3**	**None**	**None**
Erysimum franciscanum	San Francisco wallflower	Brassicaceae	4.2	S3.2	G3	None	None
Erysimum menziesii	Menzies? wallflower	Brassicaceae	1B.1	S1	G1	CE	FE
Erythronium citrinum var. citrinum	lemon-colored fawn lily	Liliaceae	4.3	S3.3	G4T4	None	None
Erythronium helenae	St. Helena fawn lily	Liliaceae	4.2	S3.2	G3	None	None
Erythronium oregonum	giant fawn lily	Liliaceae	2B.2	S2.2	G5	None	None
Erythronium revolutum	coast fawn lily	Liliaceae	2B.2	S2S3	G4	None	None
Eschscholzia hypecoides	San Benito poppy	Papaveraceae	4.3	S3.3	G3	None	None
Fissidens pauperculus	minute pocket moss	Fissidentaceae	1B.2	S1	G3?	None	None
Fritillaria agrestis	stinkbells	Liliaceae	4.2	S3.2	G3	None	None

Fritillaria glauca	Siskiyou fritillaria	Liliaceae	4.2	S3	G3G4	None	None
Fritillaria liliacea	fragrant fritillary	Liliaceae	1B.2	S2	G2	None	None
Fritillaria purdyi	Purdy's fritillary	Liliaceae	4.3	S3.2	G3	None	None
Fritillaria roderickii	Roderick's fritillary	Liliaceae	1B.1	S1	G1Q	CE	None
Gentiana setigera	Mendocino gentian	Gentianaceae	1B.2	S1	G2	None	None
Gilia capitata ssp. chamissonis	blue coast gilia	Polemoniaceae	1B.1	S2.1	G5T2	None	None
Gilia capitata ssp. pacifica	**Pacific gilia**	**Polemoniaceae**	**1B.2**	**S2.2?**	**G5T3T4**	**None**	**None**
Gilia capitata ssp. tomentosa	**woolly-headed gilia**	**Polemoniaceae**	**1B.1**	**S2**	**G5T2**	**None**	**None**
Gilia millefoliata	**dark-eyed gilia**	**Polemoniaceae**	**1B.2**	**S2.2**	**G2**	**None**	**None**
Glehnia littoralis ssp. leiocarpa	**American glehnia**	**Apiaceae**	**4.2**	**S3.2**	**G5T5**	**None**	**None**
Glyceria grandis	American manna grass	Poaceae	2B.3	S2	G5	None	None
Gratiola heterosepala	Boggs Lake hedge-hyssop	Plantaginaceae	1B.2	S2	G2	CE	None
Hackelia amethystina	amethyst stickseed	Boraginaceae	4.3	S3.3	G3	None	None
Harmonia guggolziorum	Guggolz' harmonia	Asteraceae	1B.1	S1	G1	None	None
Harmonia nutans	nodding harmonia	Asteraceae	4.3	S3.3	G3	None	None
Helianthus exilis	serpentine sunflower	Asteraceae	4.2	S3.2	G3Q	None	None
Hemizonia congesta ssp. calyculata	Mendocino tarplant	Asteraceae	4.3	S3.3	G5T3	None	None
Hemizonia congesta ssp. congesta	white seaside tarplant	Asteraceae	1B.2	S2S3	G5T2T3	None	None
Hemizonia congesta ssp. tracyi	Tracy's tarplant	Asteraceae	4.3	S3.3	G5T3	None	None
Hesperevax sparsiflora var. brevifolia	**short-leaved evax**	**Asteraceae**	**1B.2**	**S2S3**	**G4T2T3**	**None**	**None**
Hesperocyparis pygmaea	**pygmy cypress**	**Cupressaceae**	**1B.2**	**S2**	**G2**	**None**	**None**
Hesperolinon adenophyllum	glandular western flax	Linaceae	1B.2	S2.3	G2	None	None
Hesperolinon bicarpellatum	two-carpellate western flax	Linaceae	1B.2	S2.2	G2	None	None
Heteranthera dubia	water star-grass	Pontederiaceae	2B.2	S1	G5	None	None
Horkelia bolanderi	Bolander's horkelia	Rosaceae	1B.2	S1	G1	None	None
Horkelia marinensis	Point Reyes horkelia	Rosaceae	1B.2	S2.2	G2	None	None
Horkelia tenuiloba	**thin-lobed horkelia**	**Rosaceae**	**1B.2**	**S2.2**	**G2**	**None**	**None**
Hosackia gracilis	**harlequin lotus**	**Fabaceae**	**4.2**	**S3.2**	**G4**	**None**	**None**
Howellia aquatilis	water howellia	Campanulaceae	2B.2	S2	G3	None	FT
Iliamna bakeri	Baker's globe mallow	Malvaceae	4.2	S3.2	G4	None	None
Iris longipetala	**coast iris**	**Iridaceae**	**4.2**	**S3.2**	**G3**	**None**	**None**
Juncus supiniformis	hair-leaved rush	Juncaceae	2B.2	S2.2?	G5	None	None
Kopsiopsis hookeri	small groundcone	Orobanchaceae	2B.3	S1S2	G5	None	None
Lasthenia burkei	Burke's goldfields	Asteraceae	1B.1	S1	G1	CE	FE
Lasthenia californica ssp. bakeri	**Baker's goldfields**	**Asteraceae**	**1B.2**	**SH**	**G3TH**	**None**	**None**
Lasthenia californica ssp. macrantha	**perennial goldfields**	**Asteraceae**	**1B.2**	**S2.2**	**G3T2**	**None**	**None**

Lasthenia conjugens	Contra Costa goldfields	Asteraceae	1B.1	S1	G1	None	FE
Lathyrus glandulosus	sticky pea	Fabaceae	4.3	S3.3	G3	None	None
Lathyrus jepsonii var. jepsonii	Delta tule pea	Fabaceae	1B.2	S2.2	G5T2	None	None
Lathyrus palustris	marsh pea	Fabaceae	2B.2	S2S3	G5	None	None
Layia septentrionalis	Colusa layia	Asteraceae	1B.2	S2.2	G2	None	None
Legenere limosa	legenere	Campanulaceae	1B.1	S2.2	G2	None	None
Leptosiphon acicularis	bristly leptosiphon	Polemoniaceae	4.2	S3.2	G3	None	None
Leptosiphon grandiflorus	large-flowered leptosiphon	Polemoniaceae	4.2	S3.2	G3	None	None
Leptosiphon jepsonii	Jepson's leptosiphon	Polemoniaceae	1B.2	S2	G2	None	None
Leptosiphon latisectus	broad-lobed leptosiphon	Polemoniaceae	4.3	S3.3	G3	None	None
Leptosiphon rattanii	Rattan's leptosiphon	Polemoniaceae	4.3	S3.3	G3	None	None
Leptosiphon rosaceus	**rose leptosiphon**	**Polemoniaceae**	**1B.1**	**S1**	**G1**	**None**	**None**
Lessingia arachnoidea	Crystal Springs lessingia	Asteraceae	1B.2	S1	G1	None	None
Lessingia hololeuca	woolly-headed lessingia	Asteraceae	3	S3	G3	None	None
Lewisia stebbinsii	Stebbins' lewisia	Montiaceae	1B.2	S2	G2	None	None
Lilium maritimum	**coast lily**	**Liliaceae**	**1B.1**	**S2**	**G2**	**None**	**None**
Lilium pardalinum ssp. pitkinense	Pitkin Marsh lily	Liliaceae	1B.1	S1	G5T1	CE	FE
Lilium rubescens	redwood lily	Liliaceae	4.2	S3.2	G3	None	None
Limnanthes bakeri	Baker's meadowfoam	Limnanthaceae	1B.1	S1	G1	CR	None
Limnanthes vinculans	Sebastopol meadowfoam	Limnanthaceae	1B.1	S1	G1	CE	FE
Listera cordata	heart-leaved twayblade	Orchidaceae	4.2	S3.2	G5	None	None
Lomatium engelmannii	Engelmann's lomatium	Apiaceae	4.3	S3.3	G3	None	None
Lomatium repostum	Napa lomatium	Apiaceae	4.3	S3.3	G3	None	None
Lomatium tracyi	Tracy's lomatium	Apiaceae	4.3	S3.3	G3	None	None
Lupinus antoninus	Anthony Peak lupine	Fabaceae	1B.3	S2	G2	None	None
Lupinus arboreus var. eximius	San Mateo tree lupine	Fabaceae	3.2	S2.2	G2Q	None	None
Lupinus milo-bakeri	Milo Baker's lupine	Fabaceae	1B.1	S1	G1Q	CT	None
Lupinus sericatus	**Cobb Mountain lupine**	**Fabaceae**	**1B.2**	**S2.2**	**G2**	**None**	**None**
Lupinus tidestromii	Tidestrom's lupine	Fabaceae	1B.1	S1	G1	CE	FE
Lycopodium clavatum	**running-pine**	**Lycopodiaceae**	**4.1**	**S4.1**	**G5**	**None**	**None**
Malacothamnus hallii	Hall's bush-mallow	Malvaceae	1B.2	S2	G2Q	None	None
Malacothamnus mendocinensis	Mendocino bush-mallow	Malvaceae	1A	SX	GXQ	None	None
Melica spectabilis	purple onion grass	Poaceae	4.3	S3.3	G5	None	None
Micropus amphibolus	Mt. Diablo cottonweed	Asteraceae	3.2	S3.2?	G3	None	None
Microseris borealis	northern microseris	Asteraceae	2B.1	S1	G5	None	None
Microseris paludosa	marsh microseris	Asteraceae	1B.2	S2.2	G2	None	None

Mimulus nudatus	bare monkeyflower	Phrymaceae	4.3	S3.3	G3	None	None
Mitellastra caulescens	leafy-stemmed mitrewort	Saxifragaceae	4.2	S4.2	G5	None	None
Monardella viridis	green monardella	Lamiaceae	4.3	S3.3	G3T3	None	None
Navarretia cotulifolia	cotula navarretia	Polemoniaceae	4.2	S3.2	G3	None	None
Navarretia leucocephala ssp. bakeri	Baker's navarretia	Polemoniaceae	1B.1	S2	G4T2	None	None
Navarretia leucocephala ssp. plieantha	many-flowered navarretia	Polemoniaceae	1B.2	S1	G4T1	CE	FE
Navarretia sinistra ssp. pinnatisecta	pinnate-leaved navarretia	Polemoniaceae	4.3	S3.3	G4G5T3	None	None
Navarretia subuligera	awl-leaved navarretia	Polemoniaceae	4.3	S3.3	G4	None	None
Oenothera wolfii	Wolf's evening-primrose	Onagraceae	1B.1	S1	G1	None	None
Ophioglossum pusillum	northern adder's-tongue	Ophioglossaceae	2B.2	S1	G5	None	None
Orobanche valida ssp. howellii	Howell's broomrape	Orobanchaceae	4.3	S3.3	G3T3	None	None
Packera bolanderi var. bolanderi	seacoast ragwort	Asteraceae	2B.2	S2S3	G4T4	None	None
Panicum acuminatum var. thermale	Geysers panicum	Poaceae	1B.2	S2	G5T2Q	CE	None
Penstemon newberryi var. sonomensis	Sonoma beardtongue	Plantaginaceae	1B.3	S2	G4T1	None	None
Perideridia gairdneri ssp. gairdneri	**Gairdner's yampah**	**Apiaceae**	**4.2**	**S3.2**	**G5T3**	**None**	**None**
Phacelia insularis var. continentis	North Coast phacelia	Boraginaceae	1B.2	S1	G2T1	None	None
Pinus contorta ssp. bolanderi	Bolander's beach pine	Pinaceae	1B.2	S2	G5T2	None	None
Piperia candida	**white-flowered rein orchid**	**Orchidaceae**	**1B.2**	**S2**	**G3?**	**None**	**None**
Piperia leptopetala	narrow-petaled rein orchid	Orchidaceae	4.3	S3.3	G3	None	None
Pityopus californica	**California pinefoot**	**Ericaceae**	**4.2**	**S3.2**	**G4G5**	**None**	**None**
Plagiobothrys lithocaryus	Mayacamas popcorn-flower	Boraginaceae	1A	SH	GH	None	None
Plagiobothrys mollis var. vestitus	Petaluma popcorn-flower	Boraginaceae	1A	SX	G4?TX	None	None
Pleuropogon californicus var. davyi	Davy's semaphore grass	Poaceae	4.3	S3.3	G5T3	None	None
Pleuropogon hooverianus	North Coast semaphore grass	Poaceae	1B.1	S2	G2	CT	None
Pleuropogon refractus	nodding semaphore grass	Poaceae	4.2	S3.2?	G4	None	None
Polemonium carneum	Oregon polemonium	Polemoniaceae	2B.2	S1	G4	None	None
Polygonum marinense	Marin knotweed	Polygonaceae	3.1	S2	G2Q	None	None
Potamogeton epihydrus	ribbon-leaved pondweed	Potamogetonaceae	2B.2	S2.2?	G5	None	None
Potentilla hickmanii	Hickman's cinquefoil	Rosaceae	1B.1	S1	G1	CE	FE
Potentilla uliginosa	Cunningham Marsh cinquefoil	Rosaceae	1A	SH	GH	None	None
Ptilidium californicum	Pacific fuzz wort	Ptilidiaceae	4.3	S3?	G3G4	None	None
Puccinellia pumila	dwarf alkali grass	Poaceae	2B.2	SH	G4?	None	None
Ranunculus lobbii	Lobb's aquatic buttercup	Ranunculaceae	4.2	S3.2	G4	None	None
Rhynchospora alba	white beaked-rush	Cyperaceae	2B.2	S2	G5	None	None
Rhynchospora californica	California beaked-rush	Cyperaceae	1B.1	S1	G1	None	None
Rhynchospora capitellata	brownish beaked-rush	Cyperaceae	2B.2	S1	G5	None	None

Rhynchospora globularis	round-headed beaked-rush	Cyperaceae	2B.1	S1	G5	None	None
Ribes roezlii var. amictum	hoary gooseberry	Grossulariaceae	4.3	S3.3	G3G4T3	None	None
Ribes victoris	Victor's gooseberry	Grossulariaceae	4.3	S3.3	G3	None	None
Sanguisorba officinalis	great burnet	Rosaceae	2B.2	S2	G5?	None	None
Sedum laxum ssp. eastwoodiae	Red Mountain stonecrop	Crassulaceae	1B.2	S2	G5T2	None	FC
Sidalcea calycosa ssp. rhizomata	**Point Reyes checkerbloom**	**Malvaceae**	**1B.2**	**S2.2**	**G5T2**	**None**	**None**
Sidalcea hickmanii ssp. napensis	Napa checkerbloom	Malvaceae	1B.1	S1	G3T1	None	None
Sidalcea hickmanii ssp. viridis	Marin checkerbloom	Malvaceae	1B.3	S1S2	G3T1T2	None	None
Sidalcea malachroides	**maple-leaved checkerbloom**	**Malvaceae**	**4.2**	**2**	**G3G4**	**None**	**None**
Sidalcea malviflora ssp. patula	Siskiyou checkerbloom	Malvaceae	1B.2	S2	G5T2	None	None
Sidalcea malviflora ssp. purpurea	**purple-stemmed checkerbloom**	**Malvaceae**	**1B.2**	**S2.2**	**G5T2**	**None**	**None**
Sidalcea oregana ssp. hydrophila	marsh checkerbloom	Malvaceae	1B.2	S3	G5T3	None	None
Sidalcea oregana ssp. valida	Kenwood Marsh checkerbloom	Malvaceae	1B.1	S1	G5T1	CE	FE
Silene campanulata ssp. campanulata	Red Mountain catchfly	Caryophyllaceae	4.2	S3	G5T3Q	CE	None
Stellaria littoralis	beach starwort	Caryophyllaceae	4.2	S3S4. 2	G3G4	None	None
Streptanthus barbiger	bearded jewel-flower	Brassicaceae	4.2	S3.2	G3	None	None
Streptanthus brachiatus ssp. brachiatus	Socrates Mine jewel-flower	Brassicaceae	1B.2	S1	G2T1	None	None
Streptanthus brachiatus ssp. hoffmanii	Freed's jewel-flower	Brassicaceae	1B.2	S2	G2T2	None	None
Streptanthus drepanoides	sickle-fruit jewel-flower	Brassicaceae	4.3	S3.3	G3	None	None
Streptanthus glandulosus ssp. hoffmanii	**Hoffman's bristly jewel-flower**	**Brassicaceae**	**1B.3**	**SH**	**G4TH**	**None**	**None**
Streptanthus hesperidis	green jewel-flower	Brassicaceae	1B.2	S2	G2	None	None
Streptanthus morrisonii ssp. elatus	**Three Peaks jewel-flower**	**Brassicaceae**	**1B.2**	**S2.2**	**G2T2**	**None**	**None**
Streptanthus morrisonii ssp. hirtiflorus	**Dorr's Cabin jewel-flower**	**Brassicaceae**	**1B.2**	**S1**	**G2T1**	**None**	**None**
Streptanthus morrisonii ssp. kruckebergii	Kruckeberg's jewel-flower	Brassicaceae	1B.2	S1	G2T1	None	None
Streptanthus morrisonii ssp. morrisonii	**Morrison's jewel-flower**	**Brassicaceae**	**1B.2**	**S2.2**	**G2T2**	**None**	**None**
Stuckenia filiformis ssp. alpina	slender-leaved pondweed	Potamogetonaceae	2B.2	S3	G5T5	None	None
Thermopsis robusta	robust false lupine	Fabaceae	1B.2	S2.2	G2Q	None	None
Toxicoscordion fontanum	marsh zigadenus	Melanthiaceae	4.2	S3.2	G3	None	None
Tracyina rostrata	**beaked tracyina**	**Asteraceae**	**1B.2**	**2**	**G1G2**	**None**	**None**
Trichodon cylindricus	cylindrical trichodon	Ditrichaceae	2B.2	S2	G4G5	None	None
Trifolium amoenum	two-fork clover	Fabaceae	1B.1	S1	G1	None	FE
Trifolium buckwestiorum	**Santa Cruz clover**	**Fabaceae**	**1B.1**	**S2**	**G2**	**None**	**None**
Trifolium hydrophilum	saline clover	Fabaceae	1B.2	S2	G2	None	None
Trifolium trichocalyx	Monterey clover	Fabaceae	1B.1	S1	G1	CE	FE
Triquetrella californica	coastal triquetrella	Pottiaceae	1B.2	S1	G1	None	None

Triteleia lugens	dark-mouthed triteleia	Themidaceae	4.3	S3.3	G3	None	None
Usnea longissima	**Methuselah's beard lichen**	**Parmeliaceae**	**4**	**S4.2**	**G4**	**None**	**None**
Veratrum fimbriatum	**fringed false-hellebore**	**Melanthiaceae**	**4.3**	**S3.3**	**G3**	**None**	**None**
Viburnum ellipticum	oval-leaved viburnum	Adoxaceae	2B.3	S2.3	G5	None	None
Viola palustris	alpine marsh violet	Violaceae	2B.2	S1S2	G5	None	None
Wyethia longicaulis	Humboldt County wyethia	Asteraceae	4.3	S3.3	G3	None	None

Appendix B: Vascular Plants of the Buckeye Forest, The Conservation Fund, Sonoma County				
2006 and 2009 surveys conducted by Kjeldsen Biological Consulting and Redwood Coast Associates				
2014 field surveys conducted by K. Heise and G. Hulse-Stephens March 12, 13, April 10, 11, May 23, 24				
Nomenclature follows: The Jepson Manual, Higher Plants of California, 2nd edition, 2012.				
Exotic species followed by an asterix (*) have the potential to become invasive.				
Rare plants in bold: California Rare Plant Rank 1B = Plants rare, threatened, or endangered in Calif. and elsewhere;				
CRPR 2 = Rare, threatened, or endangered in Calif., but more common elsewere; CRPR 3 = A review list				
CRPR 4 = A watch list, plants of limited distribution.				
Families = 89 ; Exotic species = 166, Total species and infraspecific taxa = 606				
Family	**Scientific Name**	**Common Name**	**Exotic**	**rank**
LYCOPHYTA - Spike Mosses and Club Mosses				
Selaginellaceae - Spike-Moss family				
	Selaginella wallacei			
	Selaginella bigelovii	clubmoss		
FERNS				
Equisetaceae - Horsetail Family				
	Equisetum hyemale ssp. affine	common scouring rush		
	Equisetum laevigatum	smooth scouring rush		
	Equisetum telmateia ssp. braunii	giant horsetail		
Blechnaceae -Deer Fern Family				
	Woodwardia fimbriata	Giant Chain Fern		
Dennstaedtiaceae - Bracken Fern Family				
	Pteridium aquilinum var. pubescens	Bracken Fern		
Dryopteridaceae -Wood Fern Family				
	Dryopteris arguta			
	Polystichum californicum	California Sword Fern		
	Polystichum dudleyi	Dudley shield fern		
	Polystichum imbricans ssp. imbricans	rock sword fern		
	Polystichum munitum	western swordf fern		
Polypodiaceae - Polypody Family				
	Polypodium californicum	California polypody		
	Polypodium glycyrrhiza	licorice fern		
Pteridaceae - Brake Fern Family				
	Adiantum aleuticum	five-finger fern		
	Adiantum jordanii	common maidenhair		
	Aspidotis densa	dense lace fern		
	Cheilanthes gracillima	lace lip fern		

	Pellaea andromedifolia	coffee Fern		
	Pellaea mucronata var. mucronata	bird's foot fern		
	Pentagramma triangularis ssp. *triangularis*	Goldenback Fern		
GYMNOSPERMS				
Cupressus - Cedar Family				
	Calocedrus decurrens	incense-cedar		
Pinaceae - Pine Family				
	Pinus lambertiana	sugar pine		
	Pinus ponderosa	Ponderosa pine		
	Pinus radiata	Monterey pine	x	
	Pseudotsuga menziesii	Douglas fir		
Taxaceae - Yew Family				
	Torreya californica	California nut-meg		
Taxodiaceae -Bald Cypress Family				
	Sequoia sempervirens	coast redwood		
MAGNOLLIDS				
Aristolochiaceae - Pipevine Family				
	Aristolochia claifornica	Dutchman's pipe		
Lauraceae - Laurel Family				
	Umbellularia californica			
EUDICOTS				
Adoxaceae - Muskroot Family				
	Sambucus mexicana	blue elderberry		
Anacardiaceae - Sumac Family				
	Rhus aromatica	skunk bush		
	Toxicodendron diversilobum	poison oak		
Apiaceae - Carrot Family				
	Anthriscus caucalis	bur-chervil	x	
	Conium maculatum	poison hemlock	x	
	Daucus carota	carrot	x	
	Daucus pusillus	rattlesnake weed		
	Foeniculum vulgare	fennel	x	
	Ligusticum apiifolium			
	Lomatium dasycarpum	lace parsnip		
	Lomatium utriculatum	bladder parsnip		
	Osmorhiza berteroi (O. chilensis)	sweet cicley		
	Perideridia kelloggii	yampah		
	Sanicula arctopoides	footsteps of spring		
	Sanicula bipinnata	poison sanicle		
	Sanicula bipinnatifida	purple sanicle		
	Sanicula crassicaulis	gamble weed		
	Sanicula laciniata	coast sanicle		
	Scandix pecten-veneris	Venus' needle	x	

	Torilis arvensis	Japanese hedge parsley	x	
	Torilis nodosa	knotted hedge parsley	x	
Apocynaceae - Dogbane Family				
	Vinca major	periwinkle	x	
Araliaceae - Ginsing Family				
	Aralia californica	elk clover		
	Hedera helix	English ivy	x*	
Asteraceae - Aster Family				
	Achillea millefolium	yarrow		
	Achyrachaena mollis	blow-wives		
	Adenocaulon bicolor	trail plant, silver arrow		
	Agoseris grandiflora	grand mountain dandelion		
	Agoseris heterophylla	annual agoseris		
	Agoseris retrorsa	spearleaf mountain dandelion		
	Anisocarpus madioides (Madia madioides)	woodland tarweed		
	Anaphalis margaritacea	pearly everlasting		
	Anthemis cotula	dog fennel	x	
	Arnica discoidea	rayless arnica		
	Artemisia douglasiana	mugwort		
	Baccharis glutinosa (B. douglasii)	marsh baccharis		
	Baccharis pilularis	coyote brush		
	Belliis perennis	English daisy	x	
	Carduus pycnocephalus	Italian thistle	x*	
	Carthamus creticus (C. baeticus)	smooth distaff thistle		
	Centaurea calcitrapa	purple star-thistle	x*	
	Centaurea melitensis	Napa thistle, tocalote	x*	
	Centaurea solstitialis	yellow star-thistle	x*	
	Cirsium cymosum var cymosum	peregrine tistle		
	Cirsium occidentale var. occidentale	cobwebby thistle		
	Cirsium occidentale var. venustum	Venus thistle		
	Cirsium vulgare	bull thistle	x*	
	Ericameria parryi			
	Erigeron canadensis (Conyza c.)	horseweed	x	
	Eriophyllum lanatum var. arachnoideum	common wooly sunflower		
	Eriophyllum lanatum var. achilleoides	common wooly sunflower		
	Eurybia radulina (Aster radulinus)	broad-leafed aster		
	Gamochaeta ustulata (Gnaphalium purpureum)	featherweed		
	Hedypois cretica	Crete weed	x	
	Helenium puberulum	sneezeweed		
	Helminthotheca echioides	ox-tongue	x	
	Hemizonella minima (Madia m.)	miniture tarweed		
	Hemizonia congesta subsp. clevelandii	tarweed		
	Hemizonia congesta subsp. luzulifloia	tarweed		

	Hesperavax acaulis var. *ambusticola*	Morefield fire evax		
	Hieracium albiflorum	hawkweed		
	Holozonia filipes	whitecrown		
	Hypochaeris glabra	smooth cat's ear	x	
	Hypochaeris radicata	hairy cat's ear	x	
	Lactuca saligna	willow lettuce	x	
	Lactuca serriola	prickley lettuce	x	
	Lagophyylla ramosissima	hare leaf	x	
	Lasthenia californica	goldfields		
	Leontodon taraxacoides	hawkbit	x	
	Leucanthemum vulgare	ox-eyed daisy	x	
	Logfia gallica (Filago gallica)	daggerleaf cottonrose	x	
	Madia anomala			
	Madia elegans	common madia		
	Madia exigua	litter tarweed		
	Madia gracilis	Slender Tarweed		
	Madia sativa	coast tarweed		
	Matricaria discoidea	pineapple weed	x	
	Micropus californicus	slender cottonweed		
	Microseris douglasii subsp douglasii			
	Pentachaeta exilis	red throat		
	Petasites frigidus var palmatus	coltsfoot		
	Pseudognaphalium californicum	cudweed		
	Pseudognaphalium luteo-album	cudweed	x	
	Pseudognaphalium stramineum			
	Psilocarphus brevissimus var. brevissimus	dwarf woolly-heads		
	Psilocarphus tenellus var. tenellus	dwark woolly-marbles		
	Rafinesquia californica	California chicory		
	Senicio minius (Erichtites minima)	coastal burnweed	x	
	Senecio vulgaris		x	
	Silybum marianum	milk vetch	x	
	Soliva sessilis		x	
	Sonchus asper	prickly sow thistle	x	
	Sonchus oleraceus	common sow thistle	x	
	Stephanomeria virgata subsp. virgata			
	Taraxacum officionalis	California dandelion	x	
	Tolpis barbata		x	
	Uropappus lindleyi	silver puffs		
	Wyethia angustifolia	narrow-leaf mule's ears		
	Wyethia glabra	Coast Range mule's ears		
Berberidaceae - Barberry Family				
	Vancouveria planipetala	redwood ivy		
Betulaceae - Birch Family				

	Alnus rhombifolia	white alder		
	Alnus rubra	red alder		
	Corylus cornuta subsp. californica	hazelnut		
Boraginaceae - Borage Family				
	Amsinckia menziesii var. intermedia	rancher's fireweed		
	Cryptantha flaccida			
	Cynglossum grande	hound's tongue		
	Eriodictyon californicum	yerba santa		
	Myosotis discolor	blue scorpion grass	x	
	Nemophila heterophylla			
	Nemophila menziesii var. atomaria	baby white-eyes		
	Nemophila menziesii var. menziesii	baby blue-eyes		
	Nemophila pedunculata			
	Pectocarya pusilla	little pectocarya		
	Phacelia bolanderi			
	Phacelia californica	California phacelia		
	Phacelia distans	wild-heliotrope		
	Phacelia malvifolia	stinging phacelia		
	Plagiobothrys bracteatus	bracted popcorn flower		
	Plagiobothrys nothofulvus	popcorn flower		
	Plagiobothrys stipitatus var. micranthus			
	Plagiobothrys tenellus	Pacific popcorn flower		
	Romanzoffia californica	romanzoffia		
Brassicaceae- Mustard Family				
	Athysanus pusillus	common sandweed		
	Brassica nigra	black mustard	x	
	Brassica rapa	field mustard	x	
	Capsellabursa-pastoris	shepard's purse	x	
	Cardamine californica	milk maids		
	Cardamine hirsute	bitter cress	x	
	Cardamine oligosperma			
	Draba verna	whitlow-grass		
	Lepidium nitidum	pepper-grass	x	
	Nasturtium officinale (Rorippa nasturtium-aquaticum	water cress		
	Raphanus sativus	wild radish	x	
	Sisymbrium officinale	hedge mustard	x	
	Streptanthus glandulosus ssp.glandulosa	jewelflower		
	Thysanocarpus curvipes	fringepod		
Calycanthaceae- Sweet-shrub Family				
	Calycanthus occidentalis	spicebush		
Campanulaceae - Bluebell Family				
	Asyneuma prenanthoides (Campanula p.)	California harebell		

	Githopsis specularioides			
	Heterocodon rariflorum	western pearl flower		
Caprifoliaceae - Honeysuckle Family				
	Lonicera hispidula	honeysuckle		
	Symphoricarpos albus var laevigatus	snowberry		
	Symphoricarpos mollis	Creeping Snowberry		
Caryophyllaceae - Pink Family				
	Cerastium fontanum subsp. vulgare	mouse-ear-chickweed		
	Minuartia douglasii			
	Petrorhagia dubia		x	
	Petrorhagia nanteuilii	grass pink		
	Petrorhagia prolifera	proliferous pink	x	
	Silene gallica	Windmill Pink	x	
	Silene laciniata subsp. californica (S. californica)	California Pink		
	Spergularia rubra	sand-spurrey	x	
	Stellaria media	common chickweed	x	
	Stellaria nitens	shining chick-weed		
Chenopodiaceae - Goosefoot Family				
	Chenopodium bothrys	Jerusalem oak	x	
Convolvulaceae - Morning-Glory Family				
	Calystegia purpurata ssp purpurata			
	Calystegia subcaulis	hill morning glory		
	Convolvulus arvensis	bindweed	x	
Cornaceae - Dogwood Family				
	Cornus nuttallii	mountain dogwood		
Crassulaceae - Stonecrop Family				
	Crassula aquatica	pygmy water weed		
	Crassula connata	sand pygmy weed		
	Dudleya cymosa subsp. cymosa	canyon liveforever		
	Sedum radiatum	Coast Range stonecrop		
	Sedum spathulifolium	broadleaf stonecrop		
Cucurbitaceae - Gourd Family				
	Marah fabaceus	California man-root		
	Marah oreganus	coast manroot		
Datiscaceae - Datisca Family				
	Datisca glomerata	Durango root		
Ericaceae - Heath Family				
	Allotropa virgata	sugar stick		
	Arbutus menziesii	madrone		
	Arctostaphylos canescens var. canescens	hoary manzanita		
	Arctostaphylos manzanita subsp. glaucescens	common manzanita		
	Arctostaphylos manzanita subsp. manzanita	common manzanita		

	Arctostaphylos stanfordiana subsp. stanfordiana	Stanford manzanita		
	Chimaphila menziesii	little prince's pine		
	Hemitomes congestum	gnome plant		
	Pityopus californicus	**California pinefoot**		**4.2**
	Pleuricospora fimbriolata	fringed pinesap		
	Pterospora andromedea	pine drops		
	Pyrola picta	white-veined wintergreen		
	Rhododendron occidentale	western azalea		
	Vaccinium ovatum	California huckleberry		
Euphorbiaceae - Spurge Family				
	Croton setigerus (Eremocarpus s.)	turkey mullein		
	Euphorbia peplus	petty spurge	x	
Fabaceae - Pea Family				
	Acacia dealbata	silver wattle-acacia	x	
	Acmispon americanus var. americanus (Lotus purshianus)	Spanish lotus		
	Acmispon brachycarpus (Lotus humistratus)	deervetch		
	Acmispon glaber var. glaber (Lotus scoparius)	California broom		
	Acmispon parviflorus (Lotus micranthus)	deervetch		
	Acmispon wrangelianus (Lotus w.)			
	Astragalus breweri	**brewer's vetch**		**4.2**
	Astragalus gambelianus	Gambel's dwarf locoweed		
	Cytisus scoparius	Scotch broom	x*	
	Genista monspessulana	French broom	x*	
	Hoita macrostachya	Leather root		
	Hosackia crassifolia var. crassifolia (Lotus c.)			
	Hosackia gracilis (Lotus formosissimus)	**harlequin lotus**		**4.2**
	Hosackia rosea (Lotus aboriginus)			
	Hosackia stipularis (Lotus s.) (L. balsamiferus)	lotus		
	Lathyrus cicera		x	
	Lathyrus jepsonii var californicus			
	Lathyrus odoratus	sweeet pea	x	
	Lathyrus tingintanus	Tangier pea	x	
	Lathyrus torreyi			
	Lathyrus vestitus var. vestitus	hillside pea		
	Lotus corniculatus	birdfoot trefoil	x	
	Lupinus affinis			
	Lupinus arboreus			
	Lupinus bicolor	miniature lupine		
	Lupinus latifolius var. latifolius	broadleaf lupine		
	Lupinus nanus			
	Medicago arabica	spotted bur clover	x	

	Melilotus officinalis	yellow sweet clover	x	
	Pickeringia montana	chaparral pea		
	Robinia pseudoacacia	black locust	x	
	Rupertia physodes	California-tea		
	Thermopsis macrophylla	false-lupine		
	Trifolium albopurpureum var albopurpureum			
	Trifolium angustifolium	narrow-leaved clover	x	
	Trifolium barbigerum var barbigerum			
	Trifolium bifidum var bifidum			
	Trifolium bifidum var decipiens			
	Trifolium buckwestiorum	**Santa Cruz clover**		**1B.2**
	Trifolium campestre	hop-clover	x	
	Trifolium depauperatum var. amplectens	balloon clover		
	Trifolium dichotomum (T. albopurpureum var. d.)			
	Trifolium fragiferum	strawberry clover	x	
	Trifolium fucatum	bull clover		
	Trifolium hybridum	Alsike clover	x	
	Trifolium hirtum	rose clover	x	
	Trifolium microcephalum	maiden clover		
	Trifolium obtusiflorum			
	Trifolium oliganthum			
	Trifolium repens	white clover	x	
	Trifolium striatum		x	
	Trifolium subterraneum	subterranean clover	x	
	Trifolium varigatum	white-topped clover		
	Trifolium willdenovii	tomcat clover		
	Vicia americana subsp. americana	American vetch		
	Vicia benghalensis	purple vetch		
	Vicia hirsuta		x	
	Vicia ludoviciana subsp. ludoviciana	slender vetch	x	
	Vicia sativa ssp nigra	narrow-leaved vetch	x	
	Vicia sativa ssp sativa	spring vetch	x	
	Vicia villosa subsp. varia	hairy vetch	x	
	Vicia villosa subsp. villosa	winter vetch	x	
Fagaceae - Beech Family				
	Castanea dentata	chestnut	x	
	Chrysolepis chrysophylla var. chrysophylla	chinquapin		
	Notholithocarpus densiflorus var. densiflorus	tan oak		
	Quercus agrifolia	coast live oak		
	Quercus berberidifolia	California scrub oak		
	Quercus chrysolepis	canyon Live oak		
	Quercus douglasii	blue oak		

	Quercus douglasii x garryana	white oak hybrid swarm		
	Quercus garryana var. garryana	Oregon oak, garry oak		
	Quercus kelloggii	black oak		
	Quercus lobata	valley oak		
	Quercus parvula var. shrevei	Shreve oak		
	Quercus wislizeni var frutescens	dwarf interior live oak		
	Quercus wislizeni var. wislizeni	interior live oak		
	Quercus douglasii x Q. garryana=Q. eplingii	hybrid swarm		
Gentianaceae - Gentian Family				
	Cicendia quadrangularis			
	Zeltnera davyi (Centaurium d.)	Davy's centaury		
	Zeltnera muehlenbergii (Centarium m.)	Montery centaury		
Geraniaceae - Geranium Family				
	Erodium botrys	broadleaf filaree	x	
	Erodium cicutarium	red-stemmed filaree	x	
	Geranium dissectum	cut-leaf geranium	x	
	Geranium molle	dove-foot geranium	x	
Grossulariaceae - Gooseberry Family				
	Ribes californicum ssp. californicum	hillside gooseberry		
	Ribes sanguineum	red-flowering currant		
Hypericaceae - St. John's Wort Family				
	Hypericum anagalloides	tinker's penny		
	Hypericum concinnum	gold-wire		
	Hypericum perforatum	Klamath weed	x*	
Juglandaceae - Walnut Family				
	Juglans nigra	black walnut	x	
	Juglans regia	English walnut	x	
Lamiaceae - Mint Family				
	Clinopodium douglasii (Satureja d.)	yerba buena		
	Marrubium vulgare	horehound	x	
	Melissa officinalis	bee balm	x	
	Mentha arvensis	field mint	x	
	Mentha pulegium	penny royal	x*	
	Mentha spicata	peppermint	x	
	Monardella villosa subsp. villosa	coyote mint		
	Prunella vulgaris var. lanceolata	self-heal		
	Scutellaria antirrhinoides	skullcap		
	Scutellaria californica	California skullcap		
	Stachys rigida var. rigida	hedge nettle		
	Trichostema lanceolatum	vinegar weed		
	Trichostema laxum	turpentine weed		
Linaceae - Flax Family				
	Linum bienne	common flax	x	

	Linum usitatissimum	common flax	x	
Lythraceae - Loosestrife Family				
	Lythrum californicum	California loosetrife		
	Lythrum hyssopifolium	loosestrife	x	
Malvaceae - Mallow Family				
	Malva parviflora	cheeeseweed	x	
	Sidalcea diploscypha			
	Sidalcea malviflora	checker mallow		
Montiaceae - Montia Family				
	Calandrinia ciliata	red maids		
	Claytonia gypsophiloides			
	Claytonia perfoliata	miner's lettuce		
	Montia fontana	water chickweed, blinks		
Moraceae- Mulberry Family				
	Ficus carica	edible fig	x	
Myricaceae- Wax Mytrle Family				
	Morella californica (Myrica california)	California wax myrtle		
Myrtaceae - Eucalyptus Family				
	Eucalyptus globulus	blue gum	x	
Myrsinaceae - Myrsine Family				
	Anagallis arvensis	scarlet pimpernel	x	
	Trientalis latifolia	star flower		
Oleaceae - Olive Family				
	Fraxinus latifolia	Oregon ash		
Onagraceae - Evening Primrose Family				
	Clarkia concinna subsp. concinna	red ribbons		
	Clarkia gracilis subsp. gracilis	clarkia		
	Epilobium ciliatum ssp. ciliatum	northern willow herb		
	Epilobium densiflorum			
	Epilobium minutum			
	Epilobium torreyi	Torrey's willowherb		
	Taraxia ovata (Camissonia o.)	sun cups		
Orobanchaceae - Broomrape Family				
	Castilleja attenuata	valley tassels		
	Castilleja densiflora	owl's clover		
	Castilleja foliolosa	woolly paintbrush		
	Castilleja rubicundula subsp. rubicundula	pink creamsacs		
	Cordylanthus pilosus susp. Pilosus			
	Cordylanthus tenuis ssp.brunneus	**serpentine bird's beak**		**4.3**
	Orobanche uniflora	naked broom rape		
	Parentucellia biscosa	yellow parentucelia	x	
	Pedicularis densiflora	Indian warrior		
	Triphysaria eriantha ssp. eriantha	butter and eggs		

	Triphysaria pusilla			
	Triphysaria versicolor ssp. versicolor			
Oxalidaceae- Oxalis Family				
	Oxalis oregana	redwood ssorrel		
	Oxalis pes-caprae	Bermuda buttercup	x	
Papaveraceae - Poppy Family				
	Eschscholzia californica	California Poppy		
Philadelphaceae - Mock Orange Family				
	Whipplea modesta	yerba de selva, modesty		
Phrymaceae - Lopseed Family				
	Mimulus aurantiacus	sticky monkey-flower		
	Mimulus cardinalis	scarlet monkey Flower		
	Mimulus guttatus	common monkeyflower		
Plantaginaceae - Plantain Family				
	Anterrhinum vexillocalyculatum subsp. breweri	wiry snapdragon		
	Callitriche heterophylla var. bolanderi	Bolander's water-starwort		
	Callitriche marginata	water starwort		
	Collinsia grandiflora	large-flowered collinsia		
	Collinsia sparsiflora var. collina	blue-eyed Mary		
	Plantago erecta			
	Plantago coronopus	cut-leaf plantain	x	
	Plantago lanceolata	English plantain	x	
	Synthyris reniformis	snow queen		
	Tonella tenella			
	Veronica americana	American brooklime		
	Veronica arvensis	common speedwell	x	
Polemoniaceae - Phlox Family				
	Collomia grandiflora	large-flowered collomia		
	Collomia heterophylla	varied-leaf collomia		
	Gilia capitata ssp. capitata	blue field gilia		
	Gilia tricolor ssp. tricolor	bird's eye gilia		
	Leptosiphon androsaceus (Linanthus a.)	showey gilia		
	Leptosiphon bicolor (Linanthus b.)	Bicoloredlinanthus		
	Leptosiphon parviflorus (Linanthus p.)			
	Navarretia intertexta ssp intertexta	needle-leaved navarretia		
	Navarretia squarrosa	skunkweed		
	Phlox gracilis	slender phlox		
Polygalaceae - Milkwort Family				
	Polygala californica	California milkwort		
Polygonaceae - Buckwheat Family				
	Chorizanthe membranacea	pink spine flower		
	Polygonum argyrocoleon	Persian wireweed	x	
	Polygonum aviculare subsp. aviculare	knotweed	x	

	Rumex acetosella	sheep sorrel	x	
	Rumex crispus	curly dock	x	
	Rumex conglomeratus	dock	x	
	Rumex pulcher	fiddle dock	x	
	Rumex salicifolius	willow dock		
Primulaceae				
	Dodecatheon hendersonii	shooting star		
Ranunculaceae - Buttercup Family				
	Anemone grayi	Gray's windflower		
	Aquilegia formosa	Columbine		
	Delphinium decorum subsp decorum	coast larkspur		
	Delphinium hesperium ssp. hesperium	western larkspur		
	Delphinium nudicaule	Red Larkspur		
	Ranunculus californicus	California buttercup		
	Ranunculus muricatus	pickle-fruited buttercup	x	
	Ranunculus occidentalis	western buttercup		
Rhamnaceae - Buckthorn Family				
	Ceanothus cuneatus var. cuneatus	buckbrush		
	Ceanothus foliosus var. foliosus	wavyleaf ceanothus		
	Ceanothus incanus	coast whitethorn		
	Ceanothus integerrimus	deer brush		
	Ceanothus thyrsiflorus			
	Ceanothus velutinus	tobacco brush		
	Frangula californica (Rhamnus californica)	California coffeeberry		
	Frangula purshiana (Rhamnus purshiana)	cascara		
Rosaceae - Rose Family				
	Adenostemma fasciculatum	chamise		
	Amelanchier utahensis	service berry		
	Aphanes occidentalis	lady's mantle		
	Cercocarpus betuloides	mountain mahogany		
	Cotoneaster pannosa		x	
	Drymocallis glandulosa var. glandulosa (Potentilla g.)	sticky cinquefoil		
	Fragaria vesca	wood strawberry		
	Heteromeles arbutifolia	toyon		
	Holodiscus discolor	Ocean Spray		
	Horkelia california subsp. californica			
	Horkelia tenuiloba	**thin-lobed horkelia**		**1B.2**
	Malus pumila	apple	x	
	Prunus avium	sweet cherry	x	
	Pyracantha angustifolia	firethorn	x	
	Prunus domesticum	plum	x	
	Pyrus communis	common pear	x	

	Rosa californica	rose		
	Rosa eglantaria	sweet briar	x	
	Rosa gymnocarpa	wood rose		
	Rosa spithamea	coast ground rose		
	Rubus armeniacus	Himalayan blackberry	x	
	Rubus leucodermis	western raspberry		
	Rubus parviflorus	thimbleberry		
	Rubus spectabilis	salmonberry		
	Rubus ursinus	California blackberry		
Rubiaceae - Madder Family				
	Galium aparine	goose grass	x	
	Galium californicum ssp. californicum	California Bedstraw		
	Galium divaricatum	Lamarck's bedstraw	x	
	Galium murale	tiny bedstraw	x	
	Galium muricatum	Humboldt bedstraw		
	Galium parisiense	wall bedstraw	x	
	Galium porrigens var. porrigens	climbing bedstraw		
	Galium triflorum	sweet-scented bedstraw		
	Sherardia arvensis	field madder	x	
Salicaceae - Willow Family				
	Salix exigua	sandbar willow		
	Salix laevigata	Red Willow		
	Salix lasiandra	Pacific willow		
	Salix lasiolepis	arroyo willow		
	Salix scouleriana	Scouler's willow		
	Salix sitchensis	Sitka willow		
Sapindaceae - Soapberry Family				
	Acer macrophyllum	big leaf maple		
	Aesculus californica	California buckeye		
Saxifragaceae - Saxifrage Family				
	Boykinia occidentalis	western boykinia		
	Heuchera micrantha	Alum Root		
	Lithophragma affine	Woodland Star		
	Lithophragma heterophyllum	Woodland Star		
	Saxifraga californica	California saxifrage		
	Saxifraga mertensiana	Merten's Saxifrage		
Scrophulariaceae - Figwort Family				
	Scrophularia californica	California figwort		
	Verbascum blattaria	moth mullein	x	
	Verbascum thapsus	woolly mullein	x	
Solanaceae - Nightshade Family				
	Solanum xanti			
Valerianaceae - Valerian Family				

	Plectritis brachystemon			
	Plectritis congesta subsp. brachystemon			
	Plectritis congesta subsp. congesta			
Verbenaceae - Vervain Family				
	Verbena lasiostachys var. lasiostachys			
Violaceae - Violet Family				
	Viola adunca subsp. adunca	western dog violet		
	Viola ocellata	western heart's ease		
	Viola sempervirens	evergreen violet		
Viscaceae - Mistletoe Family				
	Arceuthobium campylopodum	western dwarf mistletoe		
	Phoradendron serotinum subsp. tomentosum (P. villosum)	American mistletoe		
Vitaceae - Grape Family				
	Vitus californicus	California grape		
	Vitus vinifera	grape	x	
MONOCOTS				
Agavaceae - Century Plant Family				
	Chlorogalum pomeridianum	soaproot		
Alliaceae - Onion Family				
	Allium amplectens	onion		
	Allium falcifolium	sickle-leaf onion		
	Allium paniculatum	panicled onion		
	Allium peninsulare var. peninsulare			
	Allium unifloium	wild onion		
Amaryllidaceae - Amaryllis Family				
	Amaryllis belladonna	naked ladies	x	
Cyperaceae - Sedge Family				
	Carex barbarea	Santa Barbara sedge		
	Carex brevicaulis	short-stemmed sedge		
	Carex globosa	round-fruited sedge		
	Carex gynodynama	wonder-woman sedge		
	Carex leptopoda	slender-foot sedge		
	Carex multicaulis	stick sedge		
	Carex nudata	torrent sedge		
	Carex obnupta	slough sedge		
	Carex pachystachya	thick-headed sedge		
	Carex subfusca	rusty slender sedge		
	Carex tumulicola	foothill sedge		
	Cyperus eragrostis	nutsedge		
	Eleocharis macrostachya	spikerush		
	Scirpus microcarpus			
Iridaceae - Iris Family				

	Iris douglasiana	Douglas iris		
	Iris macrosiphon			
	Iris purdyi	Purdy's iris		
	Iris pseudoacoris	yellow iris	x	
	Iris tenuissima			
	Sisyrinchium bellum	blue-eyed grass		
Juncaceae - Rush Family				
	Juncus balticus	wire rush		
	Juncus bolanderi	Bolander's rush		
	Juncus bufonius	toad rush		
	Juncus capitatus	dwarf rush	x	
	Juncus effusus var. pacificus	lamp rush		
	Juncus occidentalis	single-flowered short-leaf juncus		
	Juncus patens	common rush		
	Juncus phaeocephalus var phaeocephalus	brown-headed rush		
	Juncus tenuis			
	Juncus xiphioides			
	Luzula comosa	wood rush		
Liliaceae - Lily Family				
	Calochortus amabilis	Diogenes' lanturn		
	Calochortus luteus	yellow mariposa lily		
	Calochortus tolmei	pussy ears		
	Calochortus vestae	white calochortus		
	Erythronium californicum	fawn lily		
	Fritillaria affinis	checker lily		
	Prosartes hookeri (Disporum hookeri)	Hooker's fairybell		
	Scoliopus bigelovii	fetid adders tongue		
Melanthiaceae - False-Hellebore Family				
	Toxicoscordion micranthum (*Zigadenus micranthus*)	marsh zigadenus		
	Toxicoscordion fremontii (Zigadenus fremontii)	death camus		
	Toxicoscordion micranthum (Zigadenus micranthus)	death camus		
	Xerophyllum tenax	bear-grass		
Orchidaceae - Orchid family				
	Cephalanthera austiniae	phantom orchid		
	Corallorhiza maculata	spotted coralroot		
	Piperia candida	**white flowered rein orchid**		**1B.2**
	Piperia elongata			
	Piperia transversa			
	Spiranthes romanzoffiana	ladies' tresses		
Poaceae - Grass Family				
	Aegilops truncialis	barbed goatgrass	x*	

	Agrostis capillaris	colonial bent	x	
	Agrostis gigantea		x	
	Agrostis hallii			
	Agrostis oregonensis	Oregon redtop		
	Agrostis pallens			
	Agrostis stolonifera	redtop	x*	
	Aira caryophyllea	silver European hairgrass	x	
	Anthoxanthum occidentale (Hierochloe occidentalis)	sweet grass		
	Anthoxanthum ordoratum	sweet vernal grass	x	
	Avena barbata	slender wild oat	x	
	Avena fatua	wild oat	x*	
	Avena sativa		x*	
	Briza maxima	big quaking grass	x	
	Briza minor	little quaking grass	x	
	Bromus carinatus var. carinatus	California brome		
	Bromus diandrus	ripgut brome	x	
	Bromus hordeaceus	soft chess	x	
	Bromus laevipes	woodland brome		
	Bromus madritensis var. madritensis	foxtail chess	x	
	Bromus madritensis ssp. rubens (B. rubens)	red brome	x	
	Bromus sterilis	poverty brome	x	
	Bromus vulgaris			
	Calamagrostis bolanderi	**Bolander's reedgrass**		**4.2**
	Calamagrostis rubescens	pine grass		
	Cortaderia jubata	jubata grass	x*	
	Cynodon dactylon	Burmuda grass	x	
	Cynosurus echinatus	hedgehog dogtail	x	
	Dactylis glomerata	orchard grass	x	
	Danthonia californica	California oatgrass		
	Deschampsia cespitosa subsp. holiformis	Pacific hairgrass		
	Deschampsia danthanoides	annual hairgrass		
	Deschampsia elongata	slender hairgrass		
	Elymus caput-medusae (Taeniatherum caput-medusae)	medusa head	x*	
	Elymus glaucus ssp. glaucus	blue wildrye		
	Elymus multisetus	big squirrel-tail grass		
	Festuca arundinacea	tall fescue	x	
	Festuca bromoides	brome fescue	x	
	Festuca californica	California fescue		
	Festuca idahoensis	Idaho fescue		
	Festuca microstachys			
	Festuca myuros	rattail fescue	x	

	Festuca occidentalis	western fescue		
	Festuca perennis (Lolium multiflorum)	Italian ryegrass	x	
	Festuca rubra	red Fescue		
	Gastridium phleoides (G. ventricosum)	nit grass	x	
	Holcus lanatus	common velvet grass	x	
	Hordeum brachyantherum ssp. brachyantherum	meadow barley		
	Hordeum marinum ssp. gussoneanum	Mediterranean barley	x	
	Hordeum murinum ssp. leporinum	hare barley	x	
	Koeleria macrantha	junegrass		
	Melica bulbosa	bulbous onion grass		
	Melica californica	California melicgrass		
	Melica geyeri			
	Melica hardfordii			
	Melica imperfecta			
	Melica torreyana	Torrey's melic		
	Panicum acuminatum subsp acuminatum			
	Paspalum dilatatum	dallis grass	x	
	Phalaris aquatica	harding grass	x	
	Phalaris californica			
	Poa annua	annual bluegrass	x	
	Poa nemoralis	wood blue grass	x	
	Poa secunda ssp. secunda	one-sided bluegrass		
	Polypogon australis	Chilean bear grass	x	
	Polypogon interruptus	ditch beard grass	x	
	Polypogon monspeliensis	annual beard grass	x	
	Rytidosperma penicillatum (Danthonia pilosa)	hairy oatgrass	x	
	Stipa lepida (Nassella lepida)			
	Stipa pulchra (Nassella pulchra)	purple needlegrasss		
	Trisetum canescens	smooth trisetum		
Themidaceae - Brodiaea Family				
	Brodiaea californica	California brodiaea		
	Brodiaea coronaria	garland brodiaea		
	Brodiaea elegans subsp. elegans	harvest brodiaea		
	Brodiaea stellaris	star brodiaea		
	Dichelostemma capitatum ssp.capitatum	blue dicks		
	Dichelostemma congestum	ookow		
	Triteleia hyacinthina	white brodiaea		
	Triteleia laxa	Ithuriel's spear		
Typhaceae - Cattail Family				
	Typha latifolia	broad-leaved cattail		

Appendix C: Non-Vascular Plants of the Buckeye Forest

2006 and 2009 surveys conducted by Kjeldsen Biological Consulting and Redwood Coast Associates

2014 field surveys conducted by K. Heise and G. Hulse-Stephens March 12, 13, April 10, 11, May 23, 24

Nomenclature largely follows:

Brodo, Irwin M., Sylia D. Sharnoff and Stephen Sharnoff, 2001 for lichens; Smith 1956 for algae; Arora, D -1985, for fungi; Laughton -1967, W.B. Schofield -1992, Norris, D. and J. Shevock -2004 for mosses; Doyle and Stotler -2006 for liverworts and hornworts.

NCN = no common name

Rare plants in bold

Family	Scientific name	Common name	Habitat type	Abundance
CYNOBACTERIA				
	Nostoc	NCN	on soil	common
FUNGI				
Basidiomycota - club fungi				
AMANITACEAE				
	Amanita clayptrata	coccora	woodlands	occasional
	Amanita ocreata	destroying angel	woodlands	occasional
	Amanita pachycolea	Western grisette	woodlands	occasional
	Amanita pantherina	NCN	woodlands	occasional
BOLETACEAE				
	Botetus aereus	queen boleter	woodlands	common
	Leccinum manznitae	NCN	woodlands	occasional
	Suillus coerulescens	Douglas-fir suillus	woodlands	common
	Suillus fuscotomentosus	slippery jack	woodlands	common
	Suillus lakei	Western painted suillus	woodlands	common
CANTHARELLACEAE				
	Craterellus cornucopioides	horn of plenty	woodlands	common
CLAVARIACEAE				
	Clavulina rugosa	wrinkled coral	woodlands	occasional
	Clavulinopsis laeticolor	golden fairy club	under redwoods	occasional
	Multiclavula vernalis	NCN	cut banks/woodlands	occasional
COPRINACEAE				
	Coprinus micaceus	mica cap	on wood	occasional
	Panaeolus subbalteatus	belted panaeolus	on dung	occasional
CORTINARIACEAE				
	Crepidotus mollis	flabby crepidotus	woodlands	common
	Cortinarius ssp.	NCN	woodlands	occasional
	Galerina autumalis	deadly galerina	woodlands	occasional
	Inocybe sororia	corn silk inocybe	woodlands	occasional
	Hebeloma crustuliniforme	poison pie	woodlands, grasslands	common

GOMPHIDIACEAE				
	Chroogomphus vinicolor	pine spike	woodlands	common
HYGROPHORACEAE				
	Hygrophorus eburneus	ivory waxy cap	woodlands	common
LYCOPERDIALES				
	Astraeus hygrometricus	earthstar	woodlands, ruderal	common
	Calvatia booniana	giant western puffball	woodlands	occasional
	Lycoperdon perlatum	common puffball	woodlands	occasional
	Lycoperdon foetidum	dark puffball	woodlands, ruderal	common
	Pisolithus tinctorius	dead man's foot	woodlands, ruderal	common
	Scleroderma cepa	earthball	woodlands, grasslands	common
NIDULARIALES				
	Nidularia farcta	bird's nest fungus	woodlands on dead wood	common
PAXILLACEAE				
	Hygrophoropsis aurantiacus	false chanterelle	conifer woodlands	occasional
	Paxillus involutus	inrolled pax	on ground, conifer woodlands	occasional
	Phylloporous rhodoxanthus	gilled bolete	conifer woodlands in litter	occasional
POLYPORACEAE				
	Daedalea quercina	thick-walled maze polypore	woodlands on dead wood	common
	Fomitopsis officinalis	quinine conk	on Douglas fir, other conifers	common
	Fomitopsis pinicola	red-belted conk	on Douglas fir	common
	Ganoderma applanatum	artist's conk	on conifers or hardwoods	common
	Laetiporus sulphurus	sulfur shelf, chicken of the woods	on dead logs and stumps	common
	Lenzites betulina	gilled polypore	woodlands on dead wood	common
	Phaeolus schweinitzii	dyer's polypore	woodlands parasite on Douglas fir	common
	Poria corticola	NCN	on hardwoods	occasional
	Schizophyllum commune	split-gill	woodlands on dead wood	common
	Stereum hirsutum	false turkey tail	woodlands on dead wood	common

	Trametes versicolor	turkey tail	woodlands on dead wood	common
	Trametes hirsuta	hairy turkey tail	woodlands on dead wood	common
RUSSULACEAE				
	Lactarius deliciosus	delicious milk cap	woodlands	common
	Lactarius rubrilacteus	bleeding milk cap	woodlands	common
	Russula cyanoxantha	variegated russula	woodlands	occasional
	Russula placita	pleasing russula	woodlands	occasional
STROPHARIACEAE				
	Nemataloma faciculare	green gilled nemataloma	woodlands	common
	Pholiota ssp.	NCN	woodlands	occasional
TREMELLALES				
	Dacromyces deliquescens	yellow jelly coral	woodlands on dead wood	common
	Exidia glandulosa	black witch's butter	woodlands on dead wood	common
	Tremella mesenterica	witch's butter	woodlands on dead wood	common
TRICHOLOMATACEAE				
	Armillariella mella	honey mushroom	woodlands	occasional
	Mycena apillaripes	NCN	woodlands	common
	Omphalotus olivascens	jack-o-lantern mushroom	woodlans on hardwood	common
	Pleurotus ostreatus	oyster mushroom	woodlands	occasional
FUNGI				
Ascomycota - Sac Fungi				
DALDINEACEAE				
	Daldinia grandis	carbon balls	woodlands on dead wood	common
HELIOTALES				
	Bulgaria inquinans	black jelly drops	woodlands on tan oak	common
	Leotia lubrica	jelly babies	woodlands on forest floor	common
	Trichoglossum hirsutum	velvety vlack eart tongue	woodlands on forest floor	common
HELVELLACEAE				
	Helvella crispa	fluted whiite elfin saddle	woodlands	common

	Helvella lacunosa	fluted black elfin saddle	woodlands	occasional
PEZIZACEAE				
	Bisporella citrina	NCN	woodlands on dead wood	common
	Piziza brunneoatra	NCN	ondamp soil along roads	occasional
PYRENOMYCETES				
	Hypoxylon ssp.	NCN	woodlands	common
	Phytismatia acerinum	NCN	woodlands on maple	common
	Xylaria hypoxylon	candlesnuff fungus	woodlands	common
TUBERALES				
	Tuber gibbosum	Oregon truffle	Douglas fir woodlands	occasional
OOMYCOTA				
OOMYCETES				
	Phtophthora ramorum	sudden oak death	parasite on tan oak and bay	common
SLIME MOLDS				
MYXOMYCETES				
	Fuligo septica	NCN	on litter	occasional
MOSSES				
BARTRAMIACEAE				
	Anacolia menziesii	NCN	on rock face	common
	Bartramia pomiformis	apple moss	on cut banks	common
BRACHYTHECIACEAE				
	Homalothecium nuttallii	NCN	on hardwood bark and rock	common
	Isothecium stoloniferum	NCN	on shaded logs and boulders	
	Kindbergia oregana	NCN	duff, bark, logs, road cuts	common
	Kindbergia praelonga	NCN	on moist to wet logs, rock along streams	
	Scleropodium obtusifolium	NCN	on boulders inundated with water	
	Scleropodium touretii	NCN	on moist to dry soil over humus	common
CRYPHAEACEAE				
	Dendroalsia abietina	NCN	on bark	common
DICRANACEAE				
	Dicranum scoparium	NCN	woodlands	occasional
DITRICHACEAE				

	Ditrichum ambiguum	NCN	on shaded soil of roadbanks	
FISSIDENTACEAE				
	Fissidens bryoides	NCN	along small streams	common
FONTINALACEAE				
	Fontinalis antipyretica	NCN	along small streams	common
FUNARIACEAE				
	Funaria hygrometrica	NCN	road cut, sunny soil	common
GRIMMIACEAE				
	Grimmia lisae	NCN	on rocks at high water line	
	Grimmia trichophylla	NCN	rock and boulders in sun	
HEDWIGIACEAE				
	Hedwigia stellata	NCN	grasslands on rocks	common
	Pseudobraunia califronica	NCN	on sunny rock	
LEPTODONTACEAE		NCN	on shaded conifer bases	occasional
	Alsia californica	NCN	on oaks	common
LEUCODONTACEAE				
	Antitrichia californica	NCN	on oak bark	
MNIACEAE				
	Leucolepis acanthoneuron	NCN	on moist soil along streams	
ORTHOTRICHACEAE				
	Orthotrichum lyellii	NCN	on bark of tan oak and oak	common
POLYTRICACEAE				
	Atrichum selwynii	bare soil, road cuts	common	
	Polytrichum commune	haircap moss	woodlands	occasional
	Polytrichum juniperum	haircap moss	woodlands	occasional
POTTIACEAE				
	Didymodon vinealis	NCN	on soil or rock, sun or shade	
	Timmiella crassinervis	NCN	on bare soil in sun or shade	
RHABDOWEISIACEAE				
	Amphidium californicum	NCN	in shaded underhangs of rock outcrops	
SELIGERIACEAE				
	Dicranoweisia cirrata	NCN	on dead logs	
LIVERWORTS				
AYTONIACEAE				

	Astrella californica	NCN	on soil, cut banks	occasional
CEPHALOZIACEAE				
	Cephalozia ssp.	NCN	on cut banks	common
	Hygrobiella laxifolia	black liverwort	on bark of trees	common
CEPHALOZIELLACEAE				
	Cephaloziella divaricata	black liverwort	on bare soil	common
FOSSOMBRONIACEAE				
	Fossombronia longiseta	NCN	on soil	occasional
FRULLANIACEAE				
	Frullania nisqualiensis	hanging milliped liverworkt	on bark of trees	common
LUNULARIACEAE				
	Lunularia cruciata	NCN	on moist banks	common
MARCHANTIACEAE				
	Marchantia polymorpha	marchantia	on moist banks	common
	Preissia corda	NCN	on shaded banks	common
PORELLACEAE				
	Porella navicularis	NCN	on hardwood bark in shade	common
RICCIACEACEAE				
	Riccia californica	NCN	on bare soil	common
SCAPANIACEAE				
	Scapania americana	NCN	on moist cut banks	common
TARGIONIACEAE				
	Targionia hypophylla	NCN	on cut banks	common
HORNWORTS				
ANTHOCEROTAE				
	Anthoceros bulbiculosus	hornwort	on cut banks	common
	Anthoceros hallii	hornwort	on cut banks	common
LICHENS				
FOLIOSE				
	Collema furfurascens	NCN	on oaks	occasional
	Flavoparmelia caperata	NCN	on oaks	common
	Flavopuntilia flaventio	NCN	on oaks	common
	Hypogymnia enteromorpha	NCN	on oaks	common
	Hypogymnia imshaugii	NCN	on oaks	common
	Hypogymnia physoides	NCN	on oaks	common
	Hypogymnia tubulosa	NCN	on oaks	common
	Kaernefeltia californica	NCN	on chamise	common
	Melanelia elegantula	NCN	on trees and shrubs	common
	Melanelia glabra	NCN	on oaks	common
	Parmotrema chinense	NCN	on oaks	common
	Parmelia quercina	NCN	on oaks	common

	Peltigera canina	dog lichen	on road cuts	occasional
	Peltigera collina	NCN	on manzanita	occasional
	Peltigera membranaceae	NCN	on road cuts	occasional
	Peltigera neopolydactyla	NCN	on soil	occasional
	Peltigera venosa	fan lichen	on cut banks	occasional
	Physcia adscendens	NCN	on oaks	common
	Physconia detersa	NCN	on oak limbs	common
	Platismatia glauca	NCN	on fir branches	common
	Paltismatia herrei	NCN	on branches	common
	Platismatia stenophylla	NCN	on fir branches	common
	Pseudocyphellaria antrapsis	NCN	on oaks	common
	Sticta fulginosa	NCN	on oaks	common
	Tuckermannopsis chlorophylla	NCN	on wood conifer forests	occasional
	Tuckermannopsis orbata	NCN	on limbs gen. conifers	occasional
	Xanthoria polycarpa	NCN	on oaks	common
	Xanthoparmelia mexicana	NCN	on rocks	common
UMBILICATE				
	Umbilicaria phaea	NCN	on rocks	common
GELATINOUS				
	Leptogium orniculatum	jelly horn lichen	on soil or rocks with moss	common
	Leptogium lichenoides	jelly lichen	on shaded soil	common
LEPROSE				
	Parmeliella cyanoleprosa	NCN	on soil	common
FRUTICOSE				
	Alectoria sarmentosa	NCN	on tree limbs	common
	Cladonia cervicornis ssp. verticillata	ladder lichen	on soil	occasional
	Cladonia coniocrata	common powderhorn	on soil	occasional
	Cladonia fimbriata	pixie cups	on soil	occasional
	Cladonia furcata	NCN	on soil	common
	Cladonia pyxidata	NCN	on soil	common
	Cladonia scabriuscula	NCN	on shaded soil	occasional
	Evernia prunastri	NCN	on oaks	common
	Letharia vulpina	wolf lichen	on fence posts, stumps	occasional
	Ramalina farinacea	NCN	on oaks	common
	Ramalina menziesii	NCN	on oaks	common
	Usnea arizonica	NCN	on oaks	common
	Usnea californica	NCN	on oaks	common

	Usnea ceratinea	NCN	on conifers	common
	Usnea filapendula	NCN	on conifers	common
	Usnea fragilescens	NCN	on conifers	common
	Usnea glaberescens	NCN	on conifers	common
	Usnea hesperina	NCN	on conifors	common
	Usnea longissima	**NCN**	**on conifers**	**rare**
	Usnea scabrata	NCN	on conifers	common
	Usnea subfloridana	NCN	on oaks	common
	Usnea substerilis	NCN	on oaks	common
CRUSTOSE				
	Caloplaca saxicola	NCN	on rocks	common
	Leicidia atrobrunnea	NCN	on rocks	common
	Leicidia tessellata	NCN	on rocks	common
	Ochrolechia pallescens	NCN	on oaks	common
	Pertusaria armaria	NCN	on oaks	common
	Petrusaria californica	NCN	on oaks	common
	Petula obscurans	NCN	on soil	occasional
	Theloma californicum	lobed nipple lichen	on fence posts	common

Appendix D Rare Plant Ranks

California Rare Plant Ranks **(see footnote below)**
1A. Presumed extirpated in California and either rare or extinct elsewhere
1B. Rare or Endangered in California and elsewhere
2A. Presumed extirpated in California, but more common elsewhere
2B. Rare or Endangered in California, but more common elsewhere
3. Plants for which we need more information - Review list
4. Plants of limited distribution - Watch list

1A: Plants Presumed Extirpated in California and either rare or extinct elsewhere
The plants of Rank 1A are presumed extirpated because they have not been seen or collected in the wild in California for many years. This rank includes those plant taxa that are both presumed extinct, as well as those plants which are presumed extirpated in California and rare elsewhere. A plant is extinct if it no longer occurs anywhere. A plant that is extirpated from California has been eliminated from
California, but may still occur elsewhere in its range.

1B: Plants Rare, Threatened, or Endangered in California and Elsewhere
(Includes Rare Plant Ranks 1B.1, 1B.2, 1B.3)
The plants of Rank 1B are rare throughout their range with the majority of them endemic to California. Most of the plants that are ranked 1B have declined significantly over the last century. California Rare Plant Rank 1B plants constitute the majority of plant taxa tracked by the CNDDB, with more than 1,000 plants assigned to this category of rarity.

2A: Plants Presumed Extirpated in California, but more common elsewhere
The plants of Rank 2A are presumed extirpated because they have not been seen or collected in the wild in California for many years. This rank includes only those plant taxa that are presumed extirpated in California, but that are more common elsewhere in their range. Note: Plants of both Rank 1A and 2A are presumed extirpated in California; the only difference is the status of the plants outside of the
state.

2B: Plants Rare, Threatened, or Endangered in California, but More Common Elsewhere
(Includes Rare Plant Ranks 2B.1, 2B.2, 2B.3)
The plants of Rank 2B are rare, threatened or endangered in California, but more common elsewhere. Plants common in other states or countries are not eligible for consideration under the provisions of the **Federal** Endangered Species Act; however they are eligible for consideration under the **California** Endangered Species Act. This rank is meant to highlight the importance of protecting the geographic range and genetic diversity of more widespread species by protecting those species whose ranges just extend into California. Note: Plants of both Rank 1B and 2B are rare, threatened or endangered in California; the only difference is the status of the plants outside of the state.

3: Plants About Which We Need More Information - A Review list
(Includes Rare Plant Ranks 3, 3.1, 3.2, 3.3)

The plants that comprise Rank 3 are united by one common theme--we lack the necessary information to assign them to one of the other lists or to reject them. Nearly all of the plants remaining on Rank 3 are taxonomically problematic.

4: Plants of Limited Distribution - A Watch list
(Includes Rare Plant Ranks 4.1, 4.2, 4.3)
The plants in this category are of limited distribution or infrequent throughout a broader area in California, and their vulnerability or susceptibility to threat appears low at this time. While we cannot call these plants "rare" from a statewide perspective, they are uncommon enough that their status should be monitored regularly. Should the degree of endangerment or rarity of a Rank 4 plant change, we will transfer it to a more appropriate rank or delete it from consideration.

Threat Ranks:
The California Rare Plant Ranks (CRPR) use a decimal-style threat rank. The threat rank is an extension added onto the CRPR and designates the level of threats by a 1 to 3 ranking with 1 being the most threatened and 3 being the least threatened. So most CRPRs read as 1B.1, 1B.2, 1B.3, etc. Note that some Rank 3 plants do not have a threat code extension due to difficulty in ascertaining threats for these species. Rank 1A and 2A plants also do not have threat code extensions since there are no known extant populations of the plants in California.

Threat Code extensions and their meanings:
.1 - Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
.2 – Moderately threatened in California (20-80% of occurrences threatened / moderate degree and immediacy of threat)
.3 – Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

Note: In March, 2010, DFG changed the name of "CNPS List" or "CNPS Ranks" to "California Rare Plant Rank" (or CRPR). This was done to reduce confusion over the fact that CNPS and DFG jointly manage the Rare Plant Status Review groups (300+ botanical experts from government, academia, NGOs and the private sector) and that the rank assignments are the product of a collaborative effort and not solely a CNPS assignment.

In July 2013, CNPS revised the Rare Plant Ranks in order to better define and categorize rarity in California's flora. In essence, Rank 2 was split into Rank 2A and Rank 2B to be complementary to the already existing 1A and 1B ranks. This split in Rank 2 plants resulted in five Rank 2 plants moving to Rank 2A (Presumed extirpated in California, but more common elsewhere) and the remaining Rank 2 plants being re-classified as Rank 2B (Rare, Threatened or Endangered in California, but more common elsewhere)

NatureServe Element Ranking For Plants - Last updated July, 2013

The California Natural Diversity Database (CNDDB) use the same ranking methodology, originally developed by The Nature Conservancy and now maintained and recently revised by NatureServe. It includes a Global rank (G rank), describing the rank for a given taxon over its entire distribution and a State rank (S rank), describing the rank for the taxon over its state distribution. For subspecies and varieties, there is also a "T" rank describing the global rank for the subspecies. The next page of this document details the criteria used to assign element ranks, from G1 to G5 for the Global rank and from S1 to S5 for the State rank. Procedurally, state programs such as the CNDDB develop the State ranks and the Global ranks collaboratively among states/provinces containing the species. NatureServe then checks for consistency and logical errors at the national level.

An element rank is assigned using standard criteria and rank definitions. This standardization makes the ranks comparable across organism and political boundaries. NatureServe has developed a "rank calculator" to help increase repeatability and transparency of the ranking process. The three main categories that are taken into consideration when assigning an element rank are rarity, threats, and trends. Within these three categories, various factors are considered including:

- Range extent, area of occupancy, population size, number of occurrences and number of good occurrences (ranked A or B). Environmental specificity can also be used if other information is lacking.
- Overall threat impact as well as intrinsic vulnerability (if threats are unknown).
- Long-term and short-term trends.

GLOBAL RANKING

The *global rank* (G-rank) is a reflection of the overall status of an element throughout its global range. Both Global and State ranks represent a letter+number score that reflects a combination of Rarity, Threat and Trend factors, with weighting being heavier on Rarity than the other two.

SPECIES OR NATURAL COMMUNITY LEVEL

G1 = **Critically Imperiled**—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = **Imperiled**—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 = **Vulnerable**—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = **Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = **Secure**—Common; widespread and abundant.

STATE RANKING

The *state rank* (S-rank) is assigned much the same way as the global rank, but state ranks refer to the imperilment status only within California's state boundaries.

S1 = **Critically Imperiled**—Critically imperiled in the state because of extreme rarity (often 5 or fewer populations) or because of factor(s) such as very steep declines making it especially vulnerable to extirpation from the state.
S2 = **Imperiled**—Imperiled in the state because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the state.
S3 = **Vulnerable**—Vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation from the state.
S4 = **Apparently Secure**—Uncommon but not rare in the state; some cause for long-term concern due to declines or other factors.
S5 = **Secure**—Common, widespread, and abundant in the state.

Appendix E: Rare Plant GPS Coordinates

Species	Longitude (D-M-S)	Latitude (D-M-S)
Usnea longissima	123 20 32.03146	38 44 30.45575
Usnea longissima	123 16 56.14327	38 41 23.80553
Usnea longissima	123 16 56.56373	38 41 23.74195
Usnea longissima	123 16 57.84883	38 41 26.31780
Usnea longissima	123 16 58.15427	38 41 26.06343
Usnea longissima	123 16 59.88045	38 41 24.08571
Usnea longissima	123 17 00.53905	38 41 24.11807
Usnea longissima	123 16 59.55403	38 41 13.91914
Usnea longissima	123 14 43.87425	38 42 51.32540
Usnea longissima	123 15 11.67752	38 41 20.03312
Usnea longissima	123 20 14.79818	38 45 21.40488
Usnea longissima	123 20 22.65582	38 45 12.59900
Usnea longissima	123 20 20.85202	38 45 12.70343
Usnea longissima	123 20 19.10798	38 45 11.78517
Usnea longissima	123 20 17.11846	38 45 15.95219
Usnea longissima	123 20 12.18328	38 45 15.35427
Usnea longissima	123 20 17.58955	38 45 13.83023
Usnea longissima	123 20 18.12907	38 45 13.33074
Usnea longissima	123 20 12.71889	38 45 08.42683
Usnea longissima	123 20 12.29839	38 45 08.15085
Usnea longissima	123 20 10.65182	38 45 13.21864
Usnea longissima	123 20 10.91408	38 45 13.17471
Usnea longissima	123 20 07.86705	38 45 09.56641
Usnea longissima	123 19 47.77368	38 45 10.33740
Usnea longissima	123 19 35.57387	38 45 06.11280
Usnea longissima	123 18 55.94811	38 44 24.72221
Usnea longissima	123 19 45.73019	38 44 42.44183
Usnea longissima	123 19 45.54675	38 44 42.46824
Usnea longissima	123 17 13.26547	38 44 55.53264
Usnea longissima	123 17 59.74815	38 45 28.21179
Usnea longissima	123 17 42.91162	38 45 24.79866
Usnea longissima	123 17 43.64078	38 45 25.06276
Usnea longissima	123 20 30.07687	38 44 29.93026
Usnea longissima	123 20 24.74830	38 44 26.05870
Usnea longissima	123 19 50.83267	38 44 11.08238
Usnea longissima	123 19 09.85782	38 43 40.45115
Usnea longissima	123 23 00.41535	38 46 24.80736
Usnea longissima	123 22 52.25313	38 46 37.43583
Usnea longissima	123 22 53.19827	38 46 36.96582
Usnea longissima	123 22 50.60819	38 46 31.93111
Usnea longissima	123 22 08.78483	38 46 33.18290
Usnea longissima	123 22 15.04583	38 46 31.53923
Usnea longissima	123 25 08.60836	38 46 17.99897
Usnea longissima	123 25 08.79839	38 46 16.31758

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Usnea longissima	123 25 14.01457	38 46 00.15157
Usnea longissima	123 25 10.72418	38 46 08.30191
Usnea longissima	123 25 20.41175	38 46 03.48461
Usnea longissima	123 25 17.54607	38 45 47.62136
Usnea longissima	123 25 13.61634	38 45 48.44187
Usnea longissima	123 24 41.87023	38 44 53.82911
Usnea longissima	123 24 44.69730	38 44 28.90626
Usnea longissima	123 25 05.33147	38 44 58.12425
Usnea longissima	123 25 05.61196	38 44 56.79903
Usnea longissima	123 24 58.51435	38 44 58.68815
Usnea longissima	123 24 55.66193	38 44 58.00198
Usnea longissima	123 24 51.46945	38 44 59.37487
Usnea longissima	123 24 59.95517	38 44 53.98425
Usnea longissima	123 24 59.26860	38 44 50.32770
Usnea longissima	123 24 59.08889	38 44 49.00811
Usnea longissima	123 24 59.49052	38 44 46.05926
Usnea longissima	123 24 58.16986	38 44 45.23423
Usnea longissima	123 24 55.18929	38 44 45.81133
Usnea longissima	123 24 53.28970	38 44 46.73571
Usnea longissima	123 24 45.21898	38 44 38.24248
Usnea longissima	123 24 46.10159	38 44 32.46397
Usnea longissima	123 24 40.51965	38 44 41.12345
Usnea longissima	123 24 40.76477	38 44 45.74670
Usnea longissima	123 24 41.61935	38 45 05.62305
Usnea longissima	123 24 31.13136	38 44 55.17628
Usnea longissima	123 24 28.99317	38 44 55.68287
Usnea longissima	123 24 26.78301	38 44 56.43066
Usnea longissima	123 24 29.72524	38 44 26.76913
Usnea longissima	123 17 02.19613	38 41 14.22127
Usnea longissima	123°18"05.497'	38°42"58.982'
Usnea longissima	123°18"06.714'	38°42"59.032'
Usnea longissima	123°18"07.937'	38°42"57.048'
Usnea longissima	123 20 11.77137	38 45 07.09997
Pityopus californicus	123 22 52.42821	38 46 26.54914
Pityopus californicus	123 25 24.54715	38 45 54.46695
Pityopus californicus	123 22 43.72594	38 45 01.07572
Pityopus californicus	123°16"45.166'	38°45"22.632'
Piperia candida	123 19 48.40910	38 43 41.38293
Piperia candida	123 19 40.28643	38 43 44.12858
Piperia candida	123 19 39.75122	38 43 40.47596
Piperia candida	123 25 14.77363	38 46 02.83886
Piperia candida	123 25 22.94488	38 45 54.85360
Piperia candida	123 24 25.37165	38 46 01.58082

Kjeldsen Biological Consulting, Redwood Coast Associates & Klienfelder,Inc. - G -

Piperia candida	123 22 44.17943	38 45 02.32675
Piperia candida	123 24 41.00824	38 44 30.83342
Cordylanthus tenuis	123 21 44.76861	38 45 17.55279
Cordylanthus tenuis	123 21 46.61161	38 45 19.34775
Cordylanthus tenuis	123 21 41.88413	38 45 16.74044
Calamagrostis bolanderi	123 25 14.89285	38 46 02.30323
Lotus formosissimus	123 24 45.23858	38 45 04.72905
Lotus formosissimus	123 24 46.44907	38 45 05.53423
Lotus formosissimus	123 23 27.24141	38 45 55.16729
Lotus formosissimus	123 22 37.03108	38 45 35.35659
Horkelia tenuiloba	123 24 43.85049	38 44 58.21523
Horkelia tenuiloba	123 24 51.54363	38 44 57.72097
Horkelia tenuiloba	123 24 56.81748	38 44 56.62870

2014 Rare Plant Occurrences

Astragalus breweri	123.27605	38.73516
Trifolium buckwestiorum	123.36327	38.75496
Trifolium buckwestiorum	123.36643	38.75506

Fig. 1 Buckeye Forest with ridgetop 2006, 2009 ridgetop study areas and locations of rare plants (Kjeldsen et al 2006)

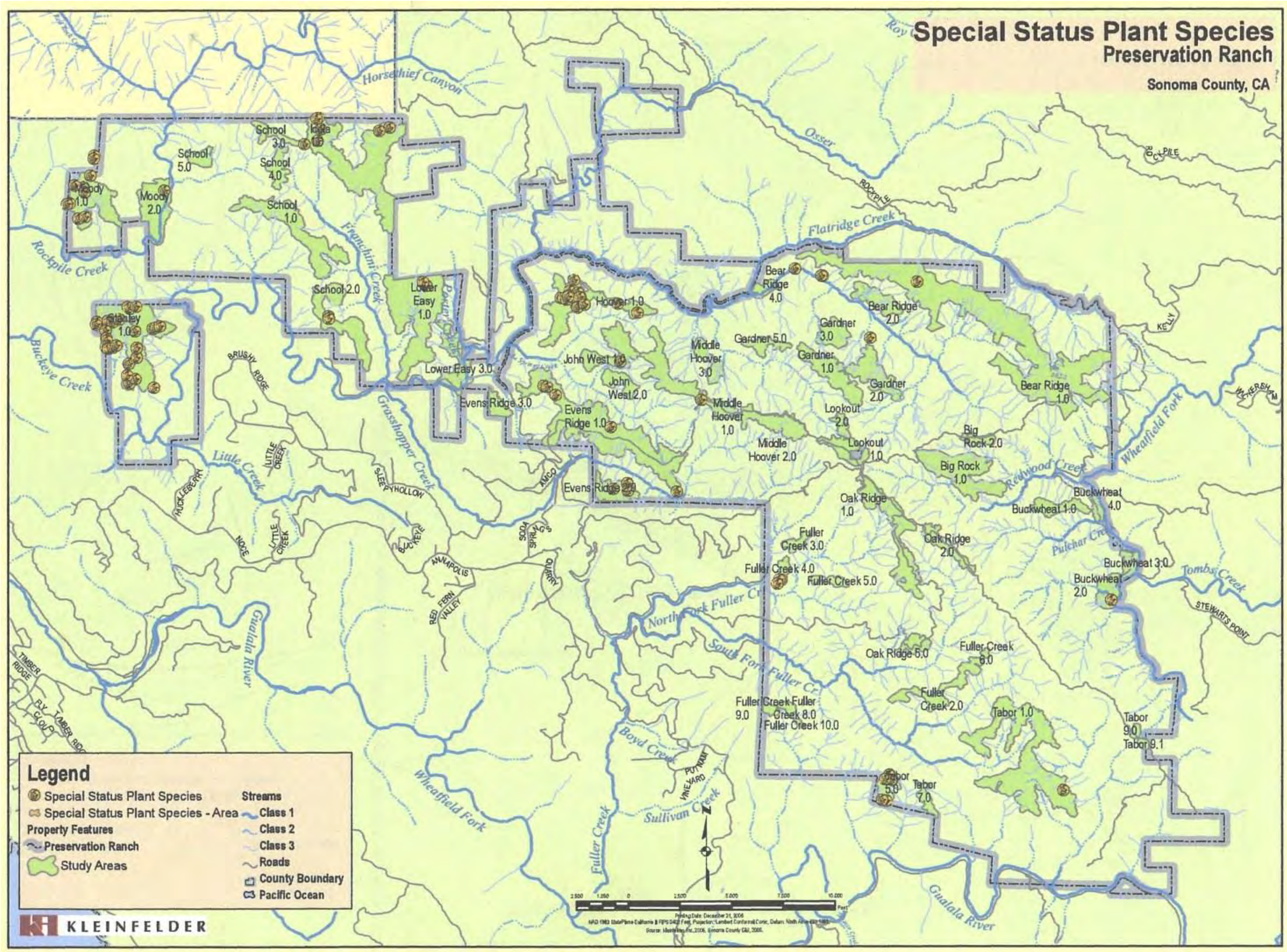

Fig. 2 Stanley Meadow Complex showing 3 meadow patches connected by roadway.

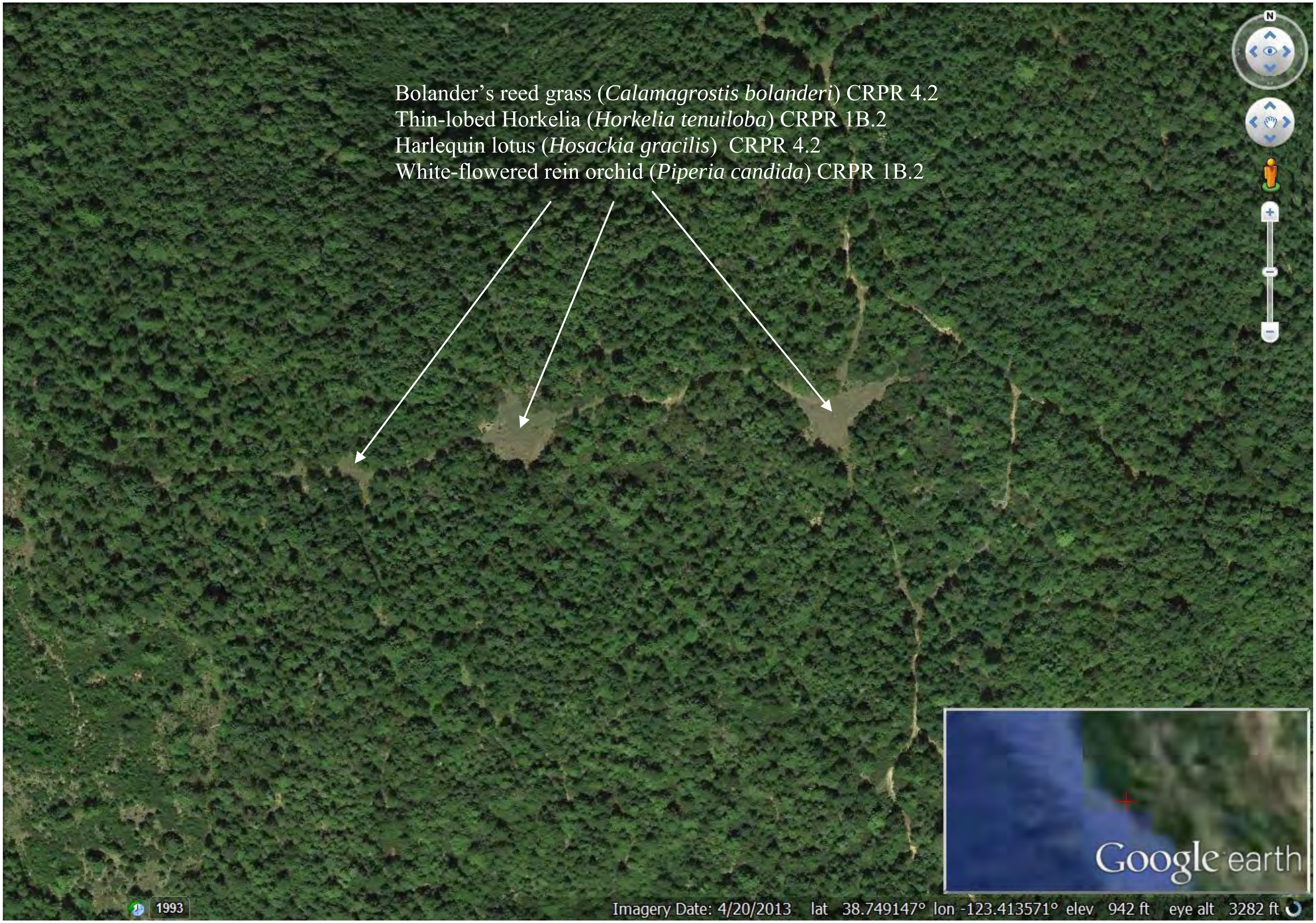

Fig. 3 Serpentine grassands and barrens within the Big Rock opening, Windy Gap Road.

Fig. 4 Serpentine bird's beak (*Cordylanthus tenuis* subsp. *brunneus*) CRPR 4.3 and prelimary *Stipa pulchra* grassland, Lower Easy Road

APPENDIX B

APPENDIX B: NORTHERN SPOTTED OWL LIFE HISTORY AND HABITAT INFORMATION

The spotted owl is a medium-sized owl, about 20 inches long with an average wingspan of 40 inches. Spotted owls have large dark eyes, lack ear tufts and the legs and feet are fully feathered. The spotted owl's diet generally consists of rodents and small birds with a smaller component of other various animals such as insects, bats and lizards (Forsman 1984). Spotted owls hunt for food or forage by perching and swooping on prey items. The spotted owl's range occurs from southern British Columbia to the southern part of the Sierra Madre Occidental and Oriental mountains in Mexico. The spotted owl is comprised of three subspecies within this range. The Mexican spotted owl's range is the largest occurring from the southern Rocky Mountains in Colorado; the Colorado Plateau in southern Utah; southward through Arizona, New Mexico, and far western Texas; in Mexico through the Sierra Madre Occidental and Oriental mountains and the southern end of the Mexican Plateaus range. The California spotted owl occurs throughout the Sierra Nevada mountain range in addition to the coastal mountain ranges of southern California north to the San Francisco peninsula. The Northern spotted owl range is north of the San Francisco peninsula throughout the coastal and inland ranges of California and throughout the coastal and Cascade mountain ranges of Oregon and Washington to southern British Columbia. The redwood region accounts for only about 9% of the northern spotted owl's range.

The northern spotted owl (hereafter referred to as NSO) was listed as a threatened species under the Endangered Species Act (ESA) in 1990 as concern mounted over the continuing loss of habitat NSOs appeared to require for survival and reproductive success (Federal Register 1990). As part of the ESA listing, landowners within the range of the NSO were required to survey for their presence if any kind of habitat-altering activities were proposed. The United States Fish and Wildlife Service (USFWS) is in charge of administering and consulting with species protected under the ESA. The USFWS developed a protocol for surveying for NSOs in 1991 and revised it in 1992. Subsequently, in 2011 the USFWS developed an updated protocol primarily intended to address the presence of barred owls. Additional minor revisions to the protocol were made in 2012. In August 2013, the California Fish and Game Commission designated the NSO as a "candidate" species for listing under the California Endangered Species Act (CESA). "Candidate" species still receive protection under CESA, and at this time, it is uncertain what regulatory changes may result from this new listing status.

Northern Spotted Owl Survey Procedures

Northern spotted owl surveys are currently required to be conducted in conformance with the 2012 revision of the 2011 USFWS NSO survey protocol. The USFWS NSO survey protocol requires landowners within the range of the northern spotted owl to survey areas for NSO presence if any "habitat altering, or significant disturbance" project is proposed. The method of surveying for presence requires covering the project area with survey stations spaced approximately ¼ - ½ mile apart. Each survey station is "called" for 10 minutes using a digital calling device that plays recorded NSO vocalizations.

Survey stations are called between sunset and sunrise, and the permitted survey season is March 1-August 31. The protocol requires six survey visits per year to the project area for two years prior to commencing project operations. If NSO are detected during nighttime surveys, daytime follow-up surveys are conducted in order to determine if there is a NSO territory in the area of the detection. If NSO are found during daytime surveys, they are offered mice, and the fate of these mice is recorded in order to determine reproductive status (i.e., whether a NSO territory is nesting or not).

The current survey methodology utilized across The Conservation Fund's (TCF's) entire North Coast ownership differs slightly from the USFWS protocol in that surveys are conducted ownership-wide rather than on a project-specific basis. In essence, the entire ownership is treated as individual project areas under the USFWS protocol. All other provisions in the 2012 USFWS survey protocol related to the conduct of surveys (i.e. spacing of survey visits, number of survey visits, weather constraints, follow-up visits, reproductive status determination, etc.) are followed. Conducting surveys in this manner has helped develop a better understanding of the dynamics of the NSO population throughout TCF's North Coast ownership. Annual ownership-wide surveys have better allowed TCF to identify when NSO activity centers move and when new NSO territories become established. This helps track and identify key areas for protection and minimizes the likelihood that a given project will result in the take of an NSO.

Habitat Requirements and Regulations

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

The USFWS defines NSO habitat as the following:

- Nesting/roosting habitat: ≥ 60% canopy cover of trees ≥ 11" DBH (diameter at breast height) and ≥ 100 square feet of basal area of trees ≥ 11" DBH
- Foraging habitat: ≥ 40% canopy cover of trees ≥ 11" DBH and ≥ 75 square feet of basal area of trees ≥ 11" DBH
- Non-suitable Habitat: ≤ 40% canopy cover of trees ≥ 11" DBH and ≤ 75 square feet of basal area of trees ≥ 11" DBH.

The Buckeye Forest is composed of a relatively continuous landscape of closed canopy 45-55 year-old timber. The dominant tree species are sugar pine, Douglas-fir, and redwood, and there is a substantial component of mixed hardwood species, primarily tanoak. No late-seral stage stands are present on the property, but a few scattered individual residual old growth trees remain. Using the USFWS habitat definitions, the majority of the property is most likely foraging habitat, with scattered patches of nesting/roosting habitat focused primarily along riparian areas.

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

Silvicultural Objectives and Habitat Development

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

Buckeye Forest NSO Survey Summary

Historically, NSO surveys on the Buckeye Forest have been somewhat inconsistent. Throughout the 1990's surveys were conducted on a timber harvest plan specific basis and little effort was made to monitor known NSO territories for occupancy and reproductive status. From 2005-2011, the previous landowner conducted NSO surveys of the proposed vineyard conversion areas and, due to the scope of these proposed projects, these surveys were functionally conducted ownership wide. No NSO surveys were conducted on the ownership in 2012 and 2013. In 2014, TCF again conducted surveys ownership wide. These surveys indicate the probable presence of 5 occupied territories across the ownership.

Additional Threats to NSOs

Aside from the habitat issues associated with NSO reproduction and survival, there is a more ominous threat to NSOs emerging, which is the invasion of the barred owl into the range of the NSO. Barred owls are in the same genus as NSOs and occupy a similar niche, competing for many of the same prey resources and nesting sites. Antagonistic behavior between barred owls and NSO is well documented throughout the Pacific northwest (Courtney et al., 2004 and Olson et al., 2005). Barred owls are displacing NSOs (Kelly et al., 2003) as well as suppressing the calling behavior of NSOs, which can make NSO survey efforts increasingly difficult and possibly ineffective (Crozier et al., 2006). In the last decade, the number of barred owls in Mendocino and Sonoma Counties has steadily increased. Barred owls have been detected during NSO surveys across TCF's ownership and have either displaced or impaired the ability to detect NSO on the Salmon Creek and Garcia River Forest properties. Barred owls were frequently detected during 2014 surveys of the Buckeye Forest in the vicinity of the Soda Springs Reserve and Skaggs Springs Road and this appeared to reduce the detection rate at nearby NSO territories. No barred owls were detected during previous years' surveys, which suggest that barred owls are likely a recent arrival in the area. In other portions of the redwood region, experimental barred owl removal trials have been partially successful at allowing NSO to re-occupy sites where they were previously displaced (Diller et al., 2012). Recent studies also suggest management activities, such as the creation of 15-25 acre patches of early seral hardwoods in close proximity to known barred owl nests and preferential removal of redwood during thinning in young stands may provide habitat conditions that

NSO are better adapted to exploit than barred owls (Irwin et al., 2013). Barred owl management activities may be considered if NSO displacement continues to become problematic and if permitting opportunities exist.

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APPENDIX C

Buckeye Forest

Aquatic Management Plan

Upper Wheatfield Fork
Gualala River

Prepared for

The Conservation Fund

Prepared by

The Gualala River Watershed Council
P.O. Box 1269
Gualala, California 95445

April, 2014

Table of Contents

List of Tables

List of Maps

Background

The aquatic management plan for the Buckeye Forest relies on a synthesis of information derived from a number of Gualala River watershed plans that include watershed assessments and the analysis of watershed limiting factors already completed in the Gualala River watershed.

2003 Gualala River Watershed Synthesis Report by the North Coast Watershed Assessment Program (NCWAP) (Klamt, et al, 2003), the Gualala River Watershed Council Cooperative Monitoring Program (GRWC, 2012), the Gualala Estuary and Lower River Enhancement Plan (ECORP Consulting, Inc. *et al*, 2005), Final Recovery Plan for Central California Coast coho salmon (Oncorhynchus kisutch) Evolutionarily Significant Unit (NOAA, 2012) and the Gualala River Watershed Technical Support Document for Maximum Daily Load for Sediment (NCRWQCB, 2001).

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 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.

For the development of this plan it is not necessary to discuss the entirety of all studies and processes involved. Rather the purpose is to establish that certain stream conditions are commonly recognized to influence salmonid production in most watersheds throughout this region, and they are generally well recognized in peer reviewed articles and publications.

Gualala River Watershed Overview

Located in both Mendocino and Sonoma Counties, the Gualala River drains 685 miles of streams in the northern California Coastal Ranges. The river enters the Pacific Ocean south of the town of Gualala, 114 miles north of San Francisco and 17 miles south of Point Arena. At 212,563 acres (332 mi^2) it is one of the largest watersheds in the Mendocino Coast Hydrological Unit. The watershed is elongated, running over 32 miles long north-south, with an average width of 14 miles. The entire basin lies within 20 miles of the Pacific Ocean. Elevations vary from sea level to 2,602 feet at Gube Mountain and terrain is most mountainous in the northern and eastern parts of the basin.

The watershed has a rural population of 3,419 centered near four unincorporated communities; Gualala, Sea Ranch, Annapolis and Stewarts Point. The economic viability of the area has long depended on timber and agriculture as a main source of employment with 80% of all the watershed lands zoned for timber production.

The climate is influenced by fog near the coast with seasonal temperatures ranging between 40°F to 60°F, with the interior basin ranging from below freezing to over 90 (F) degrees seasonally. Rainfall also varies by location within the basin with 33 inches falling on average near the town of Gualala and totals reaching over 63 inches in some areas within the interior. Coastal conifer forests of redwood and Douglas fir occupy the northwestern, southwestern and central portions of the watershed while oak-woodland and grassland cover many slopes in the interior basin.

A long history of movement along the San Andreas Fault and the Tombs Creek Fault has been a dominant force in the shaping of the basin. The sub-watersheds, largely fault controlled, flow through primarily steep valleys with little or narrow floodplains.

The Gualala watershed is typical of North Coast watersheds that have geology prone to storm induced erosion events (Kelsey et al., 1981). 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, recent uplift, and a distinctive climate accounts for the large sediment yields (Bailey et. al., 1964). Suspended sediment and turbidity are elevated for periods of time during the high runoff, rainy season (NCRWQCB, 2001)

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.

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

Map 1: Overview of Gualala River Forest

Large scale tractor logging projects 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 coniferous species in the riparian corridors has resulted in a lack of mature riparian for woody debris recruitment and thus a lack of deep pools with shelter needed for salmon and steelhead summer rearing habitat.

The Gualala River lies within the Central California Coast Coho salmon Evolutionary Significant Unit (ESU), which is listed as endangered under the Endangered Species Act (NMFS 2005). Critical habitat includes all river reaches and estuarine areas accessible to Coho salmon within the ESU's geographic area (NMFS, 1999). Winter run steelhead in the Gualala river basin are part of the Northern California

Steelhead Distinct Population Segment (DPS) and are listed as threatened under the Federal ESA (NMFS, 2006).

In 1993, the USEPA listed the Gualala River on its federal Clean Water Act §303(d) list of impaired water bodies due to declines in anadromous salmonids from excessive sedimentation. The listing was updated in 2003 and water temperatures in the basin are now considered impaired as well. *A Technical Support Document (TSD) for the Total Maximum Daily Load for the Gualala* was completed by the North Coast Regional Water Quality Control Board (NCRWQCB) in 2001.

Coho naturally inhabited the streams flowing from coniferous forest but were likely sub-dominant to steelhead in interior basin areas draining the mélange due to the more open nature of the channels, less suitable habitat, and naturally warmer stream temperatures. The interior basin is largely grassland with scattered oaks. Surface water in this area generally lack shade and is warmed with abundant sunshine.

The watershed has produced timber since before the turn of the last century and presently timber and ranching are still the main land use. In recent years timber land conversions to rural subdivisions and vineyards has increased in the Buckeye Creek, the Wheatfield Fork and the South Fork Super Planning Watersheds. Aggregate mining occurs on the South Fork between the Wheatfield Fork and the North Fork.

Buckeye Forest Overview

The Buckeye Forest encompasses 19,651 acres (31 mi^2) in the Rockpile Creek, Buckeye Creek and Wheatfield Fork Super Planning Watersheds (SPW) within the Gualala basin. The entire ownership is within Sonoma County and spans an area from the northern boundary of the Sonoma County line, south to the Wheatfield Fork main-stem and Skaggs Springs Road. The property is situated centrally, east to west, within the watershed, with the eastern boundary extending into the Tombs Creek fault zone.

Overall, the ownership represents 10% of the Gualala River watershed and contains twenty-nine (29) miles of fish bearing streams. Fish bearing streams within the ownership include three main-stem tributaries to the Gualala, Rockpile Creek, Buckeye Creek and the Wheatfield Fork, along with ten smaller tributaries that contain portions of stream reaches classified as CalFire Class I fish bearing streams.

Table 1.1: Buckeye Forest Acreage by Planning Watersheds

The Conservation Fund Buckeye Forest Calwater 2.2A Planning Watersheds*	Total Watershed Acres	Total Watershed Sq. Miles	Buckeye Forest Total Acres	Buckeye Forest Total Sq Miles	Buckeye Forest Percent of Watershed
1113.8 Gualala River HSA	212,563	332.1	19,651	30.7	9.24%
Gualala River HSA (without coastal watersheds)	190,992	298.4	19,651	30.7	10.29%
1113.82 Rockpile SPWS	22,403	35.0	1,454	2.3	6.49%
113.82013 Lower Rockpile PWS	2,946	4.6	561	0.9	19.04%
113.82012 Redrock PWS	2,219	3.5	645	1.0	29.07%
113.82011 Middle Rockpile PWS	8,165	12.8	248	0.4	3.04%
113.83 Buckeye Creek SPWS	25,784	40.3	9,916	15.5	38.46%
113.83014 Little Creek PWS	5,868	9.2	1,256	2.0	21.40%
113.83013 Grasshopper Creek PWS	5,766	9.0	3,811	6.0	66.09%
113.83012 Harpo Reach PWS	2,722	4.3	786	1.2	28.88%
113.83011 Flat Ridge creek PWS	6,529	10.2	4,063	6.3	62.23%
113.84 Wheatfield Fork SPWS	71,492	111.7	8,281	12.9	11.58%
113.84032 Fuller Creek PWS	7,039	11.0	3,370	5.3	47.88%
113.84030 Tobacco Creek PWS	8,061	12.6	2,174	3.4	26.97%
113.84012 Wolf Creek PWS	10,101	15.8	2,733	4.3	27.06%
113.84010 Buck Mountain PWS	8,189	12.8	4	< 1.0	0.05%

*The GRWC uses the California Watershed Map (Calwater version 2.2a) to delineate watershed units. The hierarchy of watershed designations consists of six levels of increasing specificity: Hydrologic Region (HR), Hydrologic Unit (HU), Hydrologic Area (HA), Hydrologic Subarea (HSA), Super Planning Watershed (SPWS), and Planning Watershed (PWS).

Historically coho salmon were most likely present within all sub-basins of the ownership. In the 1960s and 1970s the California Department of Fish and Wildlife (CDFW) conducted stream surveys within the Buckeye Creek and Wheatfield Fork watersheds; steelhead trout and coho salmon were present throughout the stream systems (Bill Cox, 1994). Historical surveys were not conducted in the Rockpile Creek sub-basin but steelhead trout have been observed.

Vegetation in the lower sub-basins is primarily conifer forest comprised of coast redwood (*Sequoia sempervirens*) and Douglas fir (*Pseudotsuga menziesii*). The primary constituents of the riparian canopy are coast redwood, Douglas-fir, red alder (*Alnus rubra*) and willow (*Salix* Spp.), all of which is nearly continuous throughout the main-stem stream network in the western portion of the property. Within the eastern sub-basins a distribution of fragmented Douglas fir and hardwoods primarily inhabit north facing slopes and riparian zones. Distant from the coastal marine influence, along steep upslope areas and ridge tops, occur a mixture of oak-woodlands, mixed chaparral and grasslands.

In 1997 Coastal Forestlands a previous landowner, conducted a Watershed and Aquatic Habitat Assessment and identified sedimentation, large woody debris (LWD) and riparian canopy/temperature as key factors causing significant adverse impacts on salmonids. These factors have been confirmed in more recent assessments.

In 2005 the previous landowner contracted with the Watershed Council for an expansion of the Gualala River Watershed Council (GRWC) monitoring program into the upper Rockpile Creek, Buckeye Creek and Wheatfield Fork watersheds to collect baseline data. This request provided the Council with an opportunity to expand the monitoring program into areas of the watershed where stream morphology data were limited. During this period twelve (12) monitoring reaches were installed on the property and baseline data were collected during the 2005 and 2006 monitoring seasons. The GRWC is continuing to collect water and air temperature data at established sites on the property.

In 2005 and 2006, Kleinfelder, Inc. was contracted to conduct a watershed assessment for the property. The assessment consisted of habitat typing according to CDFW protocols, macro invertebrate sampling and anadromous salmonids presence/absence sampling completed by ocular surveys from the bank (Stream Habitat Inventory Assessment Preservation Ranch, Kleinfelder, 2007).

Water Quality grab samples were also collected at five (5) stations throughout the property during 2005 and 2006 to determine compliance with designated uses under the Basin Plan. In addition, nine chemical active ingredients for eleven pesticides products were tested at the sampling sites and none were detected in the samples.

As part of an effort to assess limiting factors within the property, Stillwater Sciences was hired to analyze factors potentially limiting steelhead (*Oncorhynchus mykiss*) production in the Buckeye Creek and Wheatfield Fork sub-basins of the Gualala River watershed (Preservation Ranch Limiting Factors Analysis, Stillwater Sciences, 2008).

O'Connor Environmental, Inc. implemented a monitoring program in the autumn of 2005 to collect data on streamflow, turbidity, and suspended sediment load at three stations in Franchini Creek, Soda Springs Creek and upper Buckeye Creek. In 2006, a fourth station was added in the Wheatfield Fork sub-basin within the South Fork Fuller Creek watershed.

During this same period a Road Restoration Plan was developed by Kent and Associates. During plan development one-hundred (100) miles of the road network were assessed by Pacific Watershed Associates and Kent and Associates.

The highest priority recommendations for restoration within the ownership correspond to the issues facing the watershed as a whole. In general they are: (1) to decrease anthropogenic sediment delivery to watercourses by upgrading, decommissioning, and abandoning forest and ranch roads, (2) improve sediment metering, pool density, depths, and shelter ratings by increasing the abundance of in-stream large wood and (3) protect riparian buffers and increase in-channel canopy density in selected areas of the main-stems and tributaries of Rockpile Creek, Buckeye Creek and the Wheatfield Fork (NMFS 2012, GRWC 2012, Klamt et al 2003, NCRWQCB, 2003).

Aquatic Species

Three anadromous fish species and five fresh water species, including the Gualala Roach which is endemic to the Gualala, are commonly found in the fresh water environment of the Gualala River (Table 1.2). 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 that Chinook salmon ever inhabited the watershed.

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 that include 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 currently limited outside the Buckeye Forest property 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.

Within the property, coho salmon were last observed from bank observations during a stream survey on the main-stem of Buckeye in 1964 and in Franchini Creek in 1970 (Klamt, et al 2003).

Neither accurate nor credible coho salmon population estimates have been conducted in the Gualala River watershed (Klamt et al, 2003). Electrofishing (10 Pool Protocol) data from 2001 indicated that coho salmon were absent and possibly extirpated from the Gualala basin (Coho Salmon Status Review, CDFG 2001), 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.

In 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).

In 2003: in May during a Gualala River estuary sampling event a coho juvenile was found (ECORP Consulting, Inc. et al, 2005). Then again in June juvenile coho salmon were reported by NOAA Fisheries personnel to have stranded immediately after an estuary summer breach event. 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 where found in upper Dry Creek during snorkel surveys (CDFG, 2004).

2005 to 2012: comprehensive surveys and/or studies that would lead to coho observations or population assessments were not conducted in the watershed during this period.

2013: in partnership with the North Coast Regional Water Quality Control Board (NCRWQCB), the National Marine Fisheries Service (NMFS) and the California Department of Fish and Wildlife (CDFW) the GRWC implemented a three year program to conduct snorkel surveys within coho habitat in the North Fork basin. No juvenile coho were found during the snorkel surveys in 2013.

The last planting of coho salmon fingerlings in the watershed was in the Little North Fork tributary in 1998 (Klamt et al, 2003). With multiple sightings of juvenile coho continuing six (6) years later, it is highly probable that a remnant coho population existed in the Gualala until 2004.

Steelhead Trout (*Oncorhynchus mykiss*)

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

In 1973, CDFG estimated that 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. The respective 95% confidence limits were 799-5,165 and 571-9,535. In 1974-75, CDFG estimated that the adult steelhead population was 7,608, with a 95% confidence interval of 6,126-10,379 (Boydstun, 1976b). In 1975-76 the population was estimated at 6,300 (Boydstun, 1976b). In 1977, CDFG estimated the winter steelhead population at 4,400 (Sheahan, 1991).

CDFG 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.

In 2008 the Stillwater Sciences study found that although spawning gravels and water temperatures were not optimum, the spring, summer, and fall fish surveys indicated that juvenile steelhead are common to abundant in Buckeye Creek and Wheatfield Fork within the property. The report findings are summarized into four categories:

- Steelhead production remains sufficient to maintain a population although at a substantially reduced level compared to historical conditions.
- Summer survival of steelhead appears limited by warm water temperatures, a limitation that may be caused by a change in vegetation patterns from conifer to oak woodland in the upper portions of the Study Area.
- Reduction in the frequency of deep pools, caused by LWD removal and a reduction in streamside recruitment may also have reduced the carrying capacity of juveniles.
- Overwintering habitat, in particular cobble-boulder habitat complexes, is scarce and likely limits survival and production of age 1+ and older steelhead smolts.

Current adult steelhead population estimates for the Gualala River basin are not available. The GRWC 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, which is roughly half the adult population that existed in the mid-1960s (McEwan and Jackson 1996).

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.

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). Boydstun (1977) found that 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 that they spent from one to four years in fresh water and from one to three years in the ocean (Shapovalov and Taft 1954).

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.

Table 1.2: Aquatic Species Present or Potentially Occurring

Common Name	Species	Listing Status		
		California	CDFW	Federal
Fish				
Anadromous				
Coho salmon	Oncorhynchus kisutch	Threatened		Endangered
Steelhead trout	Oncorhynchus mykiss			Threatened
Pacific lamprey	Lampetra tridentata			
Freshwater				
Gualala Roach	Lavinia symmetricus parvipinnis		SSC*	
Coast range sculpin	Cottus aleuticus			
Prickly sculpin	Cottus asper			
Riffle sculpin	Cottus gulosus			
Threespine stickleback	Gasterosteus aculeatus			
Reptiles				
Northern Pacific Pond Turtle	Turtle Actinemys marmorata			
Western Aquatic Garter Snake	Thamnophis couchi			
Amphibians				
Coastal (Pacific) Giant Salamander	Dicamptodon tenebrosus			
Southern Torrent Salamander	Rhyacotriton variegatus		SSC	
Northwestern Salamander	Ambystoma gracile			
Rough-skinned Newt	Taricha granulosa			
Red-bellied Newt	Taricha rivularis			
Coast Range Newt	Taricha torosa		SSC	
Ensatina	Ensatina eschscholtzi			
Black Salamander	Aneides flavipunctatus			
Tailed Frog	Ascaphus truei		SSC	Threatened
Western Toad	Bufo boreas			
Pacific Treefrog	Hyla regilla			
California red-Legged Frog	Rana draytonii		SSC	Threatened
Foothill Yellow-legged	Frog Rana boylei		SSC	

**California Department of Fish and Wildlife Species of Special Concern*

Watercourse Location & Evaluation

The complexity of stream conditions within the sub-basins and the clear differences between tributaries and main-stems makes it difficult to develop ownership-wide assessments and recommendations. In order to be specific this chapter provides information on streams in the context of CalWater Planning Watersheds within the Rockpile Creek, Buckeye Creek and Wheatfield Fork SPWS.

Sub-basins are prioritized, with those streams with high habitat quality for steelhead and coho salmon given highest priority. Criteria are: riparian condition, water temperatures, spawning gravel quality, pool frequency, depth, and complexity.

Table 1.3: Stream Class Designation

Buckeye Forest CalWater Planning Watersheds	Total Class I Streams	Buckeye Forest Class I Streams	Total Class II Streams	Buckeye Forest Class II Streams	Total Class III Streams	Buckeye Forest Class III Streams
1113.82 Rockpile SPWS						
1113.82013 Lower Rockpile PWS	5.6	0.8	3.5	1.7	8.4	4.8
1113.82012 Redrock PWS	3.2	0.8	7.3	1.7	17.4	5.3
1113.82011 Middle Rockpile PWS	9.6	0.0	20.1	0.5	39.7	1.4
1113.83 Buckeye Creek SPWS						
1113.83014 Little Creek PWS	13.8	3.2	7.5	2.5	13.1	10.5
1113.83013 Grasshopper Creek PWs	11.1	6.0	15.2	14.5	46.8	43.6
1113.83012 Harpo Reach PWS	3.4	2.4	6.5	3.4	10.8	5.0
1113.83011 Flat Ridge Creek PWS	8.9	6.3	23.2	17.5	58.4	53.1
1113.84 Wheatfield Fork						
1113.84032 Fuller Creek PWS	10.8	4.5	14.8	11.9	37.0	33.2
1113.84030 Tobacco Creek PWS	10.8	1.5	15.8	7.3	16.7	12.6
1113.84012 Wolf Creek PWS	18.1	3.8	17.6	13.5	31.7	29.2
1113.84010 Buck Mountain PWS	8.4	0.0	3.3	0.0	1.2	0.0

In addition to the synthesis of published assessments and recommendations, data and analysis developed by the GRWC were used to evaluate current conditions. These include:

- Watershed-wide road coverage combined all available GIS road layers. A branching road identification system that gives roads in the watershed a unique and geographically logical identification number was created. The road systems were then "routed" and are connected to a database and manipulated based on the information about the condition of the road in the database.
- GRWC Cooperative Monitoring Program developed a Gualala River Watershed Monitoring Program Plan with a Quality Assurance Project Plan approved by the North Coast Regional Water Quality Control Board (NCRWQCB), State Water Resources Control Board (SWRCB), Department of Water Resources (DWR) and the California Environmental Protection Agency (CalEPA) for the Gualala River watershed.
- Thirty-five monitoring reaches have been installed in the watershed and 110 temperature monitoring sites. Surveys of thalweg elevations, cross-sections, riparian vegetation, canopy density, substrate, temperature, and large wood inventories have

been conducted at these established sites over the past 15 years. The data collected on the physical condition of the watershed allows evaluation of ecological events, trends, effects of Best Management Practices and the analysis of the effectiveness of restoration projects.

In partnership with federal and state resource agencies the GRWC has established general watershed-wide thresholds to evaluate habitat quality and provide goals for restoration efforts. Many of these thresholds are not universal but dependant on many site specific physical factors (i.e. channel size, gradient, vegetation composition, etc.).

Descriptions of common thresholds for assessing planning watershed and stream habitat health are discussed in the paragraphs below. Specific thresholds are presented in the Restoration Enhancement and Monitoring chapter in this report.

Stream temperature is one of the most important environmental factors affecting aquatic ecosystems. The vast majority of aquatic organisms are poikilothermic; their body temperatures and hence their metabolic demands are determined by temperature. Temperature has a significant effect on cold-water fish, both from a physiological and behavioral standpoint.

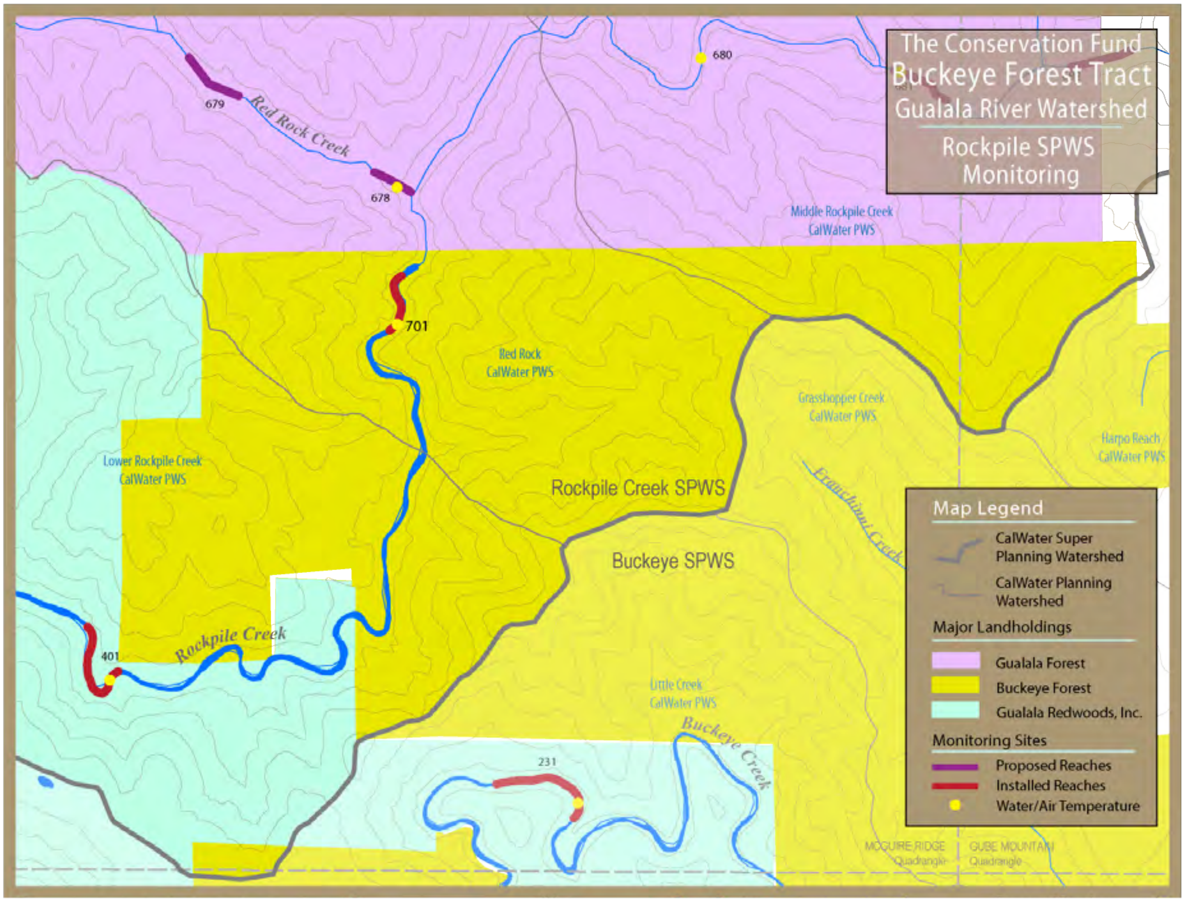
- MWAT: maximum weekly average temperature is the highest seven-day moving average of the daily mean temperatures. Habitat with an MWAT of 15.6^{0}C (60^{0}F) or below is considered fully suitable for coho salmon (Klamt et al, 2003).
- Maximum Daily: Maximum temperature during the summer. Exceeding 23.9^{0}C is considered lethal for coho salmon according to the North Coast Region Basin Plan (NCRWQCB, 1993).

Pools provide critical summer habitat for steelhead and coho under low flow conditions. A significant factor influencing the quality of salmonid habitat is the area of primary pool habitat within a stream reach length. Primary pools are defined by their maximum depth in relationship to size or stream order. In most first and second order (small) tributaries a primary pool is considered to be any pool with a maximum depth of 2’ or greater. As the order or size of the stream increases the required primary depth increases.

- Data indicate the better coastal coho streams may have as much as 40 percent of their total habitat length in primary pools (California Salmonid Stream Habitat Restoration Manual, 2010).

Included in the planning watershed evaluations are restoration recommendations most often attributed to the Gualala Synthesis Report by the North Coast Watershed Assessment Program (NCWAP) (Klamt, et al, 2003). These recommendations are also incorporated in the Final Recovery Plan for Central California Coast Coho Salmon (Oncorhynchus kisutch) Evolutionarily Significant Unit (NOAA, 2012) but are referenced back to NCWAP. In addition, a few site specific recommendations are added to the individual planning watersheds and stream evaluations.

ROCKPILE CREEK SPWS



Map 2: Rockpile Creek Watershed

The 35 mi^2 (22,389 acres) 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.

Buckeye Forest ownership is 1,454 acres approximately 6% of the Rockpile Creek SPWS. The ownership spans the center of the watershed with acreage in Lower Rockpile Creek, Redrock Creek and Middle Rockpile Creek PWS.

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

The Rockpile Creek SPWS has 169 miles of private roads. Road density is 4.8 miles per mi^2 within the basin. The NCWAP restoration map targets the central reaches within the Buckeye Forest property with the highest priority for future restoration work in sediment reduction.

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 that is affected by excess sediment storage or sediment sources (Klamt, et al, 2003).

Table 1.4: Rockpile Creek Sub-basin Streams with Negative Characteristics Resulting from Excessive Sediment

Rockpile Creek Planning Watershed	Total 1:24K Streams	1984		2000		Percent Improvement 1984 to 2000
		Length Miles	Total Percent	Length Miles	Total Percent	
Lower Rockpile	9.4	5.9	63%	3.4	36%	42%
Redrock	7.4	4.6	62%	2.9	39%	37%
Middle Rockpile	28.7	13.4	47%	6.7	23%	50%
Upper Rockpile	42.7	8.1	19%	6.7	16%	17%
Total	88.2	32	36%	19.7	22%	38%

GRWC has eleven temperature monitoring sites throughout the basin with temperature data from 1994 to 2013. Recent temperature data show the two tributaries (Redrock and Horsethief Canyon) temperatures are in the suitable ranges for salmonids (MWAT 13.2^{o} C to 15.9^{o} C). The main-stem sites vary from moderately suitable to moderately unsuitable for summertime rearing (MWAT 17.1^{o} C to 19.1^{o}C). There is a slight trend, not as pronounced as some areas within the Gualala, 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 Gualala Redwoods, Inc. property line. Data show habitat deficiencies related to canopy cover, pool frequency/depth, and shelter cover in the areas surveyed. In 2007, habitat surveys were conducted on 9,800 ft. of the Rockpile mainstem by Kleinfelder, Inc. confirming the limiting factors found in the 2001 surveys.

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, 2013).

The Rockpile Creek SPWS is considered a “Phase I Expansion Area” by the National Marine Fisheries Service (NMFS, 2012) for salmonid restoration efforts in the Gualala River Watershed. Planning for restoration projects should be implemented. Key limiting factors and basin recommendations are similar to the rest of the watershed, 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 2003, Kleinfelder, Inc., 2007).

Lower Rockpile Creek CalWater Planning Watershed

Lower Rockpile Creek (PWS) at 2,946 acres (4.6 mi^2) drains 9.4 miles of “blue line” streams of which approximately 5.6 miles are Class I streams. Anadromous habitat is found in the Rockpile Creek main-stem. The Buckeye Forest ownership spans 645 acres (1.0 mi^2) which contains 0.8 miles of Class I streams within the planning watershed. The property represents 19% of the sub-basin.

Lower Rockpile PWS has a road density of 6.5 miles per mi^2 representing a total of 30 miles of private timber roads. It is estimated that 81% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008). Approximately seven (7) miles of the total road network (23%) is on Buckeye Forest property. Some road related sediment reduction work has been completed on the property but it is not known to what extent this work conforms to current standards.

Gualala Redwoods, Inc. has hydrologically disconnected nine (9) miles of road within the planning watershed, effectively lowering the road density to 4.6 mile per mi^2 in the Lower Rockpile basin. The Gualala River Watershed Council has partnered with Gualala Redwoods, Inc. and received funding for upgrading the remaining sediment source sites on the property within the basin. Implementation of the project is slated for 2015/2016. Through the GRWC Wood In the Stream program a pilot project to measure the effectiveness of large wood placement in alluvial systems within the watershed was implemented in the lower reach of the basin.

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 improving large wood abundance to increase shelter ratings along the Rockpile main-stem are the top priority recommendations for the watershed (Klamt et al, 2003).

Rockpile Creek

Rockpile Creek is a 2^{rd} order stream and within Lower Rockpile Creek PWS has approximately 5.4 miles of anadromous habitat of which 0.8 miles are on the Buckeye Forest ownership. The Rosgen channel type is F4; the average bank-full width is 31 feet.

GRWC has two established monitoring reaches (#221 and #401) and six (6) water and air temperature sites downstream from the property line on Gualala Redwoods, Inc. property.

Three feet or deeper pool frequency is above CDFW target levels of 40% with primary pools comprising 61% of the upper reach (#401) of Rockpile Creek. The lower reach (#221) at the confluence with the South Fork does not meet target levels. Large wood abundance is well below preferred levels with an average of 42 pieces per 1,000 ft. and an average volume level of 3,899 ft^3. Piece and volume levels are higher at site #401, consistent with greater primary pool formation in the reach. Average center of channel canopy density is 48%. Temperatures appear to be moderately unsuitable for salmonids with the annual summertime Maximum Weekly Average Temperature (MWAT) range between 17.7^{o} C to 19.9^{o} C. steelhead young of the year and older are found in the system.

Location Description

Rockpile Creek – Lower Rockpile PWS sub-section: The legal description at the downstream (property-line) end is T11N R14W S34 and its NAD 83 coordinates are 38.7517 north latitude and 123.4170 west longitude. Elevations at the property line range from about 100 feet at the downstream end to 130 feet at the upstream end according to the USGS McGuire Ridge and 7.5 minute quadrangle.

Monitoring Sites

Temperature data (#221, #275, #222 and #401) have been collected from 1994 through 2013; baseline reach data at site #221 were collected in 1998 and the reach has been resurveyed in 1999 and 2003. Baseline reach data at site #401 were collected in 2006.

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 Buckeye Forest owns 645 acres (1.0 mi^2) which contains 0.8 miles of Class I stream on Rockpile Creek within the planning watershed. The ownership represents 29% of the basin.

Red Rock Creek PWS has a road density of 6.1 mile per mi^2 representing a total of 21 miles of private timber roads. Approximately six (6) miles of the total road network (29%) is on the Buckeye Forest tract. Road density for property within the planning watershed is 6.0 mile per mi^2. It is estimated that 84% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008). 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, Inc.

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, 2003).

<u>Rockpile Creek</u>

Rockpile Creek is a 2nd order stream, and within Redrock Creek PWS it has approximately 3.2 miles of anadromous habitat of which 0.8 miles are on the Buckeye Forest ownership. The Rosgen channel type is F4; the average bank-full width is 59 feet.

In-stream data is limited for this specific section of the Rockpile Creek. However, GRWC has one installed monitoring reach and temperature site (#701) on the Buckeye Forest property and another temperature site (#401) below (west) of the property line.

Pool frequency is optimal with primary pools comprising 58% of the surveyed reach. Large wood abundance is below optimal levels with 34 pieces per 1,000 ft. and a volume level of 2,961 ft^3. Center of channel canopy density is 60%. Although temperatures appear to be moderately unsuitable for salmonids (MWAT 19.5^o C and Max 23.6^o C) steelhead young of the year and older are found in the system.

Location Description

Rockpile Creek – Redrock PWS sub-section: The legal description at the downstream (property-line) end is T11N R14W S27 and its NAD 83 coordinates are 38.7767 north latitude and 123.4056 west longitude. Elevations at the property line range from about 130 feet at the downstream end to 150 feet at the upstream end according to the USGS McGuire Ridge 7.5 minute quadrangle.

Monitoring Sites

Temperature data (#701) were collected in 2008, 2009 and 2013; baseline reach data (#701) was collected in 2006 by the GRWC.

Middle Rockpile CalWater Planning Watershed

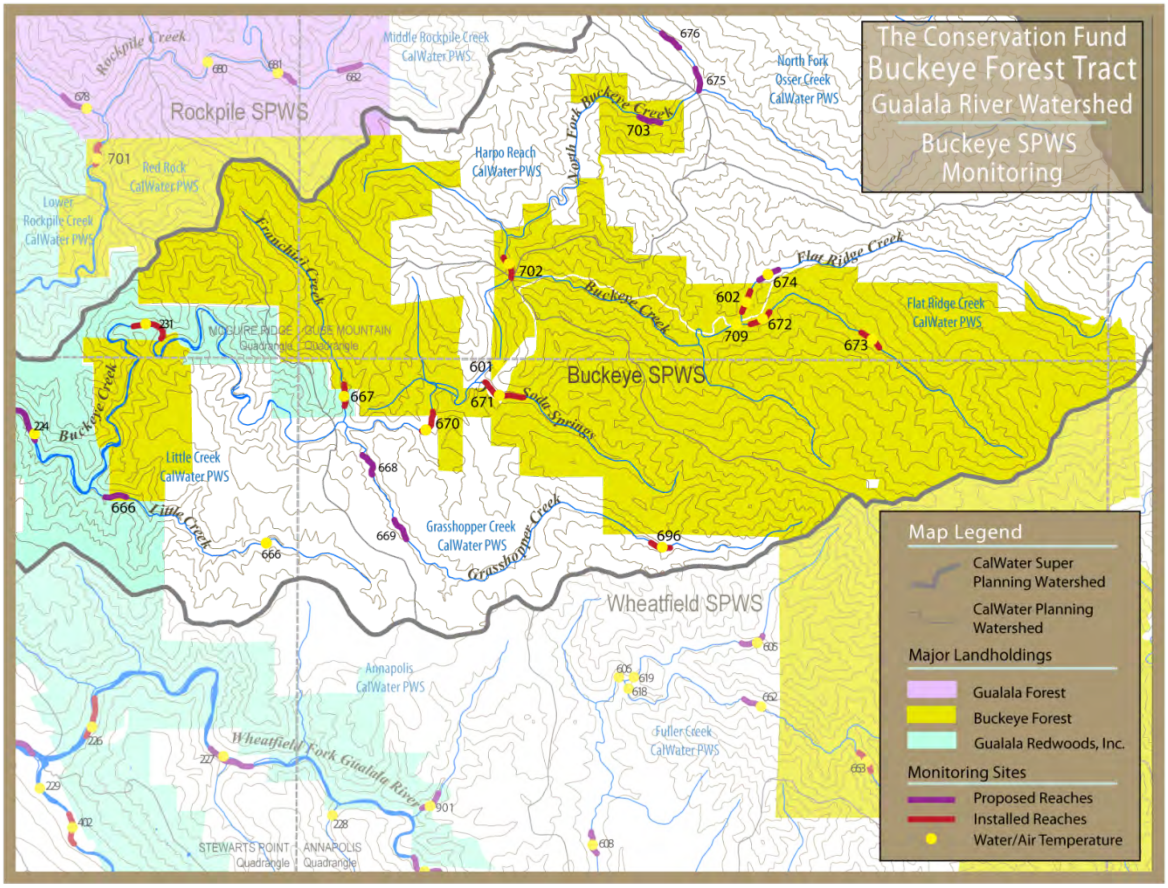
Middle Rockpile Creek (PWS) is a 12.8 mi^2 (8,165 acres) sub-watershed that drains 29 miles of blue line stream of which approximately 9.6 miles are Class I streams. Anadromous habitat is found in the Rockpile Creek main-stem and its tributary, Horsethief Canyon. The Buckeye Forest ownership is 248 acres (3%) of the 5.9 mi^2 basin, and the property does not include any Class I streams but does contain small unnamed drainages to the main-stem of Rockpile Creek.

Historically, streamside roads and landings were densely concentrated at the base of steep ravines in the Middle Rockpile Creek planning watershed. The 1963 and 1981 air photos showed a high density of road debris slides accessing streams in the Middle Rockpile PWS (Klamt et al, 2003).

The planning watershed has a road density of 5.5 mi^2 representing a total of 70 miles of private timber roads. It is estimated that 38% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008). Approximately 2.8 miles (4%) of the total road network is on Buckeye Forest property. The road network runs along the ridge top and intersects the headwaters of two small drainages.

Road related sediment source reduction strategies on the 2.8 miles of road should be implemented when sediment source work is scheduled for the roads on the Gualala Forest property in Middle Rockpile Creek PWS or road work within Franchini Creek (Grasshopper PWS) on the Buckeye Forest property.

Buckeye Creek SPWS



Map 3: Buckeye Creek Watershed

The 40 mi² (25,784 acres) Buckeye basin drains 79 miles of "blue line" streams and about 53% of the sub-basin is classified as high to very high potential for landsliding and represents a major source area for stream sediment. There are seven major tributaries to Buckeye Creek: Franchini Creek, Grasshopper Creek, Soda Springs, North Fork Buckeye, Flat Ridge Creek, Osser Creek and Roy Creek.

The watershed contains the only public access to the Gualala River. The forty (40) acre Soda Springs Reserve is one of the few remaining old growth groves in the Gualala River watershed. To ensure the reserve remained a community park, Save the Redwoods League purchased it in the early 1990s and then transferred ownership to Sonoma County. The park is adjacent to the Buckeye Forest tract.

Buckeye Forest ownership is 9,916 acres approximately 39% of the Buckeye Creek SPWS. The ownership spans the center of the watershed to the east with acreage in Little Creek, Grasshopper Creek and Harpo Reach and Flat Ridge Creek PWS.

Streams reaches throughout the wider Buckeye basin show longer reaches of moderate gradients compared to the North Fork and Rockpile basins. This indicates slower transport of sediment. Moderate stream gradients form a longer portion of the overall stream length in Little, Grasshopper, and Osser Creeks causing a higher potential for historic sediment accumulations and residual terrace formations in these areas.

By the end of 1968, 70% of the sub-basin had been harvested. Pre-2001 damage is still contributing substantial quantities of sediment to streams. Large amounts of stored sediments are still present in the watercourses within the Buckeye Creek watershed.

The Buckeye Creek SPWS has 251 miles of private roads. Road density is 6.2 mi^2 within the basin. The NCWAP restoration map targets the Grasshopper Creek PWS and the upper sub-basin reaches within the watershed for highest priority for future restoration work in sediment reduction.

Kelly Road, a privately owned major logging road was built in the 1950's and traverses several major tributaries to the Gualala River between the communities of Annapolis and Healdsburg. It runs along the Buckeye Creek stream bank for much of the drainage. In 2003, Pacific Watershed and Associates conducted a sediment source assessment through funding acquired from the Department of Fish & Wildlife; as yet the implementation work has not been completed. The road is used as the main access road to the property and easement holders along the road, including Buckeye Forest, contribute a use fee to the Kelly Road Association for maintenance. Serious consideration should be given to implementing the sediment source work outlined in the assessment.

Stream channel morphology show sediment accumulations continue to be noted in low gradient steps. In the Grasshopper Creek tributary, stream channels in many areas contain large amounts of stored sediment behind log jams of Large Wood. The channel continues to down-cut to pre-logging levels (Klamt, et al, 2003).

Table 1.5: Buckeye Creek Sub-basin Streams with Negative Characteristics Resulting from Excessive Sediment

Buckeye Creek		1984		2000		Percent
Planning Watershed	Total 1:24K Streams	Length Miles	Total Percent	Length Miles	Total Percent	Improvement 1984 to 2000
North Fork Osser	19.0	4.7	25%	2.2	12%	53%
Flat Ridge Creek	19.8	8.7	44%	4.1	21%	53%
Grasshopper Creek	19.2	11.4	59%	4.8	25%	58%
Little Creek	20.8	12.9	62%	5.6	27%	57%
Total	78.8	37.7	48%	16.7	23%	56%

The Buckeye Creek watershed is considered a high priority watershed as an “Initial Focus Core Area” for restoration (NMFS, 2012 and CDFW, 2012). Suitable water temperatures in a number of tributaries contribute to this ranking along with the importance the sub-basin provides to the Gualala River watershed as a whole. Steelhead are present in the watershed and historically coho salmon were known to spawn in the system.

GRWC has seventeen (17) temperature monitoring sites throughout the basin with temperature data from 1994 to 2013. Recent temperature data show Franchini, Grasshopper and Soda Springs Creeks temperatures are in the suitable ranges for salmonids (MWAT 13.9^o C to 15.6^o C). The main-stem sites vary from moderately suitable to unsuitable for summertime rearing (MWAT 17.1^o C to 21.5^o C). There is a trend of cooling temperatures as the stream flows towards the ocean.

In 2001 CDFW habitat surveyed 100% (51,085 ft.) of the Buckeye main-stem. Data show habitat deficiencies related to canopy cover, pool frequency/depth, and shelter cover in the areas surveyed. In 2005, Kleinfelder, Inc. habitat surveyed the portions of the Buckeye main-stem, Franchini Creek, North

Fork Buckeye and Flatridge Creek that are contained within the property. Findings were similar to the 2001 study by CDFW with the exception of a high large wood abundance in Franchini Creek.

In general, more recent GRWC surveys illustrate stream reaches that are in recovery from channel simplification due to excess sediment loads and the lack of in-stream structure (Variation Index, GRWC 2013). However, pool frequency and depth, canopy cover in the main-stems and large wood are lacking in most stream reaches (GRWC, 2013).

Key limiting factors and basin recommendations are similar to much of the Gualala River watershed, 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 main-stems are key factors limiting salmonid habitat (Klamt, et al 2003).

Little Creek CalWater Planning Watershed

Little Creek (PWS) at 5,868 acres (9.2 mi^2) and drains 21 miles of "blue line" streams of which approximately 13.8 miles are Class I streams. Anadromous habitat is found in the Buckeye Creek main-stem and its tributary, Little Creek. The Buckeye Forest owns 1,256 acres (2.0 mi^2) which contains 3.2 miles of Class I streams (23%) within the planning watershed. The ownership represents 21% of the basin.

Little Creek PWS has a road density of 8.8 miles per mi^2 representing a total of 81 miles of roads. Buckeye Forest owns approximately 19 miles (23%) of the total road network with a road density of 9.8 miles per mi^2; one of the highest in the watershed. Current sediment source work within the planning watershed includes the upgrading of fourteen (14) miles of high and medium priority roads completed by Gualala Redwoods, Inc., effectively lowering the planning watershed road density to 7.2 miles per mi^2. The GRWC has acquired funding to upgrade an additional 12 miles of road completing all high and medium priority sites on Gualala Redwoods, Inc. property and the Brushy Loop rural subdivision. It is estimated that 86% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008).

Implementing road related sediment source reduction strategies, identifying and implementing riparian enhancement projects where current canopy density and diversity are inadequate along Buckeye main-stem and improving large wood abundance along the deficient main-stem reaches are the top priority recommendations for the watershed (Klamt et al, 2003).

<u>Buckeye Creek</u>

Buckeye Creek is a 3rd order stream. Within Little Creek PWS Buckeye Creek has approximately 10.2 miles of anadromous habitat of which 2.9 miles are in the Buckeye Forest ownership. The Rosgen channel type is F4; the average bank-full width is 54 feet.

Water and air temperature has been monitored since 1995. Current data show Buckeye Creek temperatures below the property to be moderately suitable warming to moderately unsuitable traveling upstream and eastward (16.0^{o} C (#223), 16.4^{o} C (#224), 18.5^{o} C (#231)).

The GRWC has installed two (2) monitoring sites on reaches of Buckeye Creek below the property line. Pool frequency is close to target levels with primary pools comprising, on average 35% of the surveyed area. Large wood abundance is below optimal levels with average between the two reaches at 40 pieces per 1,000 ft. and an average volume level of 1,234 ft^3. Center of channel canopy density is low at 54%. Although temperatures in some portions of the stream appear to be moderately unsuitable for salmonids (MWAT 18.5^{o} C and Max 20.7^{o} C) steelhead young of the year and older are found in the system.

Location Description

Buckeye Creek – Little Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R14W S4 and its NAD 83 coordinates are 38.7387 north latitude and 123.4165 west longitude. Elevations at the property line range from about 100 feet at the downstream end to 165 feet at the upstream end according to the USGS Stewart's Point and McGuire Ridge 7.5 minute quadrangles.

Monitoring Sites

Temperature data has been collected (#235, #223, #231 and #224) from 1995 through 2013; reach data (#223 and #231) was collected in 1998, 2000 and 2008 by the GRWC. A proposed GRWC reach (#224) on the western edge of the Buckeye Forest property has not been installed.

<u>Little Creek</u>

Little Creek is a small 1st order stream and has approximately 2 miles of blue line stream of which the lower 0.3 miles is within the Buckeye Forest ownership. The stream is a tributary to the Buckeye Creek main-stem. Local residents provide accounts of coho spawning in lower Little Creek.

No habitat typing is available but water temperature is fully suitable (MWAT 14.5^{o} C) for salmonids. Sediment source restoration is planned for 2015 along the upper reaches of Little Creek.

Location Description

Little Creek – Little Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R14W S3 and its NAD 83 coordinates are 38.7341 north latitude and 123.4083 west longitude. Elevations at the property line range from about 110 feet at the downstream end to 120 feet at the upstream end according to the USGS Stewart's Point 7.5 minute quadrangle.

Monitoring Sites

Temperature data (#665 and #666) has been collected from 2010 through 2013.

Grasshopper Creek CalWater Planning Watershed

Grasshopper Creek PWS is a 9.0 mi^2 (5,766 acres) sub-watershed that drains 19.2 miles of blue line stream of which approximately 11.1 miles are Class I streams. Anadromous habitat is found in the Buckeye Creek main-stem and its tributaries Grasshopper, Franchini and Soda Springs Creeks. The Buckeye Forest ownership is 3,811 acres or 54% of the basin, and includes 6.0 miles of the Class I streams (54%) within the planning watershed.

Historically, streamside roads and landings were densely concentrated along the creeks within the watershed. Early 1960s air photos showed a high density of road debris slides contributing sediment to streams in the Grasshopper Creek PWS. The debris slides fanned out over the channel, forcing the stream to meander around the slide mass. Meandering channel patterns returned to a more lineal pattern through 1984 and more so by 1999.

Channel disturbance in Franchini Creek decreased from 90 to approximately 50 percent from 1984 to 1999-2000, and in the lower reach of Grasshopper Creek disturbance decreased from 50-75 percent to 25 percent.

The planning watershed has a road density of 7.0 miles per mi^2 representing a total of 63 miles of roads. Approximately 41 miles (65%) of the total road network is on Buckeye Forest property and the road density for the property is 6.6 miles per mi^2. It is estimated that 81% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008).

The culvert at the base of Franchini Creek appears to be a low flow fish migration barrier and should be prioritized for restoration implementation and replaced with a bridge. Juvenile steelhead were found above log jams in Franchini and Grasshopper Creeks. The jams do not currently appear to be barriers to migration but should be monitored over time.

In general, the top priority restoration recommendations for the watershed include implementation of road related sediment source reduction strategies, improving large wood abundance along Buckeye Creek main-stem and identifying and implementing riparian enhancement projects where current canopy density and diversity are inadequate along Buckeye Creek main-stem (Klamt et al, 2003).

<u>Buckeye Creek</u>

Buckeye Creek is a 3rd order stream with approximately 3.0 miles of Class I stream of which 2.7 miles (88%)split into two reaches by Soda Springs Park are on the Buckeye Forest ownership. Kelly Road follows the stream channel along the south side of the upper reach. This portion of the Buckeye main-stem is primarily low gradient (0-1%) but is interspersed with higher gradient (1-2%) reaches consisting of coarser cobble-boulder substrate.

The water temperatures within the reach of Buckeye Creek in the Grasshopper PW tend to be higher and moderately unsuitable for salmonids (19.0 ^{o}C to 19.4 ^{o}C). Pool frequency is limited with no primary pools ($\geq$ 3’) and only 27% of the monitoring reach consisting of $\geq$2 ft. pools. Large wood abundance is below preferred levels with 8 pieces per 1,000 ft. and a volume level of 944 ft^3. Center of channel canopy density is above target levels at 89%. Steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007). In June 2013, snorkel surveys were conducted on 1,000 ft. of Buckeye Creek pools above the Buckeye crossing leading to Franchini Creek. Steelhead juveniles in all age classes were present (1,103 young of the year, 82 1+, 6 2+ and 1 3+) (GRWC, 2013).

GRWC has two temperature monitoring sites (#670, #601). Current temperatures (MWAT 19.4^{o}C and 18.4^{o} C) are moderately unsuitable for salmonids.

Location Description

Buckeye Creek – Grasshopper PWS sub-section: The legal description at the downstream (property-line) end is T10N R14W S1 and its NAD 83 coordinates are 38.7422 north latitude and 123.3691 west longitude. Elevations at the property line range from about 250 feet at the downstream end to 280 feet at the upstream end according to the USGS Annapolis and Gube Mountain 7.5 minute quadrangles.

Monitoring Sites

The GRWC has one (1) monitoring reach (#670) for Buckeye Creek within the planning watershed baseline data were collected in 2006. Temperature data (#670 & #601) collection started in 2005 and the latest data sets are 2011 and 2012.

<u>Grasshopper Creek</u>

Grasshopper Creek is a 1st order stream with approximately 3.0 miles of Class I stream of which 1.0 miles of the upper third of Grasshopper Creek are on the Buckeye Forest ownership.

The 1965 photos show extreme stream channel aggradation in Grasshopper Creek. The stream patterns through the logged areas show either channels meandering through wide, flat areas of sediment fans in low gradient steps, or stream deflections around fresh debris slides. Over the past years, much of this sediment has been moving out of system.

The water temperatures in Grasshopper Creek are fully suitable for salmonids (14.5^{o} C). Pool frequency and depth is limited within the monitoring reach (22%). Large wood abundance is high with 190 pieces per 1,000 ft. and a volume level of 8,000 ft^{3} but the wood pieces are concentrated in a few large log jams. Center of channel canopy density is above target levels at 88%. Steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007) in the monitoring reach therefore the log jams do not appear to be limiting salmonid migration.

During the Preservation Ranch Limiting Factor Analysis conducted by Stillwater Sciences, the density of young of the year steelhead increased from later winter/early spring to early summer, but generally declined from early summer to early fall throughout the property, with the exception of Grasshopper Creek, where early fall densities increased. This increase may be a result of a redistribution of fish from warmer reaches to cooler reaches that are better able to support juvenile steelhead growth.

Location Description

Grasshopper Creek – Grasshopper PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S8 and its NAD 83 coordinates are 38.7317 north latitude and 123.3328 west longitude. Elevations at the property line range from about 620 feet at the downstream end to 820 feet at the upstream end according to the USGS Annapolis 7.5 minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#696) and two proposed reaches (#669 and #668). Baseline data at #696 were collected in 2006. Temperature data (#696) were collected in 2009.

<u>Franchini Creek</u>

Franchini Creek is a 1st order stream with approximately 1.5 miles of Class I stream, all on the Buckeye Forest ownership. Stream classification is based on 2005 habitat typing data but anadromy is most likely limited to the first mile of stream due to higher gradients in the upper watershed.

Water temperatures in Franchini Creek are fully suitable for salmonids (13.9^{o} C). Pool frequency and depth is near target levels ($\geq$33%). Large wood abundance is near old growth target levels with 150 pieces per 1,000 ft. and a volume level of 4,627 ft^{3} and as in Grasshopper Creek wood pieces are concentrated in large log jams. Center of channel canopy density is above target levels at 97%. Steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007) and up to 3,400 ft. above the confluence during habitat typing surveys. Large log jams (6 ft. tall) above 3,500 ft. may be limiting anadromy.

During the Limiting Factor Analysis permeability studies found Franchini Creek has the highest average steelhead egg survival to emergence (51%) for streams within the property (Stillwater Sciences, 2008).

Location Description

Franchini Creek – Grasshopper PWS sub-section: The legal description at the downstream (property-line) end is T10N R14W S1 and its NAD 83 coordinates are 38.7422 north latitude and 123.3691 west longitude. Elevations at the property line range from about 250 feet at the downstream end to 490 feet at the upstream end according to the USGS Annapolis and Gube Mountain 7.5 minute quadrangles.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#667) and baseline data were collected in 2006. Temperature data (#667) started to be collected in 2005 and remains consistent (5 year average is 14.7) with little variation.

Soda Springs Creek

Soda Springs Creek is a 1st order stream with approximately 0.5 mile of Class I stream on the Buckeye Forest ownership.

As with most of the streams in the Buckeye Creek sub-basin, during mid-20th-century tractor operations a stream side road and landings were built next to the creek pushing road fill into the creek. Within a relatively short period (1964 to 1973), most of the Soda Springs Creek watershed had been logged.

The water temperatures in Soda Springs are fully suitable for salmonids (15.6^{o} C). Pool frequency and depth is limited within the monitoring reach (24%). Large wood abundance does not meet old growth target levels with 102 pieces per 1,000 ft. and a volume level of 2,391 ft^3. Average volume levels suggest most of the wood pieces are relatively small. Center of channel canopy density is above target levels at 94%. A few steelhead young of the year were found during ocular surveys in 2005 (Kleinfelder, 2007) in the monitoring reach.

Location Description

Soda Springs Creek – Grasshopper PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S6 and its NAD 83 coordinates are 38.7470 north latitude and 123.3489 west longitude. Elevations at the property line range from about 380 feet at the downstream end to 580 feet at the upstream end of anadromy according to the USGS Annapolis 7.5 minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#671) and baseline data were collected in 2005. Temperature data (#671) collected in 2006 had a higher MWAT of 17.9^{o} C. Subsequent MWATs were 15.1 in 2010 and 15.6 in 2011.

Harpo Reach CalWater Planning Watershed

Harpo Reach PWS is a 4.3 mi^2 (2,722 acres) sub-watershed that drains 10.5 miles of blue line stream of which approximately 3.4 miles are Class I streams. Anadromous habitat is found in the North Fork Buckeye Creek main-stem. The Buckeye Forest ownership is 786 acres or 29% of the basin, and includes 2.4 miles (71%) of the Class I streams within the planning watershed.

Steelhead trout and coho salmon were reported in the North Fork Buckeye in 1964. A 1982 survey found pools at 25-40 percent of the stream. Steelhead trout comprised 40 percent of fish observed, among high water temperatures, algae blooms, and lack of cover. A 1995 survey showed 20 percent pools.

The area was tractor logged during the 1950s, with some areas entered lightly due to terrain and poor quality of the timber stands. Uncontrolled installation of fills, failure to remove fills, and lack of erosion control facilities has caused several landslides and locally severe erosion.

The planning watershed has a road density of 5.2 mi^2 representing a total of 22 miles of roads. It is estimated that 44% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008). Approximately 7.4 miles (33%) of the total road network is on Buckeye Forest property.

One of the few remaining old growth stands within the Gualala River watershed is within the Harpo Reach planning watershed on the Howlett Ranch. The old growth region adjoins the Buckeye Forest property along the North Fork Buckeye Creek drainage. Special consideration should be given to forest management planning and restoration along the lower tributary.

In 2006, 2,680 ft. of the lower reach were habitat typed by Kleinfelder, Inc. Habitat typing was stopped due to a large log jam and landslide on the property. The report also states that “no fish noted” at the end of the survey. The landslide and log jam area and upstream of the jam should be evaluated for fish migration and possible restoration implementation.

There is one 0.5 mile unnamed tributary that flows on both the Buckeye Forest and the Howlett tract properties to the North Fork. A portion was habitat typed in 2006 and steelhead were found up to 1,500 ft. above the confluence. The survey was halted due to a log jam but slope considerations most likely limit anadromy to the 1,500 ft.

In general, the top priority restoration recommendations for the watershed include implementation of road related sediment source reduction strategies, assess salmonid migration barriers, improve large wood abundance within the North Fork Buckeye Creek main-stem, and identify and implement late seral management strategies to augment existing stands.

<u>North Fork Buckeye Creek</u>

North Fork Buckeye is a 2rd order stream with approximately 3.2 miles of Class I stream within the planning watershed of which 2.4 miles (75%) are on the Buckeye Forest ownership. This portion of the North Fork Buckeye main-stem is primarily low gradient (0-1%).

In 2005, the GRWC installed a monitoring reach (#702) at the confluence of the North Fork with Buckeye Creek. Water temperatures within the reach are moderately unsuitable for salmonids (17.3^{o} C) but tend to be lower than the Buckeye main-stem. Pool frequency meets target levels with 44% of the stream reach containing 2 ft. or greater pools. Large wood abundance is below preferred levels with 12 pieces per 1,000 ft. and a volume level of 771 ft^3. Center of channel canopy density is meeting target levels at 82%.

During historic surveys coho salmon were found to inhabit the North Fork, steelhead young of the year were found during ocular surveys in 2005 and 2006 (Kleinfelder, 2007).

Location Description

North Fork Buckeye Creek – Harpo Reach PWS sub-section: The legal description at the downstream (property-line) end is T11N R13W S31 and its NAD 83 coordinates are 38.7599 north latitude and 123.3432 west longitude. Elevations at the property line range from about 280 feet at the downstream end to 480 feet at the upstream end according to the USGS Gube Mountain 7.5 minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#702) and baseline data were collected in 2005. Temperature data (#702) were collected in 2008 and 2009.

Flat Ridge Creek CalWater Planning Watershed

Flat Ridge Creek (PWS) is a 10.2 mi^2 (6,529 acres) sub-watershed that drains 19.8 miles of blue line stream of which approximately 8.9 miles are Class I streams. Anadromous habitat is found in the Buckeye main-stem and Flat Ridge Creeks. The Buckeye Forest ownership is 4,063 acres or 62% of the basin, and includes 6.3 miles of the Class I streams (71%) within the planning watershed.

Watercourse areas in the basin were heavily cut during the late 1950s tractor operations. Extensive grassland areas with more open riparian zones exist from older attempts at rangeland conversion.

The planning watershed has a road density of 5.2 miles per mi^2 representing a total of 53 miles of roads. Approximately 40 miles (75%) of the total road network is on Buckeye Forest property. Road density for the property within the planning watershed is 6.4 miles per mi^2. It is estimated that only 14% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008).

In 2006, 7,970 ft. of Buckeye Creek and 2,684 ft. (to the property line) of Flat Ridge Creek were habitat typed by Kleinfelder, Inc.

Although water temperatures range from moderately unsuitable to fully unsuitable (18^o C to 21.5^o C) in the two creeks within the planning watershed, during salmonid ocular surveys in the monitoring reaches on the property both the Buckeye main-stem and Flatridge Creeks had some of the highest counts of steelhead young of the year (Kleinfleder, 2006).

In general, the top priority restoration recommendations for the watershed include: improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate, implement road related sediment source reduction strategies on the property.

<u>Buckeye Creek</u>

Buckeye Creek is a 1st order stream in this area of the watershed, with approximately 3.5 miles of Class I stream all are on the Buckeye Forest ownership. This upper portion of the Buckeye main-stem changes to a higher gradient (1-2%) with intermittent areas of 3-4% gradient reaches. Rosgen channel type is B4.

In 2005, the GRWC installed two monitoring reaches (#672 & #673) along the upper Buckeye Creek reach. Water temperatures within the reaches are moderately unsuitable for salmonids (19.7^o C & 18.0^o C). Pool frequency and depth is limited with 17% of the stream reach containing 2 ft. or greater pools. Large wood abundance is below preferred levels with an average between both reaches of 13 pieces per 1,000 ft. and a volume level of 279 ft^3. Center of channel canopy density is low at an average of 31% reflecting the change from conifer forest to the much more open oak woodland vegetation.

Steelhead young of the year and older were found during ocular surveys and habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007).

Location Description

Buckeye Creek – Flat Ridge PWS sub-section: The legal description at the downstream (property-line) end is T11N R13W S31 and its NAD 83 coordinates are 38.7599 north latitude and 123.3432 west longitude. Elevations at the property line range from about 280 feet at the downstream end to 820 feet at the upstream end of anadromy according to the USGS Gube Mountain and Annapolis 7.5 minute quadrangles.

Monitoring Sites

The GRWC has two (2) installed monitoring reaches (#672 & #673) and baseline data were collected in 2005. Temperature data at site #672 were collected in 2005, 2006 and 2013. Temperature data at site #673 were collected in 2006 and 2013.

<u>Flat Ridge Creek</u>

Flat Ridge Creek is a 1st order stream with approximately 3.6 miles of Class I stream of which 2.5 mile is on the Buckeye Forest ownership. The gradient increases at the confluence with the Buckeye main-stem to over 1% slope with some interspersed reaches with steepening valleys increasing the gradient to over 2%. The Rosgen channel type is B4. Kelly Road follows the stream channel on the south side of the channel.

In 2005, the GRWC installed a monitoring reach (#602) at the confluence of Flat Ridge with Buckeye Creek. Water temperatures within the reach are the highest recorded for the Buckeye Creek SPWS and unsuitable for salmonids (MWAT 20.5^{o} C). The daily maximum (MAX) exceeded the lethal limit of 23.9^{o} C (COLD water fish rearing, NCRWQCB 2000) with a reading of 26.0^{o} C in 2013. Maximum temperatures remained lethal for a number of hours a day during a five-day heat spell. Pool frequency is below target levels with20% of the stream reach containing 2 ft. or greater pools. Large wood abundance is below preferred levels with 16 pieces per 1,000 ft. and a volume level of 1,173 ft^{3}. At 11%, the center of channel canopy density falls far below target levels.

During habitat typing surveys in 2006, damage caused by wild pigs to the riparian corridor was noted as impacting the stream channel.

Despite the high temperatures, steelhead young of the year and older were found during ocular surveys in 2005 and 2006 (Kleinfelder, 2006).

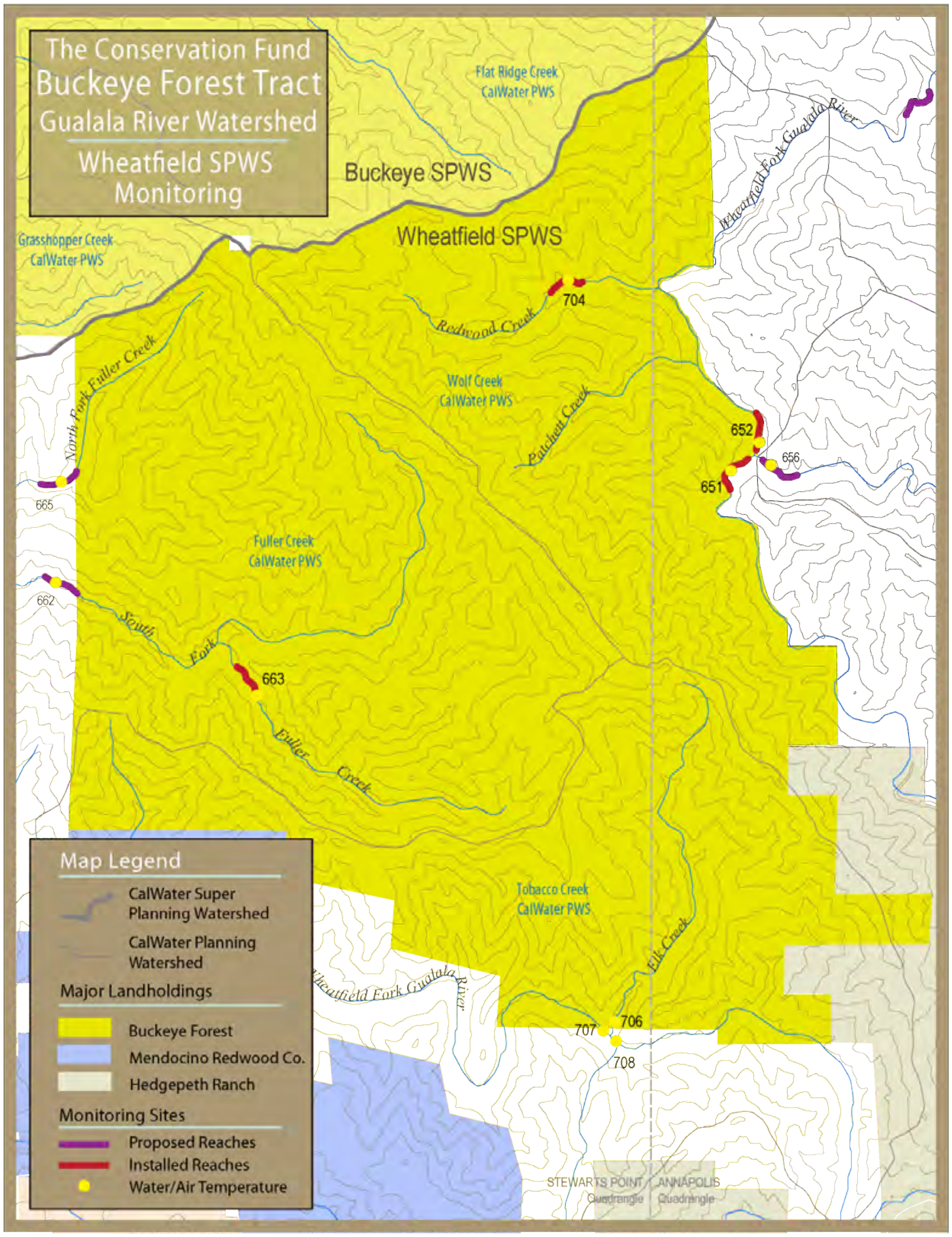
Location Description

Flat Ridge Creek – Flat Ridge PWS sub-section: The legal description at the downstream (property-line) end is T11N R13W S33 and its NAD 83 coordinates are 38.7542 north latitude and 123.3077 west longitude. Elevations at the property line range from about 420 feet at the downstream end to 510 feet at the upstream end according to the USGS Gube Mountain 7.5 minute quadrangle.

Monitoring Sites

The GRWC has one (1) installed monitoring reach (#602) and one (1) proposed monitoring reach for Flat Ridge Creek (#674). Baseline data was collected in 2005. Temperature data (#602) have been collected since 2000, the latest data set was 2013 (MWAT 20.5^{o} C).

WHEATFIELD FORK SPWS



Map 4: Wheatfield Fork Watershed

The 112 mi^2 (71,492 acres) Wheatfield Fork basin drains 246 miles of "blue line" streams and five (5) major tributaries: Fuller Creek, Haupt Creek, House Creek, Wolf Creek and Tombs Creek. Elevations range from about 80 feet at the mouth to 2,469 feet in the House Creek headwaters area according to the USGS Stewart's Point, Annapolis, Plantation, Tombs Creek and Big Foot Mountain 7.5 minute Quadrangles. Steelhead are present in the watershed and historically coho salmon were known to spawn in the system.

Buckeye Forest ownership is 8,281 acres approximately 12% of the Wheatfield Fork SPWS. The ownership spans the center of the watershed with acreage in Fuller Creek, Tobacco Creek and Wolf Creek PWS.

The Wheatfield Fork SPWS has 476 miles of private roads. Road density is 4.3 miles per mi^2 within the basin. Within the watershed the Buckeye Forest the road network encompasses 80.4 miles of road with a density of 6.24 mi. per $mile^2$. Road restoration efforts in the Fuller Creek watershed have lowered the ownership road density to 5.6 mi. per $mile^2$.

The soils and bedrock in the eastern headwaters of the basin are derived from the Franciscan Complex and over 60% of the basin has a high to very high landslide potential rating. Landslides represent the major source area for stream sediment in most planning watersheds with the exceptions of Fuller and Annapolis PWS where sediment from poorly constructed ranch and timber roads is the major contributing factor.

In the eastern portion of the watershed, the Tombs Creek Fault has influenced channel formation causing a zigzag pattern in the main channel in response to faulting. In the lower reaches of the sub-basin, streams are mainly bedrock controlled within moderately steep valleys. The narrow floodplain is limited to the lower two (2) miles.

Approximately 10% of the blue line streams were exposed to solar radiation in 1942, these areas were restricted to wide stream channels subject to alluvial deposition and stream channel migration. By the end of the tractor-harvesting era in 1968, approximately 45 percent of the blue line streams were exposed bank-to-bank. Bank-to-bank over-story exposure for 2000 shows improvement compared to 1968, reflecting riparian in-growth since the late 1960s. By 2000, canopy closure improved with approximately 30 percent of blue line streams exposed bank-to-bank.

With the building of the Annapolis Road along the main-stem Wheatfield Fork, large tracts of coniferous forests were tractor cleared during the late 1950s throughout the lower and middle reaches of Fuller, Haupt, and Tobacco Creeks. Approximately 13 miles of historic logging roads built in or along the streambed in the lower Wheatfield simplified pool structure and complexity throughout the lower basin.

The 1970s and 1980s were a period of low timber harvest activity due to depletion of the timber base in previous decades. In the central and eastern regions of the watershed ranching became a more dominant land use. Vegetation analysis in 1996 typed 6,004 acres of grazing lands (8.4 percent of the sub-basin). Timber harvest operations increased in the 1990s in response to improving markets. Vineyard development also accelerated. Currently, vineyards comprise 2.5% (706 acres) of the watershed.

Timber production and grazing remain the dominant land uses in the Wheatfield Basin. Additionally, a number of rural subdivisions have been developed in the past 40 years, primarily centered near the Annapolis area. Four timber companies own 41% of the basin: Soper-Wheeler, LLC (17%), The Conservation Fund (12%), Mendocino Redwood Company (10%) and Gualala Redwoods, Inc. (3%).

Lower reaches of the Wheatfield Fork main-stem contain stands of Redwood and Douglas fir with a mixed-hardwood and forb understory. The main tributary watercourses are largely covered with coniferous canopy cover, and include redwood, Douglas-fir, sugar pine, ponderosa pine, California nutmeg, tanoak, Pacific madrone, vine and big-leaf maple, alder and willow. Upslope vegetation in the Wheatfield Basin is determined by the elevation, soil type, available water and proximity to salt air from the ocean. The highest elevation areas contain a combination of oak woodland and open grasslands. Oak woodland and willow provide riparian structure in sub-basins which remain free from grazing.

Stream channel morphology in the Wheatfield Fork sub-basin shows improvement of in-stream channel conditions between 1984 and 2000 as evidenced by a reduction in the percentage of channel length that is affected by excess sediment storage or sediment sources (Klamt, et al, 2003).

Table 1.6: Wheatfield Fork Sub-basin Streams with Negative Characteristics Resulting from Excessive Sediment

Wheatfield Fork Planning Watershed	Total 1:24K Streams	1984		2000		Percent Improvement 1984 to 2000
		Length Miles	Total Percent	Length Miles	Total Percent	
Britain Creek	24.0	6.1	25%	4.3	18%	30%
Pepperwood Creek	24.7	7.3	30%	5.0	20%	32%
House Creek	17.5	5.6	32%	3.2	18%	43%
Haupt Creek	19.2	7.2	38%	2.5	13%	65%
Tobacco Creek	29.0	16.2	56%	5.7	20%	65%
Fuller Creek	21.5	14.1	66%	7.4	34%	48%
Annapolis	21.1	10.0	47%	5.3	25%	47%
Buck Mountain	30.9	7.0	23%	1.8	6%	74%
Tombs Creek	22.4	4.5	20%	0.5	2%	89%
Wolf Creek	35.6	12.4	35%	4.6	13%	63%
Total	245.9	90.4	37%	40.3	23%	55%

GRWC has thirty-two (32) temperature monitoring sites throughout the basin with temperature data from 1994 to 2013. Recent temperature data show that the forks, North and South, to Fuller Creek are the only tributaries with fully suitable temperatures for salmonids (MWAT 13.2^{o} C to 16.7^{o} C). The main-stem sites vary from moderately suitable to moderately unsuitable for summertime rearing (MWAT 17.1^{o} C to 24.2^{o} C). Overall, 41% of the temperature sites within the watershed exceed basin plan lethal maximums (23.9^{o} C) for intervals during the reporting period. Of the twelve (12) main-stem sites 67% exceed the maximum.

2001 CDFW habitat inventory data was limited in scope; only 45% of the basin was surveyed. 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 central and upper reaches of the watershed.

The lower Wheatfield Fork, Fuller Creek and Haupt Creek watersheds are considered “Phase I Expansion Area” for salmonid restoration efforts in the Gualala River Watershed (NMFS, 2012 and CDFW, 2012). Key limiting factors and basin recommendations are similar to the watershed as a whole, with more emphasis on inadequate riparian composition and density in the main-stem and some tributaries. 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 2003).

The GRWC has partnered with several landowners in the basin to assess, design and implement up-slope and in-stream restoration projects. Sediment source work has been implemented to hydrologically disconnect 11% of the 475.6 miles of road in the Wheatfield basin, mainly in the Annapolis and Fuller Creek sub-basins. The GRWC partnered with Gualala Redwoods, Inc. and Mendocino Redwood Company in 2005 to install 82 pieces (170 cubic meters) of large wood in Fuller Creek. Additionally, Gualala Redwoods, Inc. placed 18 cubic meters of large wood in the main-stem Wheatfield Fork in 2009 and 27 cubic meters in 2013.

Fuller Creek CalWater Planning Watershed

Fuller Creek (PWS) is a 11 mi^2 (7,039 acres) sub-watershed that drains 22 miles of blue line stream of which approximately 10.8 miles are Class I streams. Anadromous habitat is found in the Fuller Creek main-stem, lower Sullivan Creek and the North and South Forks of Fuller. The Buckeye Forest ownership is 3,370 acres or 48% of the headwaters of the basin, and includes 4.5 miles (42%) of the Class I streams within the planning watershed.

The Fuller Creek sub-basin consists of steep, deeply incised terrain, with upper reaches characterized by inner gorge ravines. In the lower reaches, there has been deep downcutting by Fuller Creek between plateau areas of moderate to near level terrain upslope.

Historically, inner riparian areas were the central locations for road building, tractor yarding, and timber removal. In the steep, deeply incised Sullivan and Fuller Creek canyons, the entire road network was built along the creek at the base of steep ravines. As a result, 1965 aerial photo analysis found that high runoff from the 1964 storms incised in-stream landings and undercut streamside roads, collapsing sections into creeks. The roads concentrated runoff triggering debris slides into watercourses.

The planning watershed had a road density of 6.7 miles per mi^2 representing a total of 74 miles of roads. Twenty-two (22) miles of road have been hydrologically disconnected (13 miles GRWC Cooperative effort, 8 miles previous owners of Buckeye Forest, 1 mile Mendocino Redwood Company) and the effective road density has been lowered to 4.7 mi^2. Approximately 39 miles (53%) of the total road network is on Buckeye Forest property. Road density for the property within the planning watershed before upgrading was 7.4 miles per mi^2; effective road density after upgrading is 5.8 miles per mi^2. It is estimated that 74% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008).

In 1989, a population estimate was calculated for one station located on the main-stem of Fuller Creek just upstream of the entrance road from the Hollowtree store. The steelhead trout juvenile population, of Fuller Creek was estimated at 62 with a standard error of 8.6.

In 1995 Fuller Creek was habitat typed by CDFW and in 2006, 3,696 ft. of the South Fork Fuller Creek, from the property line upstream was habitat typed by Kleinfelder, Inc. Ocular salmonid surveys were conducted in the monitoring reach on South Fork Fuller Creek in 2005 and in 2006 by Stillwater Sciences, Inc. implemented snorkel surveys in Fuller Creek and the North Fork Fuller Creek. Steelhead were present during all surveys.

Water temperatures range from fully suitable to moderately unsuitable (14.2 $^{\circ}$C to 19.1°C) within the planning watershed and Fuller Creek is considered one of the most important refugia planning watersheds within the Wheatfield Fork.

In general, the top priority restoration recommendations for the watershed include: continue to implement road related sediment source reduction strategies on the property, improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate.

South Fork Fuller Creek

South Fork Fuller is a 2rd order stream and within Fuller Creek PWS has approximately 5.5 miles of Class I streams of which 4.0 miles are on the Buckeye Forest ownership. The Rosgen channel type is F4; the average bank-full width is 18 feet. The stream gradient is between 1-2% with interspersed reaches with gradients over 2%.

In 2005, the GRWC installed a monitoring reach (#663) along the upper South Fork Fuller reach. The reach is above the upper fork of the channel and the stream at this point is considered to be a 1st order stream. Pool frequency and depth is close to target levels with pools equal to or greater than 1 ft. comprising 36% of the reach length. Large wood abundance is below preferred levels with 59 pieces per 1,000 ft. and a volume level of 4,327 ft^3. The GRWC has installed three (3) air and water temperature monitoring sites along the South Fork.

Water temperatures within the reach are suitable in the headwaters (14.2^o C) but appear to warm downstream at the confluence with the North Fork to moderately unsuitable for salmonids (average MWAT 18.4^o C).

Steelhead young of the year and older were found during ocular surveys and habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007).

Location Description

South Fork Fuller Creek – Fuller Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S15/16 and its NAD 83 coordinates are 38.7077 north latitude and 123.3043 west longitude. Elevations at the property line range from about 550 feet at the downstream end to 750 feet at the upstream end according to the USGS Annapolis 7.5 minute quadrangle.

Monitoring Sites

Temperature data at site #663 were collected in 2009, at site #662 in 2004 and at site #618 2000 through 2009; The GRWC has two (2) monitoring reaches, one proposed (#662) and one installed (#663); baseline reach data was collected in 2005 by the GRWC.

<u>North Fork Fuller Creek</u>

North Fork Fuller is a 2nd order stream and has approximately 1.7 miles of Class I streams of which 0.5 mile is on the Buckeye Forest ownership. The stream gradient is between 1-2% with interspersed reaches with gradients over 2%.

In-stream data is limited for the North Fork of Fuller Creek. However, GRWC has two water and air temperatures sites (#619 and #665). Most recent water temperatures at the two (2) sites were found to be fully suitable (MWAT 16.3^o C and 16.6^o C) for salmonids.

Location Description

North Fork Fuller Creek – Fuller Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S15/16 and its NAD 83 coordinates are 38.7164 north latitude and 123.3043 west longitude. Elevations at the property line range from about 620 feet at the downstream end to 510 feet at the upstream end according to the USGS Annapolis 7.5 minute quadrangle.

Monitoring Sites

The GRWC Cooperative Monitoring Program has one (1) proposed reach (#665) and two (2) temperature sites. Temperature data at site #619 were collected 2005, 2006 and 2009 and at site #665 in 2004.

Tobacco Creek CalWater Planning Watershed

Tobacco Creek (PWS) is a 12.6 mi^2 (8,061 acres) sub-watershed that drains 29 miles of blue line stream of which approximately 10.8 miles are Class I streams. Anadromous habitat is found in the Wheatfield Fork main-stem and its tributary Elk Creek. The Buckeye Forest ownership is 2,174 acres (27%) and has 1.5 miles (13%) of Class I streams within the planning watershed.

The planning watershed has a road density of 4.1 miles per mi^2 representing a total of 61.4 miles of private timber roads. Approximately 19.4 miles (32%) of the total road network is on Buckeye Forest property. Road density for the property within the planning watershed is 5.7 miles per mi^2. It is estimated that 45% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008).

Bank to bank canopy exposure is evident along all of the Wheatfield Fork main-stem in the planning watershed.

In-stream data is limited for this specific section of the Wheatfield Fork. However, GRWC has two (2) temperature sites on the main-stem and one (1) site on Elk Creek. Water temperatures on the Wheatfield Fork main-stem are fully unsuitable; Elk Creek temperatures are in the moderately unsuitable range.

In general, the top priority restoration recommendations for the watershed include: improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and implement road related sediment source reduction strategies on the property.

Wheatfield Fork

Wheatfield Fork is a 4^{th} order stream with approximately 10.5 miles of Class I stream of which 0.8 mile are on the Buckeye Forest ownership. This portion of the main-stem is primarily low gradient (0-1%) and Skaggs Springs Road (Sonoma County Road) follows the channel on the south side through this portion of the property.

Current in-stream data is limited for this section of the Wheatfield Fork. The reach was habitat typed in 2001 and data show habitat deficiencies related to canopy cover, pool frequency/depth, and shelter cover in the main-stem throughout the basin. GRWC has three (3) temperature monitoring sites (#620, #707 and #708). Current temperatures (MWAT 21.8 ^{o}C, 23.4^{o} C and 23.4^{o} C) are fully unsuitable for salmonids. Sites #620 and #707 have recorded temperatures above the basin plan lethal maximum (MAX) limit of 23.9 ^{o}C.

Location Description

Wheatfield Fork – Tobacco Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S25/26 and its NAD 83 coordinates are 38.6730 north latitude and 123.2655 west longitude. Elevations at the property line range from about 260 feet at the downstream end to 350 feet at the upstream end according to the USGS Annapolis and Tombs Creek 7.5 minute quadrangles.

Monitoring Sites

The GRWC has one (1) proposed monitoring reach for Wheatfield Fork (#647) and one (1) proposed for a non-anadromous stream, Crocker Creek. Neither reaches are on Buckeye Forest property. Temperature data (#620, #707 and #708) were collected in 2000 through 2013.

Elk Creek

Elk Creek is a 1^{st} order stream with approximately 0.7 mile of Class I stream, all on the Buckeye Forest ownership. The bottom low gradient (0-1%) reach increases to 1% for with three-quarters of the Class I reach.

Elk Creek was heavily impacted by tractor operations in the 1950s and 1960s. Upper segments of Elk Creek were used as skid trails with in-stream landings at road crossings, and logging debris and soil was placed in streambeds. Elk Creek was used historically for livestock grazing (the Tabor Ranch). Mixed conifer/hardwood stands developed in response to clearing and burning operations with the intent to convert to rangeland.

In-stream data is limited. GRWC has one (1) temperature monitoring site above the confluence with Wheatfield Fork (#706). Current temperatures (MWAT 17.2^{o} C) are moderately unsuitable for salmonids. In 2005, the site registered a moderately suitable MWAT of 16.3^{o} C.

Some road-related sediment reduction work has been completed on the property but it is not known to what extent this work conforms to current standards (Coastal ForestLands, LTD., 1997).

Location Description

Elk Creek – Tobacco Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S25 and its NAD 83 coordinates are 38.6757 north latitude and 123.2549 west longitude. Elevations at the property line range from about 260 feet at the downstream end to 400 feet at the upstream end according to the USGS Annapolis and Tombs Creek 7.5 minute quadrangles.

Monitoring Sites

The GRWC has one (1) temperature site (#706); data were collected in 2009, 2006 and 2005.

Wolf Creek CalWater Planning Watershed

Wolf Creek (PWS) is a 15.8 mi^2 (10,101 acres) sub-watershed that drains 36 miles of blue line stream of which approximately 18.1 miles are Class I streams. Anadromous habitat is found in the Wheatfield Fork main-stem and its main tributaries Wolf Creek, Tombs Creek and Redwood Creek. The Buckeye Forest ownership is 2,733 acres (27%) of the 15.8 mi^2 basin, and has 3.8 miles (21%) of Class I streams within the planning watershed.

The planning watershed has a road density of 3.5 miles per mi^2 representing a total of 59 miles of roads. Approximately 22 miles (38%) of the total road network is on Buckeye Forest property. Road density for the property within the planning watershed is 5.1 miles per mi^2. It is estimated that 31% of the total erosion yield within the watershed is road related (O'Connor Environmental, 2008).

In 2001, the lower section of the Wheatfield Fork within the planning watershed was habitat typed by CDFW and in 2006, 7,837 ft. of the Redwood Creek was habitat typed by Kleinfelder, Inc. Ocular salmonid surveys were conducted in the monitoring reaches on Wheatfield Fork above and below Tombs Creek and in Redwood Creek in 2005. In 2006 Stillwater Sciences, Inc. implemented snorkel surveys in Upper Wheatfield Fork, Tombs Creek at the confluence with Wheatfield Fork and Redwood Creek. Steelhead were present during all surveys.

Water temperatures range from moderately unsuitable to fully unsuitable (19.7^{o} C to 20.9^{o} C) within the planning watershed.

In general, the top priority restoration recommendations for the watershed include: continue to implement road related sediment source reduction strategies on the property, improve large wood abundance to increase shelter and pool habitat, identify and implement riparian enhancement projects where current canopy density and diversity are inadequate.

Wheatfield Fork

Wheatfield Fork is a 4th order stream with approximately 9.3 miles of Class I stream of which 3.3 miles are on the Buckeye Forest ownership. This portion of the Wheatfield main-stem is low gradient (0-1%) with some interspersed reaches with steepening valleys increasing the gradient to over 1%.

In 2005, the GRWC installed two (2) monitoring reaches (#651 and #652) on the upper Wheatfield above and below the confluence of Tombs Creek. Pool frequency and depth are below target levels with pools equal to or greater than 3 ft. comprising an average of 16% of the two reaches. Large wood abundance is non-existent with only 1 piece per 1,000 ft. and an average volume of 59 ft^3. Canopy in the center of the channel at site #651 is 18% and 63% at site #652.

Within the reaches, the GRWC has installed two (2) air and water temperature monitoring sites. Water temperatures within the reaches are moderately unsuitable at site #651 (19.9^o C) and fully unsuitable (20.9^o C) with daily temperatures (25.2^o C) exceeding the Basin Plan lethal maximums of 23.9^o C at site #652

Notwithstanding the high temperatures, steelhead young of the year and older were found during ocular surveys and steelhead were documented during habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007). Stillwater Sciences, Inc. found somewhat low steelhead densities (fish/m^2) in the upper Wheatfield reach (#652) during the Limiting Factors Analysis.

Location Description

Wheatfield Fork – Wolf Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R12W S19/30 and its NAD 83 coordinates are 38.6933 north latitude and 123.2279 west longitude. Elevations at the property line range from about 390 feet at the downstream end to 550 feet at the upstream end according to the USGS Tombs Creek 7.5 minute quadrangle.

Monitoring Sites

The GRWC has two (2) installed monitoring reaches (#651 and #652) and one proposed reach (#648; baseline date were collected in 2006. Temperature data (#680 & #683) were collected in 2006 and 2009.

Redwood Creek

Redwood Creek is a 1st order stream with approximately 0.5 mile of Class I stream all on the Buckeye Forest ownership. The creek is high gradient (2-3%) with some interspersed reaches with steepening valleys increasing the gradient to over 6%.

In 2006, the GRWC installed a monitoring reach (#704) in Redwoods Creek. Pool frequency and depth do not meet target levels with pools equal to or greater than 1 ft. comprising 24% of the reach length. Large wood abundance is close to preferred levels with146 pieces per 1,000 ft. and a volume level of 5,442 ft^3 with wood concentrated in large log jams.

The GRWC installed one (1) air and water temperature site within the monitoring reach. Water temperatures within the reach are moderately unsuitable (MWAT 19.7^o C).

Location Description

Redwood Creek – Wolf Creek PWS sub-section: The legal description at the downstream (property-line) end is T10N R13W S12 and its NAD 83 coordinates are 38.7299 north latitude and 123.2507 west longitude. Elevations at the property line range from about 550 feet at the downstream end to 1,360 feet at the upstream end according to the USGS Tombs Creek and Annapolis 7.5 minute quadrangle.

Steelhead young of the year and older were found during ocular surveys and steelhead were documented during habitat typing surveys in 2005 and 2006 (Kleinfelder, 2007).

Monitoring Sites

The GRWC has one (1) monitoring reach (#704); baseline data was collected in 2006. Temperature data (#704) were collected in 2006.

Restoration Enhancement and Monitoring

Management of species' populations and biological diversity requires a landscape-scale perspective and recognition that the complexity and function of any particular location is influenced heavily by the nature of the landscape that surrounds it.

To implement aquatic management, we must develop strategies that incorporate long-term planning and commitment, while recognizing the need to make short-term decisions.

Many studies have been conducted on the Gualala River Watershed documenting the adverse conditions limiting salmonid populations. They consistently recommend four priority management strategies to enhance beneficial uses and improve watershed health; 1) reduce upslope nonpoint source (NPS) sediment inputs through road upgrades, repairs and decommissioning, 2) increase in-stream habitat diversity through large woody debris placement, 3) riparian enhancement and 4) continue and expand the GRWC monitoring program to increase understanding of watershed processes and evaluate resource management strategies.

Many factors affect the health of watershed habitat. No single factor is responsible, but time is of the essence to provide viable habitat for salmonid populations. The focus must be on remediating the major impacts we can quantify and have the tools to fix.

When planning projects, multiple restoration objectives should be met to increase cost-efficiency, the quality of the project, and minimize associated impacts. Implementing reach scale restoration projects planned on watercourses adjacent to and in conjunction with timber harvest plans or other land use activities are recommended. For example, restoration actions often utilize heavy equipment and open road networks found in timber harvest operations or during upslope restoration activities. This minimizes their ecological impact (e.g. opening new roads and tractor activity) and has many advantages.

Sediment

Erosion control and erosion prevention work is the first and perhaps the most important step to protecting and restoring watersheds and their anadromous fish populations. This is especially true for the Gualala River watershed. Unlike many watershed improvement activities, erosion prevention and "storm-proofing" has an immediate benefit to the streams and the aquatic habitat of the basin. Roads are a major source of erosion and sedimentation on most managed forest and ranch lands (Weaver and Hagans, 1997).

In 2003 the Gualala River Watershed Technical Support Document For Sediment (TSD) estimated that the Gualala River watershed's present erosion rate was 1,220t/mi^2/yr, with a background erosion rate of 380t/mi^2/yr. Newer sediment source assessments conducted at the scale of planning watersheds in the Gualala are consistent with the TSD findings. The goal of the Gualala TSD and the GRWC is to lower anthropogenic sediment loads to 25% above the background erosion level (475t/mi^2/yr). The TSD states that road related erosion accounted for 58% of the total estimated watershed erosion rate and 85% of the human-caused (controllable) portion of the estimated erosion rate.

Thresholds

The National Marine Fisheries Service (1996) guidelines for salmon habitat characterize watersheds with road densities greater than 3 miles of road per square mile of watershed area (mi/sq mi) as "not properly functioning", while "properly functioning condition" was defined as less than or equal to 2 mi./sq. mi., with no or few stream side roads. The Final Recovery Plan for Central California Coast coho salmon states that road density and streamside road density are the greatest overall source of impairment to watershed processes (NOAA, 2012).

By following the protocols developed by Hagans & Weaver roads can be 95% hydrologically disconnected from streams, reducing delivery of sediment from road sources by as much as 95% and potentially decreasing the human-caused erosion by 80%.

Relating site-specific sediment reductions to watershed scale estimates is complex, however; road restoration contributes significantly to meeting load reductions. It specifically meets many of the TSD Short-Term numeric targets including reducing hydrologic connectivity to < than 5%, stream diversion potential to < 1%, Stream Crossing Failures < 1% and all road related Mid-Term and Long-Term numeric targets.

Desired Salmonid Freshwater Habitat Conditions for Sediment-Related Indices (NCRWQCB, 2006) specifies that turbidity should not increase more than 20 percent above naturally occurring background levels and the suspended sediment load and suspended sediment discharge rate of surface waters should not adversely affect beneficial uses. Baseline turbidity monitoring has been conducted at four (4) sites within the ownership and could be used for future monitoring of land use management and restoration planning.

Planning and Implementation

The Buckeye Forest road network has an overall road density of 6.6 miles per mi^2. For the purposes of project planning, sub-basins and their road networks are prioritized based on sediment source analysis, road densities, roads proximate to streams, potential salmonid habitat.

Table 2.1: Buckeye Forest Road Density by Planning Watershed

Buckeye Forest CalWater Planning Watersheds	Gualala Watershed Total Road Network	Buckeye Forest Road Network Miles	Buckeye Forest Percent PWS Miles	Buckeye Forest Road Density Miles per mi^2	Buckeye Forest Road Upgraded Miles	Buckeye Forest Effective Density Miles per mi^2
1113.8 Gualala River HSA (without coastal watersheds)	1,532	203.6	13.3%	6.6	9.6	6.3
1113.82 Rockpile SPWS	169					
1113.82013 Lower Rockpile PWS	29.9	6.8	22.7%	7.8	0.3	7.8
1113.82012 Redrock PWS	21.0	6.1	29.0%	6.0	0.0	6.0
1113.82012 Middle Rockpile Creek	70.4	2.8	4.0%	7.8	0.0	7.8
1113.83 Buckeye Creek SPWS	251					
1113.83014 Little Creek PWS	80.8	19.3	23.9%	9.8	0.0	9.8
1113.83013 Grasshopper Creek PWs	62.8	40.5	64.5%	6.8	1.0	6.6
1113.83012 Harpo Reach PWS	22.2	7.4	33.3%	6.0	0.2	5.9
1113.83011 Flat Rdge creek PWS	53.1	40.4	76.1%	6.4	0.0	6.4
1113.84 Wheatflied Fork	476					
1113.84032 Fuller Creek PWS	74.0	38.9	52.6%	7.4	8.1	5.8
1113.84030 Tobacco Creek PWS	61.4	19.4	31.6%	5.7	0.0	5.7
1113.84012 Wolf Creek PWS	57.8	22.0	38.1%	5.1	0.0	5.1

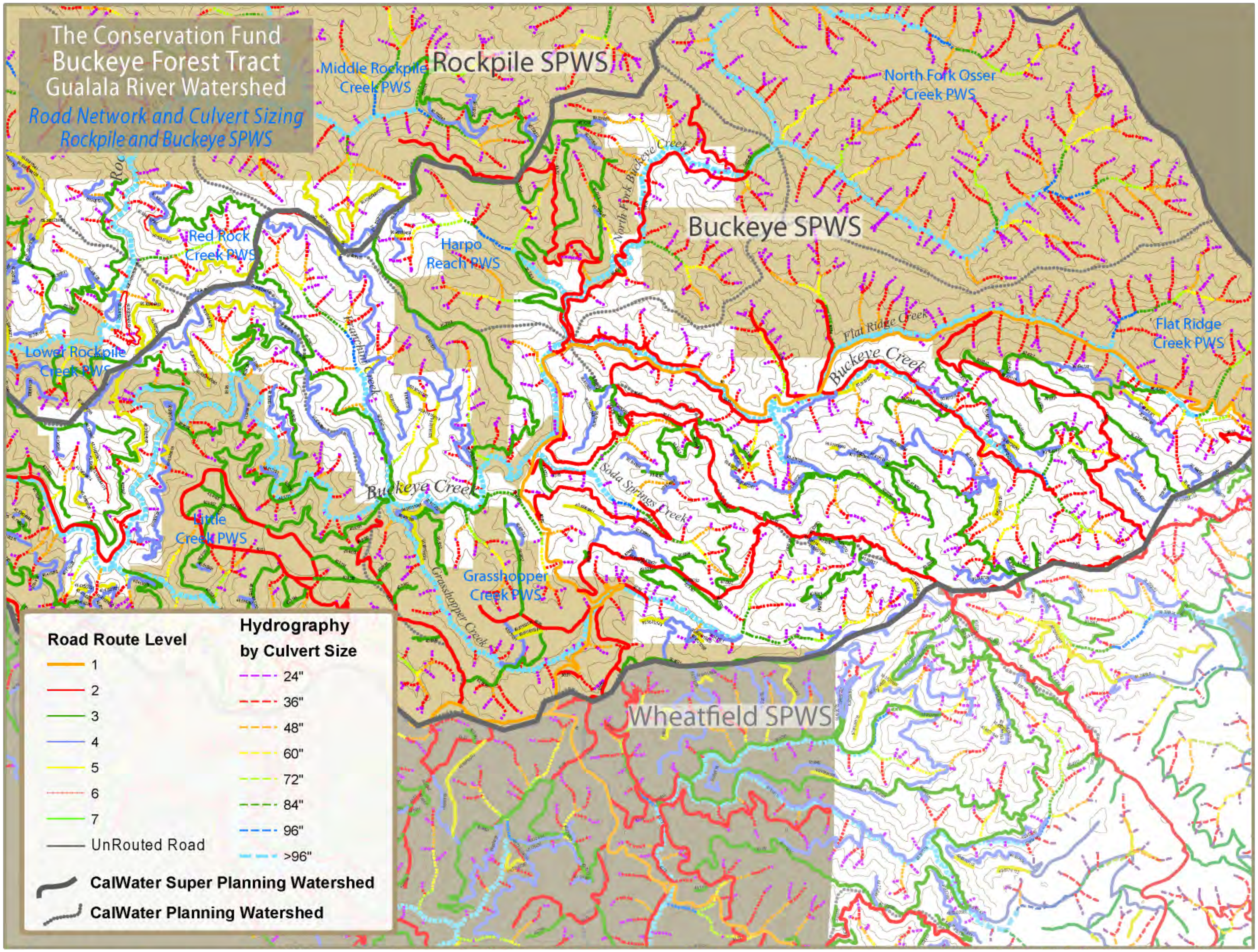
The sediment source assessment completed on the road networks within the Buckeye Forest Tract in 2007 focused on access roads to the proposed vineyard tracts (Kent & Associates, 2007). Phase I of the restoration plan concentrates on main haul roads and ridge-tops roads. The plan should be reviewed to develop additional assessment mileage for each planning watershed with a focus on roads proximate to streams and mid-slope roads, which normally have the highest potential sediment yields.

In Table 2.2, estimated costs are based on present day average costs for road assessment and implementation work within the watershed. Only High and Medium priority roads are included in implementation, as a result a 20% reduction has been applied to all GRWC mapped road mileage within the planning watershed. This percentage was derived by the GRWC to represent low priority roads based on an average of comparable work already completed. *Mileage for assessments costs include already assessed road networks.*

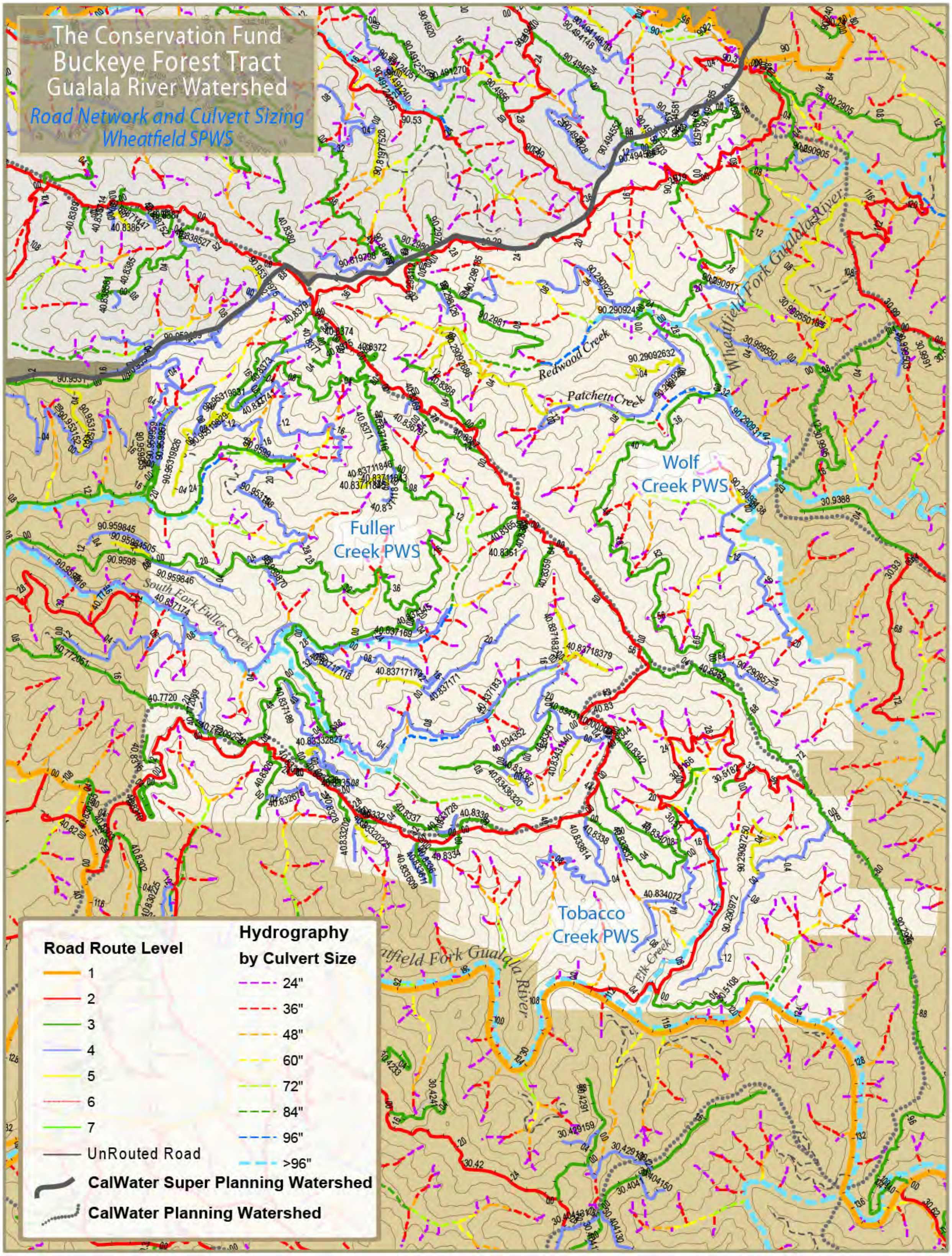
Time frames for sediment are based on a ten-year time table and potential funding cycles. Cost efficiency or funding availability may dictate a different schedule. Watersheds are listed in order of priority.

The GRWC Sediment Reduction Program has hydrologically disconnected from the stream channels 263 miles of road in five high priority CalWater planning watersheds comprising 38,524 acres or 18% of the watershed. To assist landowners in management planning the GRWC has developed a number of computer based tools that can be used to develop recommendations for management.

The Buckeye Forest road network and assessment plan has been included in the GRWC Geographic Information System (GIS) coverage and watershed road network database. The extensive database includes road networks, restoration, and monitoring watershed-wide. The GIS road network inventories road systems by unique road number (routes), distance (mile posting) and specific site numbers. The road inventory contains site specific information including, road number, site identifying number, mileage, site problem, site solution, hours of equipment, cost, sediment yield, sediment saved and monitoring photos. Continued use of this tool will allow planning at the ownership, planning watershed and watershed-wide level (see Map 5 & 6, Appendix 1).



Map 5: Rockpile & Buckeye Creek Watershed Culvert Sizing



Map 6: Wheatfield Fork Culvert Sizing

Table 2.2: Buckeye Forest Priority Road Restoration by Planning Watersheds

Priority List of Planning Watersheds for Road Restoration	Time Frame	Per Mile Cost	Total
Little Creek PWS (19.3 miles)			
Road assessment on 15.4 miles Medium & High priority roads in upper watershed.	2014 to 2016	$1,500.00 to $2,500.00	$23,160.00 to $38,600.00
Road Implementation in upper watershed based on assessment mileage.	2016 to 2019	$20,000.00 to $25,000.00	$308,800.00 to $386,000.00
Grasshopper Creek PWS (39.5 mi, 1 mi upgraded)			
Road assessment on 32.4 miles Medium & High priority roads in upper watershed.	2014 to 2016	$1,500.00 to $2,500.00	$47,400.00 to $79,000.00
Road Implementation in upper watershed based on assessment mileage.	2017 to 2020	$20,000.00 to $25,000.00	$632,000.00 to $790,000.00
Harpo Reach PWS (7.4 mi, 0.2 upgraded)			
Road assessment on 5.76 miles Medium & High priority roads in upper watershed.	2014 to 2016	$1,500.00 to $2,500.00.00	$8,640.00 to $14,400.00
Road Implementation in upper watershed based on assessment mileage.	2017 to 2020	$20,000.00 to $25,000.00	$115,200.00 to $144,000.00
Flat Ridge PWS (40.4 mi)			
Road assessment on 32.32 miles Medium & High priority roads in upper watershed.	2016 to 2018	$1,500.00 to $2,500.00	$48,480.00 to $80,800.00
Road Implementation in upper watershed based on assessment mileage.	2018 to 2021	$20,000.00 to $25,000.00	$646,400.00 to $808,000.00
Fuller Creek PWS (30.8 mi, 8.1 mi upgraded)			
Road assessment on 24.64 miles Medium & High priority roads in upper watershed.	2017 to 2019	$1,500.00 to $2,500.00	$36,960.00 to $61,600.00
Road Implementation in upper watershed based on assessment mileage.	2019 to 2022	$20,000.00 to $25,000.00	$492,800.00 to $616,000.00
Lower Rockpile Creek PWS (6.8 mi, 0.3 mi upgraded)			
Road assessment on 5.44 miles Medium & High priority roads in upper watershed.	2017 to 2019	$1,500.00 to $2,500.00	$7,800.00 to $13,000.00
Road Implementation in upper watershed based on assessment mileage.	2019 to 2022	$20,000.00 to $25,000.00	$104,000.00 to $130,000.00
Road assessment and implementation should be planned during restoration work on Gualala Forest Tract.			

Redrock Creek PWS (6.1 mi total)			
Road assessment on 4.88 miles Medium & High priority roads in upper watershed.	2017 to 2019	$1,500.00 to $2,500.00	$7,320.00 to $12,200.00
Road Implementation in upper watershed based on assessment mileage.	2019 to 2022	$20,000.00 to $25,000.00	$97,600.00 to $122,000.00
Road assessment and implementation should be planned during restoration work on Gualala Forest Tract			
Tobacco Creek PWS (19.4 mi)			
Road assessment on 15.52 miles Medium & High priority roads in upper watershed.	2018 to 2020	$1,500.00 to $2,500.00	$23,280.00 to $38,800.00
Road Implementation in upper watershed based on assessment mileage.	2020 to 2023	$20,000.00 to $25,000.00	$310,400.00 to $388,000.00
Wolf Creek PWS (22.0 mi)			
Road assessment on 17.6 miles Medium & High priority roads in upper watershed.	2019 to 2021	$1,500.00 to $2,500.00	$26,400.00 to $44,000.00
Road Implementation in upper watershed based on assessment mileage.	2020 to 2023	$20,000.00 to $25,000.00	$352,000.00 to $440,000.00
Middle Rockpile PWS (2.8 mi)			
Road assessment on 2.24 miles Medium & High priority roads in upper watershed.	2019 to 2021	$1,500.00 to $2,500.00	$3,360.00 to $5,600.00
Road Implementation in upper watershed based on assessment mileage.	2020 to 2023	$20,000.00 to $25,000.00	$44,800.00 to $56,000.00
Road assessment and implementation should be planned during restoration work on Gualala Forest Tract			

Large Wood

The Gualala River Watershed Assessment Report (Klamt et al., 2003) determined that pool depth, pool frequency and pool shelter are the leading limiting factors to salmonids throughout the Rockpile Creek, Buckeye Creek and Wheatfield Fork SPWS. The highest restoration priority to remediate these limiting factors is in-stream structure enhancement.

The positive role that large wood plays creating suitable salmonid habitat in riverine ecology is well documented (Martin and Benda 2001). In forested streams large wood is associated with the majority of pools and the amount of large wood in the channel has a direct affect on pool volume, pool depth and the percentage of pool area (Elliot 1986; Murphy et al 1986; Carlson et al 1990; Beechie and Wyman 1992). Woody debris benefits all life stages of salmonids (Bisson et al. 1987, Sullivan et al. 1987). Large wood augmentation increases channel and habitat complexity and provides both cover and high-flow refugia for juvenile and adult salmonids.

The 1997 Coastal Forestlands Aquatic Assessment found that stream reaches lack essential habitat provided by LWD. Two indices measured for the survey, LWD pieces per bank-full width and LWD volume index fell short of criteria established by Peterson et al (1992). The Gualala Synthesis Report states that past land management involving logging and associated practices such as splash dam log transportation, as well as previous CDFW projects that removed migration barriers throughout the watershed, have led to the dearth of salmonid habitat provided by LWD (Klamt et al, 2003).

In 2001 the GRWC developed the Large Wood In the Stream program to remediate the effects of legacy anthropogenic sediment sources by creating summer and winter salmonid habitat, increasing floodplain connectivity, and re-establishing salmonid migration corridors by supplementing natural large wood levels. Since 2001 the GRWC has placed over 700 logs, rootwads and live conifers in eleven (11) tributaries within the watershed.

The Limiting Factor Analysis (Stillwater Sciences, Inc., 2007) completed for the property found in general, the natural recruitment of LWD within the study area was insufficient to maintain or improve current channel conditions based on the diameter and height of trees along the riparian corridor.

Based on channel and riparian suitability the GRWC has developed four methods that are recommended for large wood placement in the Gualala: (1) tractor and skidder placement of cull logs and rootwads, (2) trees directly felled or pushed into the channel, (3) trees and cull logs placed during cable harvest operations, and (4) logs partially buried in the channel. Wood placement attempts to mimic nature and allow project wood to adjust by hydraulic forces under natural conditions. Site locations favor specific areas where sufficient wedging opportunities exist amongst riparian roughness elements e.g., existing trees, stumps, or boulders or areas that have downstream pinch points, to maximize retention within the system. Site selection is based on natural wood inventory levels, stream order, size of sub-watershed drainage, channel form, shelter ratings, Rosgen channel type, and accessibility.

Thresholds

Literature suggests a number of different targets for large wood loading levels to achieve optimum habitat response. All are based on stream size and/or drainage area and include numeric targets for large wood piece and volume levels or quantity of key large wood pieces.

The Final Recovery Plan for Central California Coast coho salmon recommends increasing large wood abundance to a minimum of 1.3 to 4 key pieces (minimum diameter 0.55m and length 10m, or a volume 2.5m^3) every 100 meters in 10 to 100 meter bankfull width (BFW) streams. For streams with a BFW of 0 to 10 meters the recommendation is 6 key pieces every 100 meters (NOAA, 2012).

Recommendations

A large wood program plan that outlines specific reaches, large wood staging sites and defined access points similar to or in conjunction with the GRWC Wood In the Stream program should be developed. An adaptive management approach for wood placement based on equipment and large wood availability is the most efficient way to implement projects within the watershed. As in the case of the GRWC program where existing permits cover multiple planning watersheds, large scale permits should be acquired for planning watersheds within the ownership or consideration should be given to including or amending THPs to include large wood placement projects.

Costs and time-frames were not developed and need to be based on the availability of equipment for implementation. Combining wood projects with either road restoration projects or timber harvest plans dramatically decreases both the implementation costs and permitting fees. Current wood placement costs through the GRWC Wood In the Stream program are $300.00 per log or $400.00 per log with effectiveness monitoring (excluding permit development and fees). In Table 2.3 planning watersheds and streams are listed in order of priority.

Table 2.3: Large Wood Placement Streams

Buckeye Forest Designated Streams for Large Wood Enhancement	Reach Distance Miles	Comment
Little Creek PWS Stream Reaches Buckeye Creek main-stem	2.9	Large wood project is planned for 2015 on Gualala Redwoods, Inc property in lower Buckeye reach in conjunction with road upgrading project.
Grasshopper Creek PWS Stream Reaches Buckeye Creek main-stem	2.7	Soda Springs Park is in between the two reaches of ~one mile each on the Buckeye Creek ownership. Wood project could be expanded to include portions of Buckeye Creek within Soda Springs Park. Kelly road follows the south side of the upper reach; wood project would have to be in partnership with Kelly Road Association.
Harpo Creek PWS Stream Reaches North Fork Buckeye	2.4	Lower 1.3 miles of North Fork Buckeye Reach. Project should be planned in conjunction with Howlett Ranch.
Flat Ridge Creek PWS Stream Reaches Upper Buckeye Creek Flat Ridge Creek	 3.5 2.5	Flat Ridge Creek implementation would have to be in partnership with Kelly Road Association.
Tobacco Creek PWS Stream Reaches Wheatfield Fork	0.8	In-stream data limited for this section of the Wheatfield Fork but 2001 habitat typing data and visual surveys confirm the lack of large wood. Skaggs Springs Road follows the channel on the south side.
Wolf Creek PWS Stream Reaches Wheatfield Fork	3.3	Buckeye Forest ownership is the west-side of the channel. Partnerships should be developed with landowners on the east-side of the channel.
Lower Rockpile PWS Stream Reaches Rockpile Creek main-stem	0.8	GRWC Wood Project established in Lower Rockpile Creek Planning Watershed (not on property). Additional wood placement planned in the lower reach during 2015/2016 sediment source work.
Red Rock Creek PWS Stream Reaches Rockpile Creek main-steam	0.8	Wood placement should be in conjunction with Gualala redwoods, Inc. and Gualala Forest projects.
Total	19.7	

Riparian

Portions of all stream reaches within the ownership lack areas of sufficient canopy density and are recommended for riparian enhancement (Klamt et al., 2003). Restoration efforts to increase canopy may decrease stream temperatures over the long-term. However, stream temperatures in the Gualala main-stems trend towards warmer temperatures in the headwaters and appear to be already unsuitable before entering the property.

In addition to mediating steam temperatures, the riparian zone provides habitat for many types of wildlife. There are several features of riparian forest that indicate its value as habitat and as part of the stream system. The density and diversity of plant species, the width of the riparian corridor beyond the edge of the creek scour channel, the size of the trees in the corridor and the occurrence of dead trees, vines, downed wood and other features, all determine the habitat quality for birds, mammals, reptiles, amphibians and salmonids.

In 1997, Coastal Forestlands Aquatic Assessment found canopy conditions below average on stream reaches within the ownership. An analysis using aerial photography conducted during the NCWAP synthesis compared 1942, 1968, and 1999 bank to bank exposure. Streams within the ownership did show improved canopy conditions from 1968 but most main-stem reaches show canopy limitations.

The Gualala NCWAP Team frequently recommended tree planting of former riparian areas that had been converted to pastureland during the mid century. However, artificial regeneration can be difficult. These areas are often highly compacted from decades of prolonged cattle grazing. Several planting seasons are usually required to overcome high seedling mortality rates (Klamt et al, 2003).

The Final Recovery Plan for Central California Coast coho salmon recommends for most stream reaches on the property that riparian enhancement projects should be identified and implemented where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in all streams within the property (NOAA, 2012).

Habitat typing and Limiting Factors studies conducted on the property 2006 and 2007 confirm the lack of riparian cover on most main-stems throughout the ownership (Kleinfelder, 2007 & Stillwater Sciences, 2008).

Thresholds

Literature suggests that an optimal canopy density is 80% or greater and conifer regeneration be encouraged in the riparian zones.

Recommendations

Appropriate riparian forest management along with grazing exclusionary fencing will promote riparian growth throughout the property. Further discussions and planning using the bank-to-bank canopy GIS coverage (Klamt et al, 2003) augmented by current data (aerial photography, in-stream and riparian monitoring data and field observations) could be initiated to develop specific strategies for riparian restoration.

Monitoring

Management that acknowledges the significance of biological diversity is made all the more daunting by the fact that such diversity is itself a dynamic property of ecosystems affected by variations in spatial and temporal scale. Monitoring contributes to the understanding of complex ecological systems and is essential in documenting watershed trends and restoration performance. It is a critical component of restoration planning and adaptive management and can be used to identify and correct watershed problems as they occur.

In 2000, the GRWC developed a watershed based monitoring program designed to evaluate long-term trends at the watershed scale and also study restoration effectiveness at the tributary level. Data collected on the physical and biological condition of the watershed allows us to evaluate ecological events, watershed trends, use of Best Management Practices and the effectiveness of restoration projects.

The GRWC Quality Assurance Project Plan for Monitoring Sediment Reduction was approved by the North Coast Regional Water Quality Control Board, State of California Water Resources Control Board and the California EPA. Metrics that are surveyed and analyzed are water temperature, channel morphology, riparian composition & large wood recruitment potential, in-stream large wood abundance, and canopy density. Additional metrics at selected reaches include snorkel and spawning surveys and macro invertebrate sampling.

In 2005 and 2006, the GRWC installed seventeen (17) air and water temperature monitoring sites on the Buckeye Forest along with twelve (12) reach sites. The GRWC has continued to monitor temperature annually at selected sites on a rotational basis (see GRWC database Stream Monitoring Report, Appendix 2).

Due to the listing status of salmonids and their significance as a keystone or indicator species of water quality, quantified salmonid population estimates are valuable. In 2012, with assistance from Sean Gallagher (CDFW) the GRWC developed a plan for spawning survey reaches within the watershed that conforms to protocols developed by the Coastal Monitoring Program (CMP) and will result in adult salmonid population estimates. The plan has been a collaborative effort between the GRWC, landowners and agency personnel. The long-term goal is to include the Gualala River watershed in the CMP program and to expand efforts to develop salmonid population estimates for the watershed as a whole.

In addition, through another collaborative effort, the GRWC, CDFW, NMFS and the NCRWQCB are conducting snorkel surveys in the North Fork basin to develop a comprehensive assessment of the viability of coho populations in the watershed. Since coho salmonid presence/absence data are limited for the Buckeye Forest tract, this effort could be expanded to include suitable sections of the Buckeye Creek SPWS and the Fuller Creek PWS in Wheatfield Fork basin. The study would have to be a three (3) year effort to cover all possible salmon cohorts. The GRWC has been in discussions with State and Federal agencies involved in the Russian River Brood Stock Program. Implementing snorkel surveys would be a precursor to evaluating the merits of starting a coho salmon brood stock program in the Gualala and/or stocking Buckeye Creek and Fuller Creek with brood stock from the Russian River Program.

Thresholds

A significant factor influencing the quality of salmonid habitat is the area of primary pool habitat within a stream reach length. The generally accepted target is >40% of a reach length should be comprised of primary pools.

To quantify channel complexity a Variation Index (VI) for the thalweg is developed for each monitoring site using a model designed by Mary Ann Madej (USGS and Redwood National Park). Simply stated, the VI measures the complexity of the channel bed; reduction of complexity occurs with excessive sediment introduction, increased complexity indicates a recovery from such a condition. The VI target for recovery is considered to be '20' (Madej, 1999) and channels with a VI index of > 20 are believed to be in recovery from excessive sediment loads.

Table 2.4: Temperature Thresholds

NCWAP Thresholds	MWAT
Fully Suitable	10-15.6° C
Moderately Suitable	15.7-16.7° C
Somewhat Suitable	16.8-17.2° C
Undetermined	17.3-17.8° C
Somewhat Unsuitable	17.9-18.9° C
Moderately Unsuitable	19-19.9° C
Fully Unsuitable	*≥ 20° C*

Literature concerning stream temperatures for coho and steelhead indicates that suitable temperatures for these salmonids occur within the range of 10^0 to 17.5° C (50-63.5° F) gauged from a seven-day rolling average of the daily average temperatures (Welsh, 2001, Sullivan, 2000). The maximum of the weekly averages is referred to as MWAT and is often used as a single point metric to evaluate stream temperature. The GRWC uses thresholds developed by NCWAP (Klamt et al, 2003) for the Gualala watershed (Table 2.4).

Recommendations

TEMPERATURE

Temperature monitoring should be continued on an annual basis. Most temperature data is limited with only 3 years of data (2004, 2009 and 2013). Once sufficient baseline data has been collected, it may not be necessary to survey all sites annually and a rotational monitoring plan could be developed. Monitoring sites could be expanded to capture temperature at the upper end of the property line to better evaluate temperature entering the property. Additional sites may be added for project specific monitoring.

Air & water temperature site estimated cost (includes data management): New site $500.00 (includes equipment cost) - existing site $325.00. GRWC has match funding available for landowners participating in the Cooperating Monitoring Program.

SEDIMENT, IN-STREAM HABITAT AND LARGE WOOD

The GRWC Cooperative Monitoring Program is designed and approved to monitor sediment reduction within the Gualala River watershed. The design of the reach monitoring protocol also allows for quantitative data collection on metrics that define habitat quality, including large wood abundance. The baseline data collected on the property is now close to ten years old. Buckeye Forest should re-survey established reaches to obtain current data for continued trend and project effectiveness monitoring either in collaboration with the GRWC or using the established protocols. In addition to the twelve (12) reaches already installed on the property the GRWC has one (1) proposed monitoring reach not installed on the North Fork Buckeye. Monitoring reach estimated costs (includes data management): New site $4,000.00 (includes equipment cost) - Existing site $3,000.00. GRWC has matched funding available for landowners participating in the Cooperating Monitoring Program.

In 2001 approximately 100 miles of the Gualala River watershed was habitat typed during the NCWAP assessment process. Portions of the main-stem reaches within the property on Buckeye Creek and Wheatfield Fork were included in the assessment. In 2006, selected stream reaches were habitat typed within ownership (Kleinfelder, 2007). Habitat typing can be used as a coarse indicator of potential limiting factors, to determine general habitat conditions and to provide specific restoration prescriptions. While habitat typing provides a useful inventory it is not a valid monitoring tool (Poole et al., 1997). Consequently, repeated habitat typing is not suitable for monitoring changes in stream habitat over time (Krisweb). Habitat typing small tributaries where monitoring reaches are not installed may be useful to determine their overall fisheries value and limits of anadromy.

Biological Assessment

As discussed earlier, spawning and snorkel surveys are being conducted in the Gualala River watershed on a limited basis. During the Limiting Factor Analysis ten (10) reaches were snorkeled and it was recommended to continue annual snorkel surveys to determine viability of steelhead populations (Stillwater Sciences, 2008).

Coho salmon data are limited for the watersheds on the property. The most likely coho habitat appears to be in tributaries to Buckeye Creek and the North and South Fork Fuller Creek tributaries in the Wheatfield Fork. A snorkel survey program similar to the GRWC effort in the North Fork Gualala could be developed to determine coho salmon viability as a precursor to possible brood stock implementation.

Since salmonid data is limiting in Rockpile Creek snorkel surveys could be conducted when/if reach sites are installed to determine over-summer juvenile relative abundance. It is unlikely there are still viable coho salmon populations in Rockpile Creek but determining steelhead juvenile abundance and distribution could be a valuable tool for land use adaptive management, restoration project planning and effectiveness monitoring.

Estimated cost for snorkel surveys within established monitoring reaches is (includes data management): $300.00 per reach.

Coastal Monitoring Plan spawning & snorkel surveys in the Rockpile, Buckeye and Wheatfield basins to determine population estimates could be considered when the Gualala River watershed-wide CMP frame work is adopted.

The quality and diversity of benthic communities can be an indicator to evaluate environmental quality and stream health. The State Waterboard (SWQCB) is in the process of developing a work plan for *DEVELOPING BIOLOGICAL OBJECTIVES FOR PERENNIAL WADEABLE STREAMS IN THE STATE OF CALIFORNIA* to develop numeric objectives for biota within streams in forested watersheds. Although not yet approved, it appears that the proposed sampling protocols are sufficiently different from protocols used in past sampling efforts; consequently the data will not be comparable. There also appears to be some ambiguity on whether the costs will be borne by the landowner or a regulatory agency. The GRWC is participating in SWQCB trainings and will be certified under the new protocols. Expanding monitoring to sampling macro invertebrates should be postponed until the remaining issues with the program are resolved and the GRWC certification is completed.

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Gualala River Watershed Technical Studies

Technical and Scientific Documentation Table	
Technical and Scientific Document Name	**Document Description**
Gualala River Watershed Council. GRWC Quality Assurance Project Plan for Monitoring Sediment Reduction, 2008.	Project effectiveness monitoring quality assurance plan.: **http://grwc.info/Assets/Reports/grwc-qapp-ver-3-1.pdf**
North Coast Regional Control Board, et al. Gualala River Synthesis Report, 2003.	Multi-agency assessment of the Gualala River Watershed: **http://grwc.info/Assets/Reports/cdfg-ncwap-summary.pdf**
Ecorp Consulting, Gualala River Estuary Study, 2005	Fisheries assessment of the Gualala River Estuary: **http://grwc.info/Assets/Reports/Gualala-River-Estuary-Report-05.pdf**
North Coast Regional Water Quality Control Board. Water Quality Control Plan for the North Coast Region, State of California, February 1993	Document describes protection of beneficial uses, and wastewater discharge guidelines: http://www.swrcb.ca.gov/northcoast/water_issues/programs/basin_plan
North Coast Regional Control Board, Gualala River Technical Support Document for Sediment (TSD), 2000	TMDL Technical Support Document, evaluating sediment source inputs into the Gualala River Watershed: **http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/gualala_river**
Hagans and Weaver. Handbook for Forest and Ranch Roads, 1994	Technical road restoration manual: **http://www.krisweb.com/biblio/gen_mcrcd_weaveretal_1994_handbook.pdf**
California Department of Fish and Game. California Salmonid Stream Habitat Restoration Manual Volume II, January 2004.	Describes several components of watershed restoration including sediment production and delivery, upslope erosion assessment, analysis and reporting of assessment data, implementing restoration work, quality control, documentation of projects, and project monitoring: http://www.dfg.ca.gov/fish/resources/habitatmanual.asp

Appendix 1

Gualala River Watershed Road Restoration Status

Gualala River Watershed - Road Upgrading

Owner	Acres	Abandoned Fixed	Abandoned Left	Deacti-vated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile Total*	Road Miles/Square Mile Connected*
WAA Name	*NF Gualala*											
Planning Watershed	*Billings Creek*											
Other	8,217							0.0	60.6	0.0%	4.7	4.7
Wheeler	882							0.0	3.8	0.0%	2.8	2.8
Gualala River Forest	1,551							0.0	14.7	0.0%	6.1	6.1
Billings Creek	10,650							0.0	79.1	0.0%	4.8	4.8
Planning Watershed	*Doty Creek*											
Gualala Redwoods, Inc.	3,568			2.0	0.6	33.2	0.5	36.3	44.4	81.6%	8.0	1.5
Other	689					0.5		0.5	9.9	5.0%	9.2	8.8
Mendocino Redwood Co	370	0.2				1.0		1.3	5.6	22.7%	9.7	7.5
Doty Creek	4,628	0.2		2.0	0.6	34.7	0.5	38.0	60.0	63.4%	8.3	3.0
Planning Watershed	*Robinson Creek*											
Mendocino Redwood Co	509			0.8				0.8	6.7	12.6%	8.4	7.4
Gualala River Forest	1,982			0.0				0.0	21.4	0.1%	6.9	6.9
Gualala Redwoods, Inc.	5,898	0.2	1.9	5.7	5.5	23.4	13.7	50.4	61.0	82.6%	6.6	1.2
Other	402			0.1		0.0		0.1	3.7	2.5%	5.8	5.7
Robinson Creek	8,792	0.2	1.9	6.6	5.5	23.4	13.7	51.3	92.8	55.3%	6.8	3.0
Planning Watershed	*Stewart Creek*											
Other	249							0.0	2.4	0.0%	6.1	6.1
Gualala River Forest	4,392							0.0	52.6	0.0%	7.7	7.7
Gualala Redwoods, Inc.	1,944			1.3	0.1	0.8	1.9	4.1	22.8	17.9%	7.5	6.2
Stewart Creek	6,585			1.3	0.1	0.8	1.9	4.1	77.8	5.2%	7.6	7.2
NF Gualala	30,654	0.4	1.9	9.9	6.2	58.9	16.1	93.4	309.7	30.2%	6.5	4.5
WAA Name	*Rockpile*											
Planning Watershed	*Lower Rockpile Creek*											
Buckeye Forest	561				0.0			0.0	6.8	0.4%	7.8	7.8
Other	12			0.0				0.0	0.1	1.3%	5.0	4.9
Gualala River Forest	2					0.0	0.0	0.0	0.2	10.1%	54.4	48.9
Gualala Redwoods, Inc.	2,371		0.5	1.3	2.3	2.9	1.7	8.7	22.8	38.2%	6.1	3.8
Lower Rockpile Creek	2,946		0.5	1.3	2.4	2.9	1.7	8.7	29.9	29.2%	6.5	4.6
Planning Watershed	*Middle Rockpile Creek*											
Other	3,428							0.0	26.7	0.0%	5.0	5.0
Buckeye Forest	248							0.0	2.8	0.0%	7.2	7.2
Gualala River Forest	3,793							0.0	34.9	0.0%	5.9	5.9
Howlett	697					0.0		0.0	6.0	0.2%	5.5	5.5
Middle Rockpile Creek	8,165					0.0		0.0	70.4	0.0%	5.5	5.5

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Owner	Acres	Abandoned Fixed	Abandoned Left	Deacti-vated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile Total*	Road Miles/Square Mile Connected*
Planning Watershed *Red Rock*												
Gualala Redwoods, Inc.	9				0.0	0.1		0.1	0.2	48.1%	17.4	9.1
Gualala River Forest	1,561				0.0			0.0	14.7	0.0%	6.0	6.0
Other	4							0.0	0.0	0.0%	2.9	2.9
Buckeye Forest	645							0.0	6.1	0.0%	6.0	6.0
Red Rock	2,219				0.0	0.1		0.1	21.0	0.6%	6.1	6.0
Planning Watershed *Upper Rockpile Creek*												
Other	2,091							0.0	13.7	0.0%	4.2	4.2
Gualala River Forest	2,457							0.0	13.0	0.0%	3.4	3.4
Wheeler	438							0.0	2.3	0.0%	3.4	3.4
Foppiano	4,088							0.0	18.3	0.0%	2.9	2.9
Upper Rockpile Creek	9,073							0.0	47.4	0.0%	3.3	3.3
Rockpile	22,403		0.5	1.3	2.4	3.0	1.7	8.9	168.7	5.3%	4.8	4.6
WAA Name *Buckeye*												
Planning Watershed *Flat Ridge Creek*												
Other	2,465							0.0	12.7	0.0%	3.3	3.3
Buckeye Forest	4,063							0.0	40.4	0.0%	6.4	6.4
Flat Ridge Creek	6,529							0.0	53.1	0.0%	5.2	5.2
Planning Watershed *Grasshopper Creek*												
Other	1,955					1.2	0.2	1.3	22.3	5.9%	7.3	6.9
Buckeye Forest	3,811						1.0	1.0	40.5	2.5%	6.8	6.6
Grasshopper Creek	5,766					1.2	1.2	2.4	62.8	3.7%	7.0	6.7
Planning Watershed *Harpo Reach*												
Other	1,323					0.0		0.0	6.9	0.6%	3.3	3.3
Buckeye Forest	786					0.2		0.2	7.4	2.2%	6.0	5.9
Howlett	613					2.0		2.0	7.9	25.9%	8.2	6.1
Harpo Reach	2,722					2.2		2.2	22.2	10.1%	5.2	4.7
Planning Watershed *Little Creek*												
Buckeye Forest	1,256					0.0	0.0	0.0	19.3	0.0%	9.8	9.8
Gualala Redwoods, Inc.	2,410	0.2		0.6	1.2	4.5	7.4	13.9	33.4	41.6%	8.9	5.2
Other	2,202					0.8		0.8	28.2	3.0%	8.2	7.9
Little Creek	5,868	0.2		0.6	1.2	5.3	7.4	14.7	80.8	18.2%	8.8	7.2
Planning Watershed *North Fork Osser Creek*												
Gualala River Forest	226							0.0	0.7	0.0%	2.0	2.0
Other	4,673							0.0	31.0	0.0%	4.2	4.2
North Fork Osser Cree	4,899							0.0	31.7	0.0%	4.1	4.1
Buckeye	25,784	0.2		0.6	1.2	8.7	8.6	19.3	250.6	7.7%	6.2	5.7

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Owner	Acres	Abandoned Fixed	Abandoned Left	Deacti-vated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile Total*	Road Miles/Square Mile Connected*
WAA Name	*Wheatfield*											
Planning Watershed	*Annapolis*											
Other	2,279			0.0		0.5		0.5	24.1	2.3%	6.8	6.6
Mendocino Redwood Co	3,121			0.1		2.2		2.3	34.1	6.6%	7.0	6.5
Gualala Redwoods, Inc.	2,179	0.7	0.5	5.5		1.8	0.1	8.7	27.5	31.6%	8.1	5.5
Annapolis	7,579	0.7	0.5	5.6		4.5	0.1	11.5	85.7	13.4%	7.2	6.3
Planning Watershed	*Britain Creek*											
Other	4,220							0.0	22.3	0.0%	3.4	3.4
Soper Wheeler	2,488							0.0	13.7	0.0%	3.5	3.5
Britain Creek	6,708							0.0	36.0	0.0%	3.4	3.4
Planning Watershed	*Buck Mountain*											
Buckeye Forest	4							0.0	0.1	0.0%	17.8	17.8
Other	8,185							0.0	41.0	0.0%	3.2	3.2
Buck Mountain	8,189							0.0	41.1	0.0%	3.2	3.2
Planning Watershed	*Fuller Creek*											
Mendocino Redwood Co	885					1.1		1.1	7.2	14.6%	5.2	4.4
Other	2,784		0.1			13.2		13.2	27.9	47.3%	6.4	3.4
Buckeye Forest	3,370	1.2	1.1	3.7		2.1		8.1	38.9	20.9%	7.4	5.8
Fuller Creek	7,039	1.2	1.2	3.7		16.3		22.4	74.0	30.3%	6.7	4.7
Planning Watershed	*Haupt Cr*											
Mendocino Redwood Co	614		0.6			0.2		0.7	5.1	14.6%	5.3	4.5
Soper Wheeler	32							0.0	0.3	0.0%	6.1	6.1
Other	3,955							0.0	18.0	0.0%	2.9	2.9
Ohlson	1,443							0.0	9.0	0.0%	4.0	4.0
Haupt Cr	6,043		0.6			0.2		0.7	32.3	2.3%	3.4	3.3
Planning Watershed	*House Creek*											
Soper Wheeler	3,139							0.0	10.1	0.0%	2.1	2.1
Other	2,155							0.0	14.7	0.0%	4.4	4.4
House Creek	5,293							0.0	24.8	0.0%	3.0	3.0
Planning Watershed	*Pepperwood Creek*											
Soper Wheeler	4,371							0.0	18.5	0.0%	2.7	2.7
Other	1,870					0.0		0.0	9.2	0.0%	3.1	3.1
Pepperwood Creek	6,241					0.0		0.0	27.7	0.0%	2.8	2.8
Planning Watershed	*Tobacco Creek*											
Other	2,705					1.5		1.5	18.8	8.0%	4.4	4.1
Soper Wheeler	279							0.0	1.0	0.0%	2.3	2.3
Buckeye Forest	2,174							0.0	19.4	0.0%	5.7	5.7
Ohlson	569					0.3		0.3	4.0	8.4%	4.5	4.1
Mendocino Redwood Co	2,334	1.6				6.8		8.4	18.2	46.2%	5.0	2.7
Tobacco Creek	8,061	1.6				8.6		10.2	61.4	16.7%	4.9	4.1

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Owner	Acres	Abandoned Fixed	Abandoned Left	Deacti-vated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile Total*	Road Miles/Square Mile Connected*
Planning Watershed *Tombs Creek*												
Silva Ranch	1,373					7.5		7.5	13.1	57.0%	6.1	2.6
Other	4,865					0.0		0.0	21.6	0.1%	2.8	2.8
Tombs Creek	6,237					7.5		7.5	34.8	21.6%	3.6	2.8
Planning Watershed *Wolf Creek*												
Soper Wheeler	1,577							0.0	6.7	0.0%	2.7	2.7
Buckeye Forest	2,733							0.0	22.0	0.0%	5.1	5.1
Silva Ranch	2,782					2.3		2.3	11.6	19.6%	2.7	2.1
Other	3,009							0.0	17.6	0.0%	3.7	3.7
Wolf Creek	10,101					2.3		2.3	57.8	3.9%	3.7	3.5
Wheatfield	71,492	3.5	2.3	9.3		39.4	0.1	54.7	475.7	11.5%	4.3	3.8
WAA Name	*SF Gualala*											
Planning Watershed *Big Pepperwood Creek*												
Other	678	0.0				0.1		0.1	9.9	1.2%	9.3	9.2
Gualala Redwoods, Inc.	5,853	1.5	1.2	3.9	2.5	24.4	12.7	46.2	74.1	62.4%	8.1	3.0
Big Pepperwood Cree	6,531	1.5	1.2	3.9	2.5	24.5	12.7	46.3	84.0	55.2%	8.2	3.7
Planning Watershed *Lower Marshall Creek*												
Other	6,016							0.0	35.2	0.0%	3.7	3.7
Lower Marshall Creek	6,016							0.0	35.2	0.0%	3.7	3.7
Planning Watershed *Middle South Fork Gualala Ri*												
Mendocino Redwood Co	3							0.0	0.2	0.0%	38.9	38.9
Other	7,907							0.0	44.2	0.0%	3.6	3.6
Middle South Fork Gu	7,910							0.0	44.4	0.0%	3.6	3.6
Planning Watershed *Mouth of the Gualala River*												
Gualala Redwoods, Inc.	3,516			0.0	0.3	6.1	12.7	19.2	45.5	42.1%	8.3	4.8
Other	1,788							0.0	21.3	0.0%	7.6	7.6
Mouth of the Gualala	5,305			0.0	0.3	6.1	12.7	19.2	66.8	28.7%	8.1	5.7
Planning Watershed *Upper Marshall Creek*												
Other	6,619					14.3		14.3	40.4	35.4%	3.9	2.5
Upper Marshall Creek	6,619					14.3		14.3	40.4	35.4%	3.9	2.5
Planning Watershed *Upper South Fork Gualala Ri*												
Soper Wheeler	4							0.0	0.0	0.0%	0.1	0.1
Other	8,399					8.1		8.1	57.1	14.2%	4.4	3.7
Upper South Fork Gua	8,403					8.1		8.1	57.1	14.2%	4.4	3.7
SF Gualala	40,783	1.5	1.2	4.0	2.7	53.1	25.5	88.0	327.8	26.8%	5.1	3.8

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Owner	Acres	Abandoned Fixed	Abandoned Left	Deactivated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile Total*	Road Miles/Square Mile Connected*

WAA Name *Coastal Gualala*

Planning Watershed *Black Point*

Owner	Acres	Abandoned Fixed	Abandoned Left	Deactivated	Not Connected	Storm Proofed	Upgraded	Improved Total	Miles Total	Percent Disconnected	Road Miles/Square Mile Total*	Road Miles/Square Mile Connected*
Other	3,493					0.0		0.0	47.9	0.0%	8.8	8.8
Gualala Redwoods, Inc.	1,128					3.5	0.4	3.9	14.0	28.1%	7.9	5.7
Black Point	4,621					3.5	0.4	3.9	61.9	6.4%	8.6	8.0
Coastal Gualala	4,621					3.5	0.4	3.9	61.9	6.4%	8.6	8.0
Grand Total	195,737	5.7	5.9	25.1	12.5	166.6	52.4	268.2	1,594.3	16.8%	5.2	4.3

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Appendix 2

Buckeye Forest Monitoring Database Stream Report

Stream Monitoring Report

Ownerships: Buckeye Forest
Visit Purpose: All
Planning Watersheds: All

Station Number	Name	Miles Up Stream	Year	Temperature Seasonal Maximum	Temperature MWAT	LWD Bank Full >6 In & >4 Ft or >10 CuFt CuFt/1000'	LWD Bank Full Pieces/1000'	Substrate >0.85 mm	Substrate D50	Streambed (Thalweg) Slope	Streambed VI	Streambed A/D	Riparian Zone Canopy % WLPZ	Riparian Zone Canopy % Cr.	Riparian Zone Basal Area	Riparian Zone Tree Ht.	Fish or Redds per Mile Coho	Fish or Redds per Mile SH (1+)	Fish or Redds per Mile Redds	Aquatic Macroinvertebrates Richness	Simpson	Hilsenhoff	Russian R Index	% Dominant
Hydrologic Unit				**Rockpile**																				
Stream				**Rockpile Creek**																				
701	Roc4	6.10	2005																	26		3.0		39
701	Roc4	6.10	2006			2,961	36		34	0.2%	52		83%	60%										
701	Roc4	6.10	2008	21.3	19.5																			
701	Roc4	6.10	2009	21.3	18.6																			
701	Roc4	6.10	2013	22.5	19.9																			
Rockpile Creek			Avg	21.7	19.3	2,961	36		34	0.2%	52		83%	60%						26		3.0		39
Hydrologic Uni	Rockpile		Avg	21.7	19.3	2,961	36		34	0.2%	52		83%	60%						26		3.0		39
Hydrologic Unit				**Buckeye**																				
Stream				**Buckeye Creek**																				
709	Buc	0.00	2008	23.6	20.3																			
709	Buc	0.00	2013	24.4	20.8																			
670	Buc4	11.17	2005																	27	0.14	4.6		38
670	Buc4	11.17	2006	26.3	22.2	944	8		15	0.6%	26		100%	89%										
670	Buc4	11.17	2008	20.2	18.6																			
670	Buc4	11.17	2009	21.3	17.9																			
670	Buc4	11.17	2011	22.7	19.4																			
672	Buc8	15.53	2005	18.0	16.5	232	6		71	1.5%	69		33%	36%	79	87				35		4.1		22
672	Buc8	15.53	2006	24.4	19.4																			
672	Buc8	15.53	2013	22.5	19.7																			
673	Buc9	16.48	2005			325	20		60	1.6%	58		28%	29%	111	86				38		3.6		18
673	Buc9	16.48	2006	26.7	22.8																			
673	Buc9	16.48	2013	19.8	18.0																			
Buckeye Creek			Avg	22.7	19.6	412	12		55	1.4%	56		44%	44%	95	87				33	0.14	4.1		26
Stream				**Flat Ridge Creek**																				
602	FLR2	0.04	2000	25.6	20.9																			
602	FLR2	0.04	2001	25.2	20.5																			
602	FLR2	0.04	2005			1,173	16		47	1.1%	89		12%	11%	162	92				38		3.2		25

Station Number	Name	Miles Up Stream	Year	Temperature Seasonal Maximum	Temperature MWAT	LWD Bank Full >6 In & >4 Ft or >10 CuFt CuFt/ 1000'	LWD Bank Full Pieces/ 1000'	Substrate >0.85 mm	Substrate D50	Streambed (Thalweg) Slope	Streambed (Thalweg) VI	Streambed (Thalweg) A/D	Riparian Zone Canopy % WLPZ	Riparian Zone Canopy % Cr.	Riparian Zone Basal Area	Riparian Zone Tree Ht.	Fish or Redds per Mile Coho	Fish or Redds per Mile SH (1+)	Fish or Redds per Mile Redds	Aquatic Macroinvertebrates Richness	Aquatic Macroinvertebrates Simpson	Aquatic Macroinvertebrates Hilsenhoff	Aquatic Macroinvertebrates Russian R Index	Aquatic Macroinvertebrates % Dominant
602	FLR2	0.04	2006	25.8	22.6																			
602	FLR2	0.04	2009	26.3	20.7																			
602	FLR2	0.04	2013	26.0	21.5																			
674	FLT	0.38	2005	19.5	16.7																			
Flat Ridge Creek			Avg	24.7	20.5	1,173	16		47	1.1%	89		12%	11%	162	92				38		3.2		25
Stream	Franchini Creek																							
667	FRN1	0.19	2005	16.5	14.9															29		4.2		31
667	FRN1	0.19	2006	18.7	16.4	4,627	150		32	3.5%	31		75%	97%										
667	FRN1	0.19	2008	14.9	14.5																			
667	FRN1	0.19	2009	14.2	14.0																			
667	FRN1	0.19	2010	14.2	13.9																			
Franchini Creek			Avg	15.7	14.7	4,627	150		32	3.5%	31		75%	97%						29		4.2		31
Stream	Grasshopper Creek																							
696	GRS1	2.65	2005																	30		3.8		31
696	GRS1	2.65	2006			8,000	190		28	2.2%	24		82%	88%										
696	GRS1	2.65	2009	15.1	14.5																			
Grasshopper Creek			Avg	15.1	14.5	8,000	190		28	2.2%	24		82%	88%						30		3.8		31
Stream	Little Creek																							
666	LiCr	0.09	2012	14.3	13.9																			
Little Creek			Avg	14.3	13.9																			
Stream	North Fork Buckeye Creek																							
702	NFB2	0.02	2005			771	12		40	0.6%	62		96%	82%	447	60				31		3.9		27
702	NFB2	0.02	2008	21.0	18.6																			
702	NFB2	0.02	2009	19.5	17.3																			
North Fork Buckeye Creek			Avg	20.2	17.9	771	12		40	0.6%	62		96%	82%	447	60				31		3.9		27
Stream	Soda Springs Creek																							
671	SSP1	0.08	2005			2,391	102		66	2.2%	68		100%	94%	265	79				34		3.6		21
671	SSP1	0.08	2006	19.7	17.9																			
671	SSP1	0.08	2010	16.5	15.1																			
671	SSP1	0.08	2011	17.4	15.6																			
Soda Springs Creek			Avg	17.9	16.2	2,391	102		66	2.2%	68		100%	94%	265	79				34		3.6		21
Hydrologic Uni	Buckeye		Avg	20.7	18.1	1,797	51		49	1.6%	59		61%	60%	213	81				33	0.14	3.9		27

Hydrologic Unit Wheatfield

Stream	Elk Creek	

Station Number	Name	Miles Up Stream	Year	Temperature Seasonal Maximum	Temperature MWAT	LWD Bank Full >6 In & >4 Ft or >10 CuFt CuFt/ 1000'	LWD Pieces/ 1000'	Substrate >0.85 mm	Substrate D50	Streambed (Thalweg) Slope	VI	A/D	Riparian Zone Canopy % WLPZ	Canopy % Cr.	Basal Area	Tree Ht.	Fish or Redds per Mile Coho	SH (1+)	Redds	Aquatic Macroinvertebrates Richness	Simpson	Hilsenhoff	Russian R Index	% Dominant
706	Elk	0.00	2005	18.4	16.3																			
706	Elk	0.00	2006	21.0	18.4																			
706	Elk	0.00	2009	21.0	17.2																			
Elk Creek			Avg	20.1	17.3																			
Stream	Redwood Creek																							
704	Rdw1	0.38	2005																	30		4.2		25
704	Rdw1	0.38	2006	20.6	19.7	5,442	146		26	6.9%	20		79%	97%										
Redwood Creek			Avg	20.6	19.7	5,442	146		26	6.9%	20		79%	97%						30		4.2		25
Stream	South Fork Fuller Creek																							
663	SFu1	2.65	2005			4,327	59		61	2.1%	24				144	51				32		3.2		26
663	SFu1	2.65	2009	15.2	14.2																			
South Fork Fuller Creek			Avg	15.2	14.2	4,327	59		61	2.1%	24				144	51				32		3.2		26
Stream	Tombs Creek																							
656	tomb	0.09	2009	26.0	20.4																			
Tombs Creek			Avg	26.0	20.4																			
Stream	Wheatfield Fork Gualala River																							
707	WFG	0.00	2006	24.4	22.0																			
707	WFG	0.00	2008	26.7	22.8																			
707	WFG	0.00	2009	28.7	23.4																			
708	WFG	0.00	2006	26.3	24.3																			
708	WFG	0.00	2008	22.9	19.4																			
708	WFG	0.00	2009	29.5	23.4																			
708	WFG	0.00	2011	22.5	19.5																			
708	WFG	0.00	2012	29.1	23.2																			
708	WFG	0.00	2013	23.6	20.5																			
651	WFG6	22.73	2005																	24		4.0		20
651	WFG6	22.73	2006	27.0	23.5	10	1		49	0.6%	38		66%	18%										
651	WFG6	22.73	2009	21.8	19.9																			
652	WFG7	23.11	2005																	29		3.7		24
652	WFG7	23.11	2006	27.9	25.8	107	1		22	0.6%	26		87%	63%										
652	WFG7	23.11	2009	25.2	20.9																			
Wheatfield Fork Gualala Riv			Avg	25.8	22.2	59	1		36	0.6%	32		76%	40%						26		3.8		22
Hydrologic Uni	Wheatfield		Avg	24.1	20.8	2,843	53		44	2.4%	27		77%	59%	144	51				29		3.8		24

Station Number Name	Miles Up Stream	Year	Temperature		LWD Bank Full >6 In & >4 Ft or >10 CuFt		Substrate		Streambed (Thalweg)			Riparian Zone				Fish or Redds per Mile			Aquatic Macroinvertebrates				
			Seasonal Maximum	MWAT	CuFt/ 1000'	Pieces/ 1000'	>0.85 mm	D50	Slope	VI	A/D	Canopy % WLPZ	Cr.	Basal Area	Tree Ht.	Coho	SH (1+)	Redds	Richness	Simpson	Hilsenhoff	Russian R Index	% Dominant
		Avg	22.0	19.2	2,133	51		47	1.7%	50		65%	60%	201	76				31	0.14	3.8		27
		Min	14.2	13.9	10	1		15	0.2%	20		12%	11%	76	44				24	0.14	3.0		18
		Max	29.5	25.8	8,000	190		71	6.9%	89		100%	97%	465	96				38	0.14	4.6		39
Old Growth Watersheds (HRSP)			18.5	16.6			21.6%	62											26.2	0.89			
Poor-Normal-Good										>20									26-35	.8-.89	4.6-3.1	12-17	39-15
NCWQCB Target			18.3	16.8			<14%																

Temperature

- Seasonal Maximum – The highest water temperature recorded during the summer.
- Maximum weekly average temperature (MWAT) - The highest average temperature for any seven day rolling average

Large Woody Debris (LWD)

- LWD must be at least 6 inches on the small end and longer than 4 feet.
- Cubic Feet per 1,000 feet – The cubic volume of LWD located between the bankfull lines.
- Pieces per 1,000' – The number of LWD pieces per 1000'

Stream Substrate

- <0.85mm – The percent fines less than 0.85 millimeters in a McNeal sample.
- D50- The pebble size of the median pebble of a 100 pebble sample. Three sample sites on each reach are averaged.

Fish Surveys

- Presence/absence snorkel surveys also estimate fish numbers per mile.
  - Coho – Coho salmon any age.
  - SH (1+) – Steelhead one year old or older.
- Redds - Number of salmon spawning nests found per mile during the season.

Streambed (Thalweg) Survey

- Slope – the slope of the channel
- VI – The variation index is the [(SD of residual depth/bank full depth) *100]. This is a way of quantifying roughness and hence suitability for fish. Greater than 20 is a good indication of recovery.
- A/D – The change in elevation of the channel (aggradation or degradation) relative to the first year of measurement.

Riparian Condition

- Canopy Cover percent as measured with a spherical densiometer. Every 200', canopy percent is measured in the center of the channel. And at bank full and 50' into the riparian zone from bankfull on both sides of the channel. Four measurements are averaged at each point.
- WLPZ (Watercourse and Lake Protection Zone) – The average of all the measurements taken on either side of the channel 50' into the riparial zone.
- Cr. – The average of all the measurements taken in the center of the channel.
- Riparian inventory plots were locate both sides of the channel every 200'
- Basal Area – Is the average basal area in square feet of all the riparian plots
- Tree Ht. – Is the average height of the 100 tallest trees per acre.

Macroinvertebrates

- Richness – Total number of Genuses represented.
- Simpson Diversity Index – Measures the evenness of species diversity
- Hilsenhoff – This is a locally modified Hilsenhoff index. It indicates levels of organic pollution
- Russian River Index – A localized index that combines several standard metrics
- Percent Dominant Taxon – this is a species distribution index

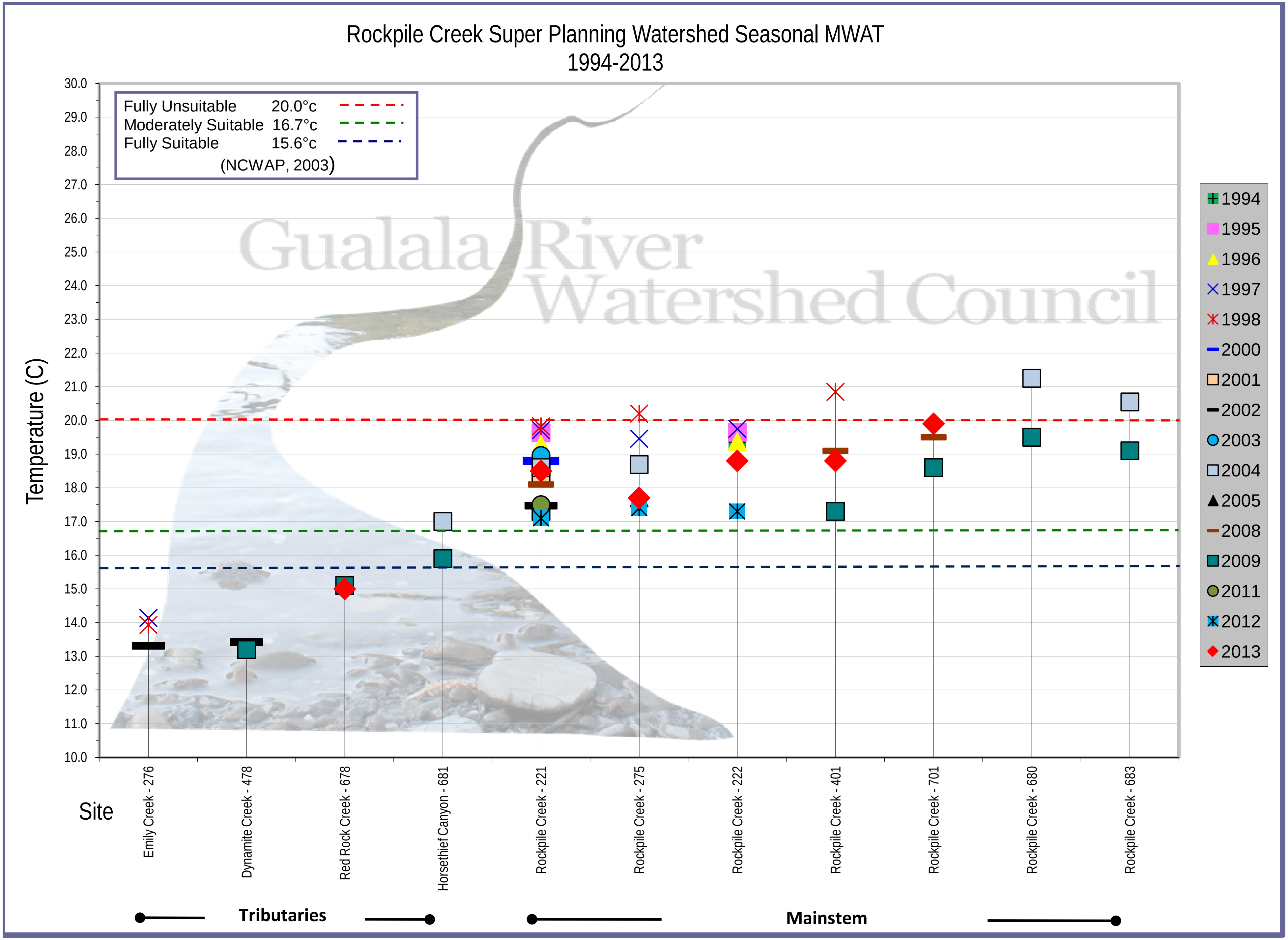
Thalweg Report

Ownerships: Buckeye Forest

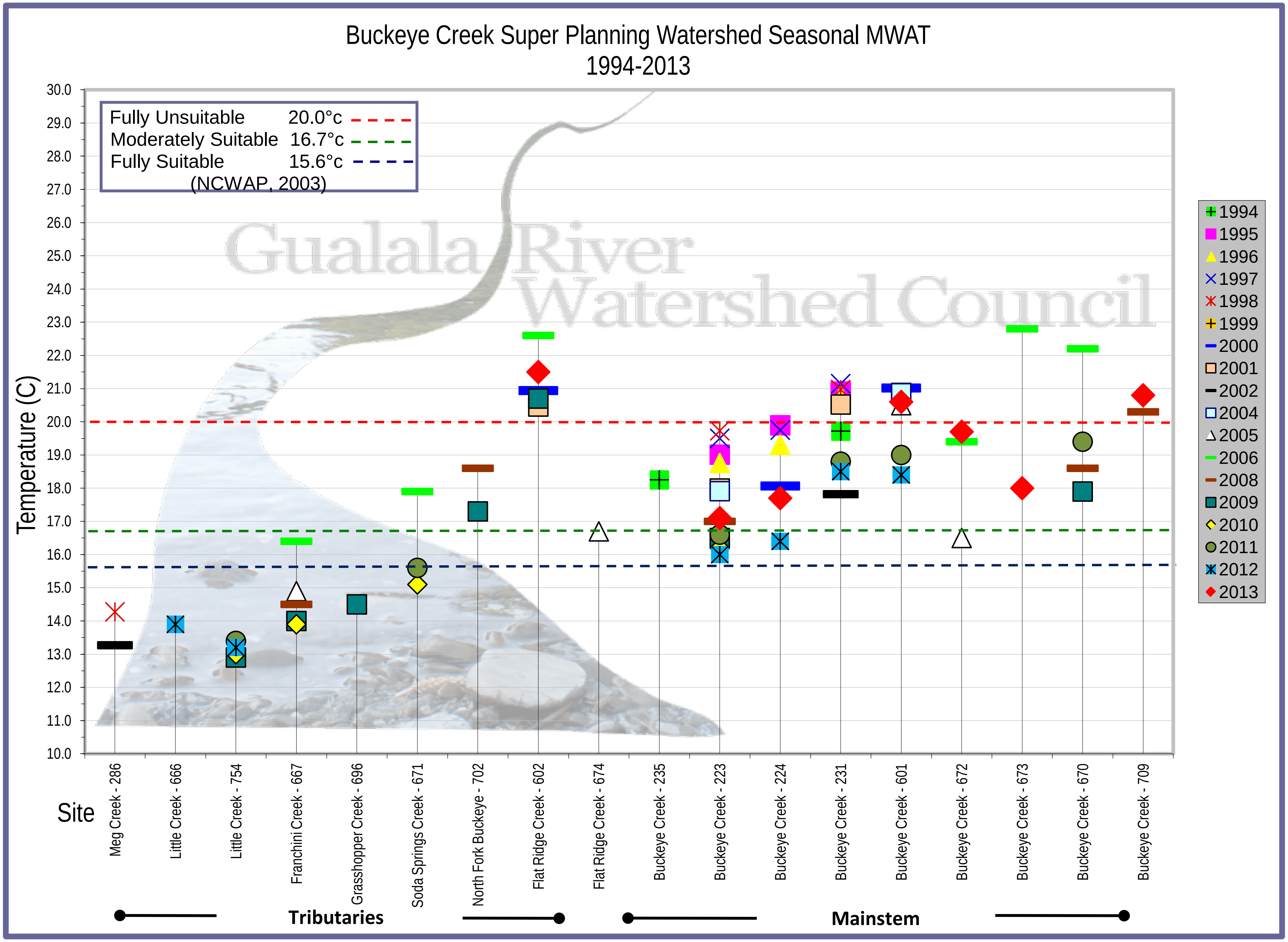
Planning Watersheds: All

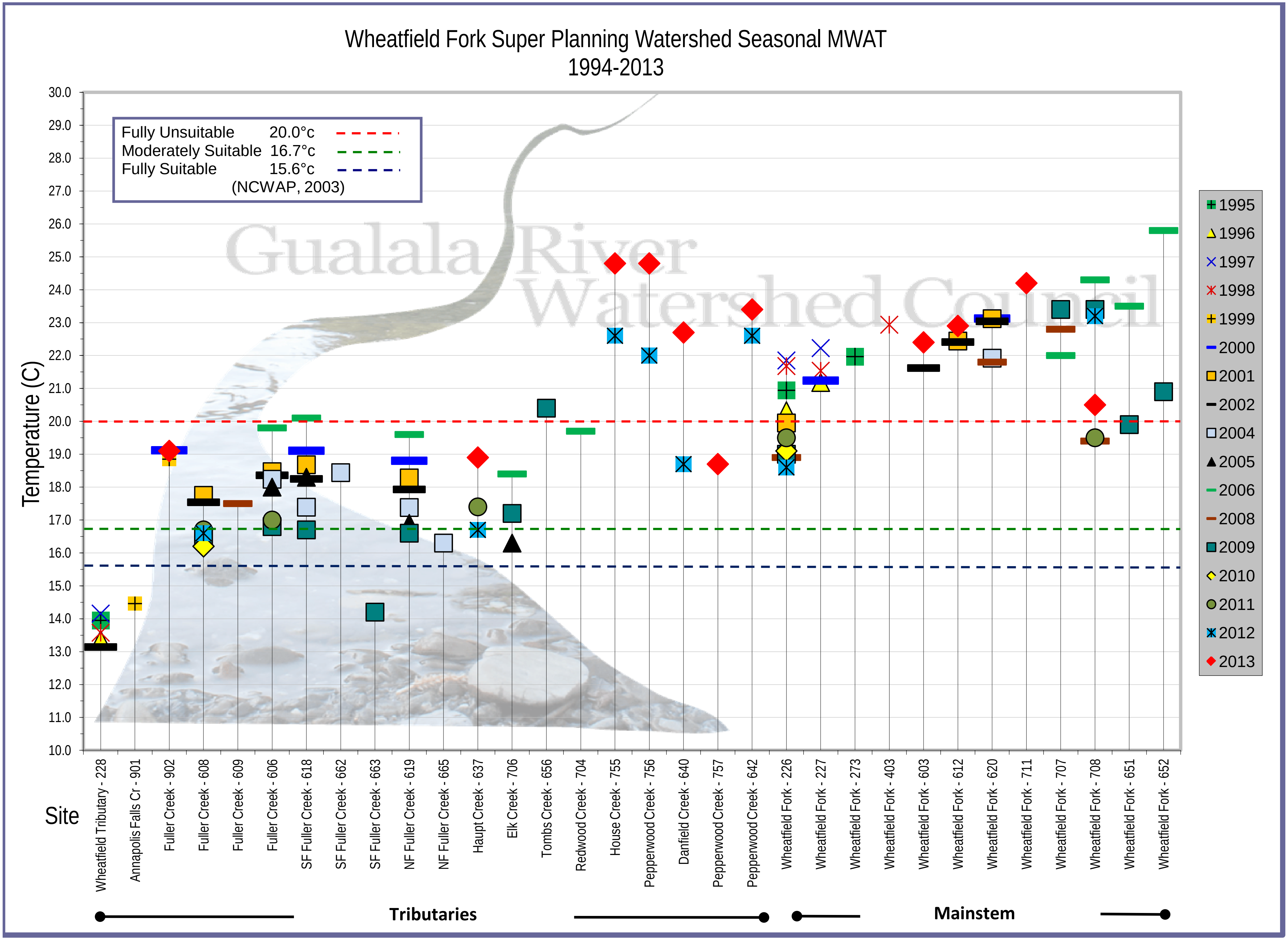
Stream	Station Name	#	Visit ID	Year	Distance up Stream (Feet)	Drainage Area (Acres)	Slope	Streambed Agradation Degradation (Feet)	Variation Index	Pools >1'	%	>2'	%	>3'	%	Max Depth (Feet)	Longitudinal Cross Sectional Area of Pools >1' Deep (Sq Ft/1,000')
Watershed	Buckeye																
Buckeye Cr	Buc4	670	802	2006	59,000	16,331	0.58%		26.0	5	65%	1	27%	0	0%	2.6	504
Buckeye Cr	Buc8	672	695	2005	82,000	1,976	1.49%		68.8	11	51%	4	17%	2	9%	5.2	527
Buckeye Cr	Buc9	673	694	2005	87,000	1,511	1.64%		57.5	8	36%	3	17%	1	4%	3.4	365
Flat Ridge Cr	FLR2	602	692	2005	200	2,810	1.14%		88.6	9	50%	3	20%	1	11%	3.2	371
Franchini Cr	FRN1	667	803	2006	1,000	1,131	3.47%		30.6	14	33%	1	2%	1	2%	3.2	248
Grasshopper	GRS1	696	804	2006	14,000	689	2.22%		23.9	7	22%	2	4%	0	0%	2.4	148
NF Buckeye	NFB2	702	793	2005	100	7,617	0.62%		62.0	5	75%	2	44%	1	32%	3.1	769
Soda Springs	SSP1	671	792	2005	400	970	2.22%		68.3	8	24%	3	8%	1	1%	4.5	213
Watershed	Rockpile																
Rockpile Cr	Roc4	701	807	2006	32,200	18,925	0.24%		52.4	4	73%	3	64%	2	58%	6.2	1,123
Watershed	Wheatfield																
Redwood Cr	Rdw1	704	805	2006	2,000	703	6.90%		19.9	11	24%	1	4%	1	4%	3.5	202
SF Fuller	SFu1	663	776	2005	14,000	1,065	2.05%		24.3	9	36%	0	0%	0	0%	1.5	216
Wheatfield	WFG6	651	809	2006	120,000	16,864	0.63%		38.2	4	63%	3	58%	1	31%	3.8	746
Wheatfield	WFG7	652	808	2006	122,000	10,620	0.55%		26.4	4	66%	2	41%	0	0%	2.2	500

Total Station Visits: 13



Rockpile Creek Super Planning Watershed Seasonal MWAT
1994-2013
Fully Unsuitable 20.0°c
Moderately Suitable 16.7°c
Fully Suitable 15.6°c
(NCWAP, 2003)
Gualala River Watershed Council
Temperature (C)
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
1994
1995
1996
1997
1998
2000
2001
2002
2003
2004
2005
2008
2009
2011
2012
2013
Site
Emily Creek - 276
Dynamite Creek - 478
Red Rock Creek - 678
Horsethief Canyon - 681
Rockpile Creek - 221
Rockpile Creek - 275
Rockpile Creek - 222
Rockpile Creek - 401
Rockpile Creek - 701
Rockpile Creek - 680
Rockpile Creek - 683
Tributaries
Mainstem


Buckeye Creek Super Planning Watershed Seasonal MWAT
1994-2013
Fully Unsuitable 20.0°c
Moderately Suitable 16.7°c
Fully Suitable 15.6°c
(NCWAP, 2003)
Gualala River Watershed Council
Temperature (C)
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
Site
Meg Creek - 286
Little Creek - 666
Little Creek - 754
Franchini Creek - 667
Grasshopper Creek - 696
Soda Springs Creek - 671
North Fork Buckeye - 702
Flat Ridge Creek - 602
Flat Ridge Creek - 674
Buckeye Creek - 235
Buckeye Creek - 223
Buckeye Creek - 224
Buckeye Creek - 231
Buckeye Creek - 601
Buckeye Creek - 672
Buckeye Creek - 673
Buckeye Creek - 670
Buckeye Creek - 709
Tributaries
Mainstem
1994
1995
1996
1997
1998
1999
2000
2001
2002
2004
2005
2006
2008
2009
2010
2011
2012
2013



Wheatfield Fork Super Planning Watershed Seasonal MWAT
1994-2013
Fully Unsuitable 20.0°c
Moderately Suitable 16.7°c
Fully Suitable 15.6°c
(NCWAP, 2003)
Gualala River Watershed Council
Temperature (C)
30.0
29.0
28.0
27.0
26.0
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
13.0
12.0
11.0
10.0
Site
Wheatfield Tributary - 228
Annapolis Falls Cr - 901
Fuller Creek - 902
Fuller Creek - 608
Fuller Creek - 609
Fuller Creek - 606
SF Fuller Creek - 618
SF Fuller Creek - 662
SF Fuller Creek - 663
NF Fuller Creek - 619
NF Fuller Creek - 665
Haupt Creek - 637
Elk Creek - 706
Tombs Creek - 656
Redwood Creek - 704
House Creek - 755
Pepperwood Creek - 756
Danfield Creek - 640
Pepperwood Creek - 757
Pepperwood Creek - 642
Wheatfield Fork - 226
Wheatfield Fork - 227
Wheatfield Fork - 273
Wheatfield Fork - 403
Wheatfield Fork - 603
Wheatfield Fork - 612
Wheatfield Fork - 620
Wheatfield Fork - 711
Wheatfield Fork - 707
Wheatfield Fork - 708
Wheatfield Fork - 651
Wheatfield Fork - 652
1995
1996
1997
1998
1999
2000
2001
2002
2004
2005
2006
2008
2009
2010
2011
2012
2013
Tributaries
Mainstem

APPENDIX E

APPENDIX E: BUCKEYE FOREST MODELING BASED ON THE 2013 STAND INVENTORY

The following tables and figures were modeled using the Forest Planning and Projection System (FPS) software using data collected in the fall and winter of 2013. The modeling results presented describing acres of silvicultural methods and volume harvested demonstrate that TCF's general approach to achieved sustained yield is valid; they are not, however, presented as a concrete plan of action. TCF foresees the need to deviate from planned silviculture and volume harvested from time to time to account for site specific conditions and inherent stand variability.

Forest-wide Growth and Yield Tables

	Buckeye All Acres MBF Totals						Buckeye Unconstrained MBF Totals					
Period	**Pre-Harvest Standing**	**Harvested**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**	**Pre-Harvest Standing**	**Harvest**	**Post-Harvest Standing**	**Growth**	**Growth / Year**	**Harvest as a % of Growth**
2013	136,533	0	NA	NA	NA	NA	116,379	0	NA	NA	NA	NA
2016-2020	165,259	9,236	197,747	41,724	8,345	**22%**	140,225	8,000	167,843	35,618	7,124	**22%**
2021-2025	197,747	9,998	233,483	45,734	9,147	**22%**	167,843	9,998	196,900	39,055	7,811	**26%**
2026-2030	233,483	12,004	272,333	50,853	10,171	**24%**	196,900	12,004	228,115	43,219	8,644	**28%**
2031-2035	272,333	17,472	310,960	56,099	11,220	**31%**	228,115	13,996	262,001	47,883	9,577	**29%**
2036-2040	310,960	15,084	361,846	65,970	13,194	**23%**	262,001	14,997	303,778	56,773	11,355	**26%**
2041-2045	361,846	16,118	419,496	73,768	14,754	**22%**	303,778	16,008	351,019	63,250	12,650	**25%**
2046-2050	419,496	17,062	475,836	73,403	14,681	**23%**	351,019	16,997	396,753	62,731	12,546	**27%**
2051-2055	475,836	24,554	523,206	71,925	14,385	**34%**	396,753	17,989	440,852	62,087	12,417	**29%**
2056-2060	523,206	19,037	575,853	71,684	14,337	**27%**	440,852	18,986	484,171	62,305	12,461	**30%**
2061-2065	575,853	20,182	628,314	72,643	14,529	**28%**	484,171	19,997	527,140	62,966	12,593	**32%**
2066-2070	628,314	22,026	678,792	72,504	14,501	**30%**	527,140	21,998	567,825	62,683	12,537	**35%**
2071-2075	678,792	24,799	725,958	71,964	14,393	**34%**	567,825	22,999	607,052	62,226	12,445	**37%**
2076-2080	725,958	24,040	773,405	71,488	14,298	**34%**	607,052	23,999	644,864	61,811	12,362	**39%**
2081-2085	773,405	26,079	818,582	71,256	14,251	**37%**	644,864	25,991	680,342	61,470	12,294	**42%**
2086-2090	818,582	27,994	861,394	70,806	14,161	**40%**	680,342	27,994	713,263	60,915	12,183	**46%**
2091-2095	861,394	30,759	900,585	69,949	13,990	**44%**	713,263	29,997	743,398	60,131	12,026	**50%**
2096-2100	900,585	32,251	937,248	68,914	13,783	**47%**	743,398	31,974	770,560	59,137	11,827	**54%**
2101-2105	937,248	34,073	970,841	67,666	13,533	**50%**	770,560	33,992	794,404	57,836	11,567	**59%**
2106-2110	970,841	36,042	1,001,140	66,341	13,268	**54%**	794,404	36,000	814,916	56,511	11,302	**64%**
2111-2115	1,001,140	39,522	1,026,827	65,209	13,042	**61%**	814,916	38,965	831,405	55,454	11,091	**70%**

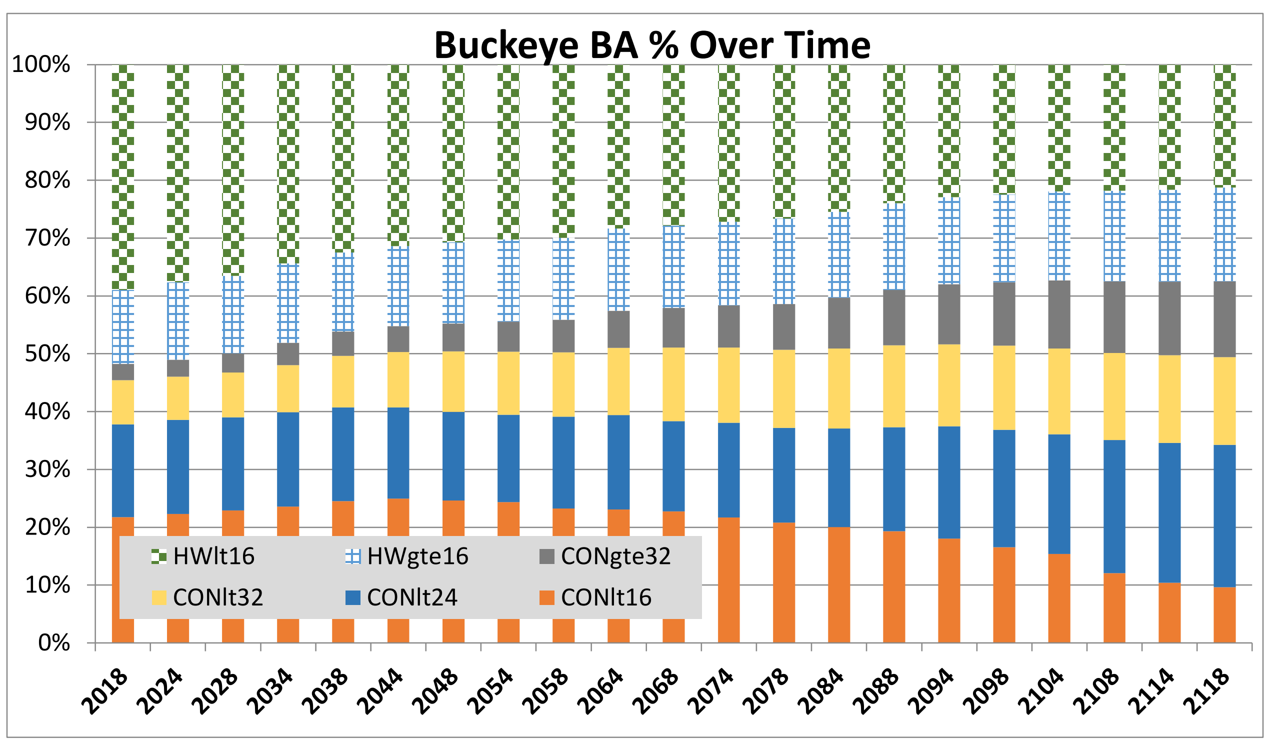
Note: There is an initial 1.5 MMBF total harvest constraint in the first period and this is slowly raised over time. Some other critical starting variables are:

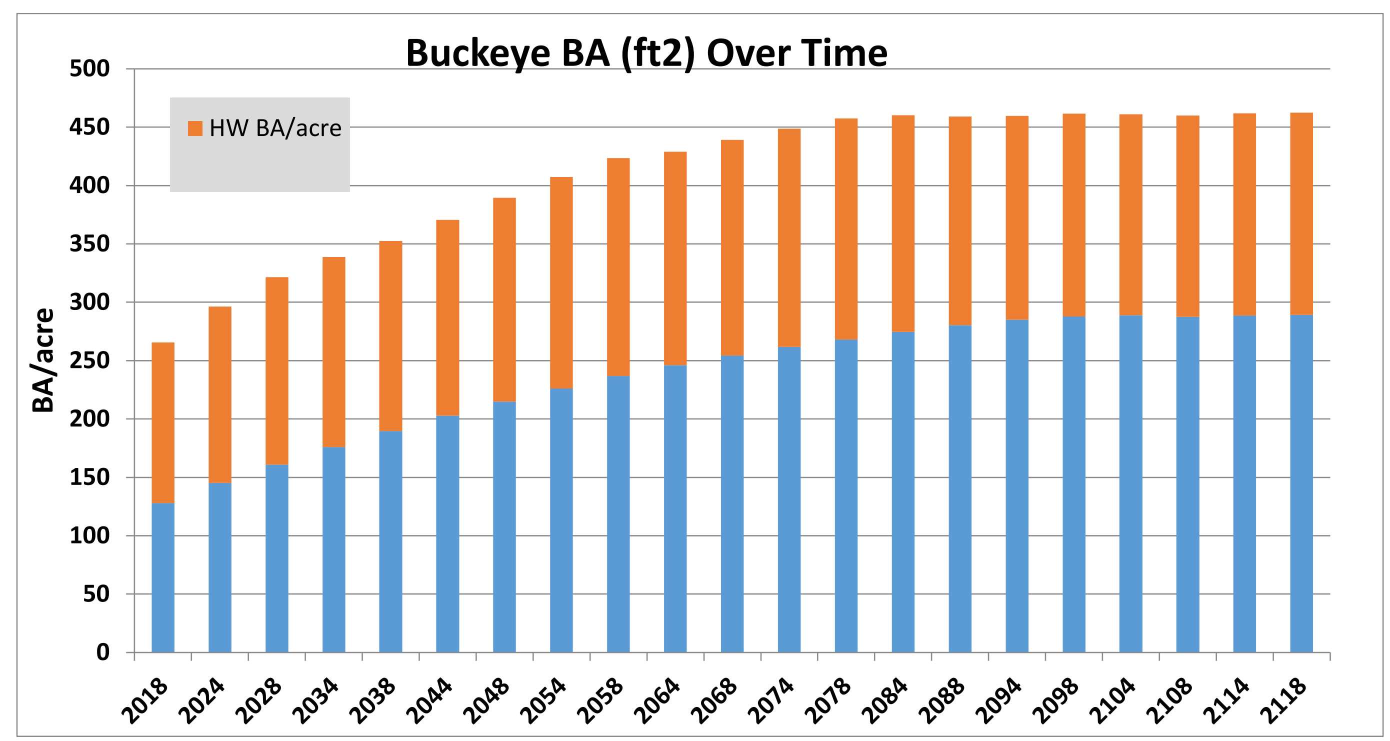
1) percent BA to Cut = 1/3
2) max Percent BF to Remove = 40%
3) min DBH for BA = 4”
4) target BA for good stands = 250, for poor stands = 200
5)min DBH to Cut = 12"
6) grown forward to 2016
7) 113 BA required for selection; 100 BA for transition

Percent Basal Area

Class	2018	2024	2028	2034	2038	2044	2048	2054	2058	2064	2068	2074	2078	2084	2088	2094	2098	2104	2108	2114	2118
CONgte32	86000.34	100774.9	123327	152034.7	170152.2	191892.6	215658.5	246744.7	277978.5	316294.5	350761.2	378909.8	419470.7	468303.4	509765	553938	586155.7	628988	658058.9	680631.2	702658.7
CONlt16	668433.2	765787.2	852358.9	924112.9	1000409	1071616	1110961	1148745	1139869	1147354	1157671	1128359	1103941	1068655	1026725	960726	886222.5	822648	643240.3	555813.2	514700.8
CONlt24	493627.1	558373.4	600252.1	640860.5	661587.8	676368.4	691994	711557.9	779555.7	809667.6	792274.5	851055.9	868128.3	906151.8	956999.9	1032627	1084591	1104931	1224412	1293396	1319499
CONlt32	235770.9	256244.6	288575	319571.2	365099.4	410349.9	471398.9	513384.6	545632.6	578206.6	646670	674929	714837.7	737838.9	753315.9	755603.1	777726.5	789604.6	803417.5	812752.6	812466
HWgte16	393252.1	458538.6	499471.6	536619	558661.7	594933.2	634799	670717.1	694648.5	708356.9	722925.7	751140.3	781877.1	791668.6	795648.4	801369	812010.4	821296.4	835872.6	850063.1	865866.3
HWlt16	1199132	1293096	1359737	1349425	1327215	1347411	1386724	1425750	1468474	1407468	1416015	1412793	1412159	1357975	1276523	1220259	1201467	1171970	1161169	1158516	1139812
Conifer Total	1483832	1681180	1864513	2036579	2197249	2350227	2490013	2620432	2743035	2851523	2947377	3033253	3106378	3180949	3246806	3302894	3334695	3346171	3329129	3342593	3349324
HW Total	1592384	1751634	1859209	1886044	1885877	1942344	2021523	2096467	2163122	2115825	2138941	2163934	2194036	2149644	2072171	2021628	2013477	1993267	1997042	2008579	2005678
Conifer BA/acre	128.0946	145.1311	160.9576	175.8116	189.6817	202.8878	214.9551	226.2138	236.7978	246.1632	254.4379	261.8514	268.164	274.6015	280.2867	285.1286	287.874	288.8646	287.3934	288.5558	289.1368
HW BA/acre	137.4656	151.2132	160.4998	162.8164	162.8019	167.6766	174.5119	180.9816	186.7357	182.6526	184.6482	186.8057	189.4043	185.5721	178.8841	174.5209	173.8173	172.0726	172.3985	173.3944	173.144

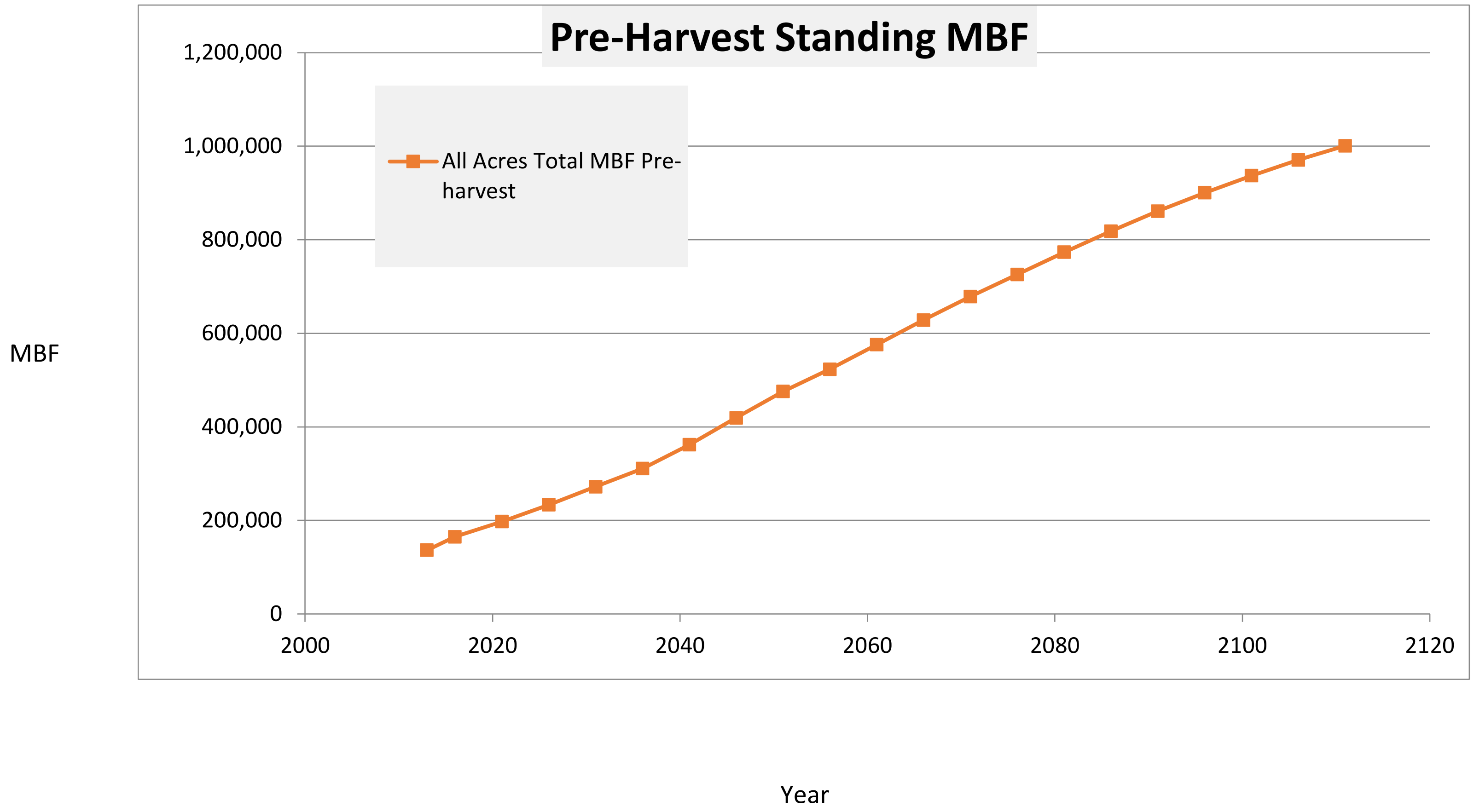
CONgte32 = conifer greater than or equal to 32” dbh
CONlt16 = conifer less than 16” dbh
CONlt24 = conifer less than 24” dbh
CONlt32 = conifer less than 32” dbh
HWgte16 = hardwood greater than or equal to 16” dbh
HWlt16 = hardwood less than 16” dbh





Forest-wide Harvested Acres by Year

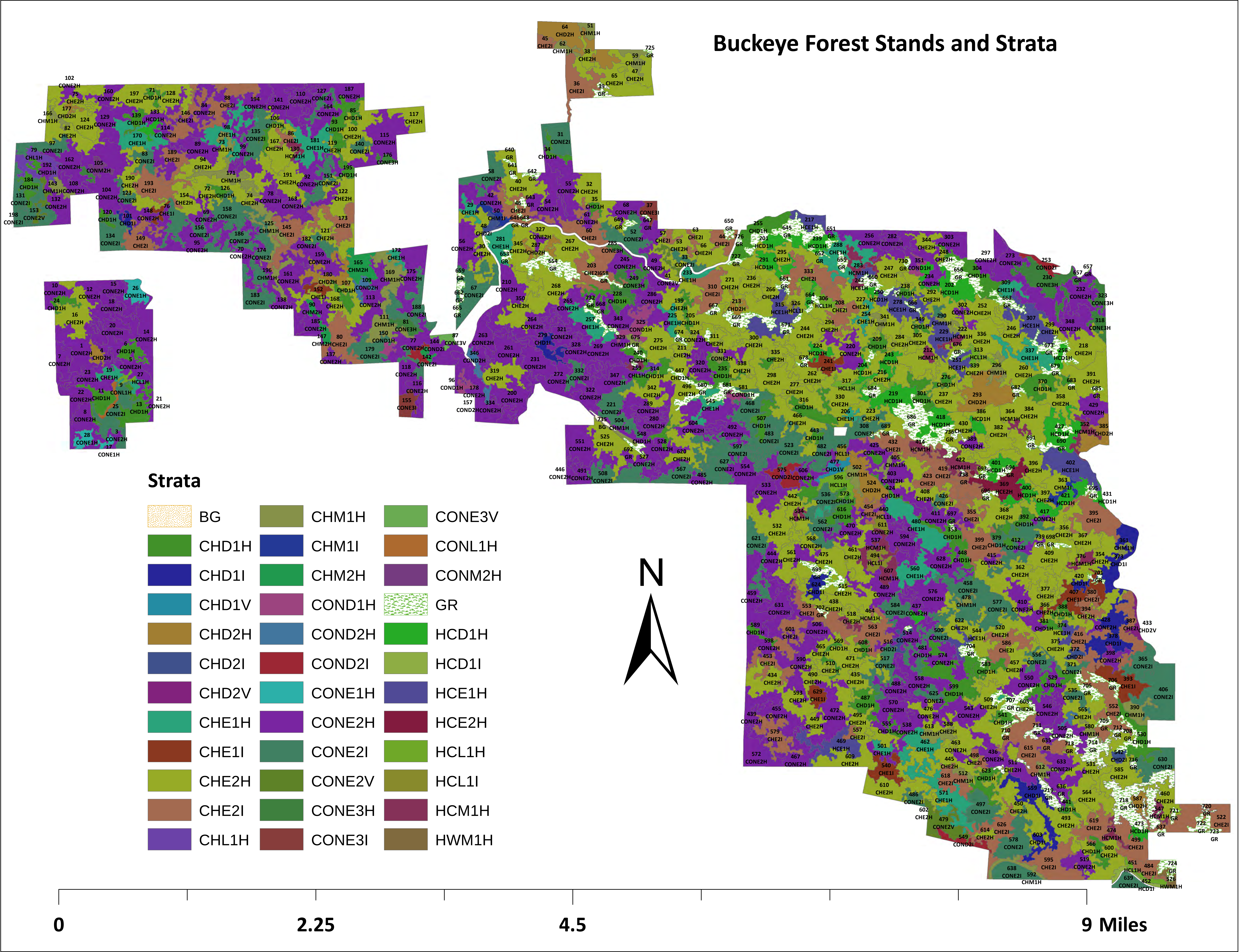
Period	Buckeye MBF/acre Results: Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres	Harvest/Year (All Acres)	Harvest/Year (Unconstrained Acres)
2013	7.6	7.6	NA	NA	NA	NA	0	0
2016-2020	9.2	9.2	4.8	5.8	12.9	11.0	1,847	1,600
2021-2025	11.0	11.0	6.7	6.7	15.2	12.9	2,000	2,000
2026-2030	13.0	12.9	7.5	7.5	17.8	14.9	2,401	2,401
2031-2035	15.1	14.9	5.8	9.2	20.3	17.1	3,494	2,799
2036-2040	17.3	17.1	8.6	8.7	23.6	19.8	3,017	2,999
2041-2045	20.1	19.8	9.9	10.1	27.4	22.9	3,224	3,202
2046-2050	23.3	22.9	10.3	10.5	31.1	25.9	3,412	3,399
2051-2055	26.5	25.9	8.0	11.8	34.2	28.8	4,911	3,598
2056-2060	29.1	28.8	11.8	11.9	37.6	31.6	3,807	3,797
2061-2065	32.0	31.6	11.9	12.2	41.0	34.4	4,036	3,999
2066-2070	34.9	34.4	12.3	12.4	44.3	37.1	4,405	4,400
2071-2075	37.7	37.1	7.5	13.1	47.4	39.6	4,960	4,600
2076-2080	40.4	39.6	16.4	16.6	50.5	42.1	4,808	4,800
2081-2085	43.0	42.1	17.3	18.5	53.4	44.4	5,216	5,198
2086-2090	45.5	44.4	18.3	18.3	56.2	46.6	5,599	5,599
2091-2095	47.9	46.6	8.9	15.5	58.8	48.5	6,152	5,999
2096-2100	50.1	48.5	15.3	15.5	61.2	50.3	6,450	6,395
2101-2105	52.1	50.3	14.3	15.0	63.4	51.9	6,815	6,798
2106-2110	54.0	51.9	18.7	18.8	65.4	53.2	7,208	7,200
2111-2115	55.7	53.2	12.7	25.0	67.0	54.3	7,904	7,793



Pre-Harvest Standing MBF
All Acres Total MBF Pre-harvest
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2000
2020
2040
2060
2080
2100
2120
MBF
Year

	Buckeye Silvicultural Acres by Period									
Year	**WLPZ1**	**WLPZ2**	**standard**	**transition**	**VR40**	**VR60**	**CommThin**	**ConRelease**	**Rehab**	**Sum**
2016-2020	10	533	1,274	63	46	0	0	0	0	**1,926**
2021-2025	0	0	1,490	4	8	0	0	0	0	**1,501**
2026-2030	0	0	1,589	0	1	0	0	0	0	**1,590**
2031-2035	353	1,127	1,445	0	28	44	0	0	0	**2,997**
2036-2040	22	22	1,529	160	28	0	0	0	0	**1,761**
2041-2045	29	16	1,589	0	0	0	0	0	0	**1,634**
2046-2050	9	15	1,626	0	0	0	0	0	0	**1,650**
2051-2055	383	1,152	1,523	0	0	0	0	0	0	**3,059**
2056-2060	6	11	1,596	0	0	0	0	0	0	**1,613**
2061-2065	35	30	1,637	0	0	0	0	0	0	**1,702**
2066-2070	0	9	1,780	0	0	0	0	0	0	**1,789**
2071-2075	401	1,153	1,756	0	0	0	0	0	0	**3,310**
2076-2080	3	11	1,450	0	0	0	0	0	0	**1,465**
2081-2085	56	48	1,404	0	0	0	0	0	0	**1,508**
2086-2090	0	0	1,533	0	0	0	0	0	0	**1,533**
2091-2095	424	1,119	1,931	0	0	0	0	0	0	**3,474**
2096-2100	0	45	2,065	0	0	0	0	0	0	**2,111**
2101-2105	63	54	2,272	0	0	0	0	0	0	**2,389**
2106-2110	0	8	1,919	0	0	0	0	0	0	**1,928**
2111-2115	435	1,128	1,556	0	0	0	0	0	0	**3,118**

WLPZ1 = prescription of around Class I and Large Class II stream courses
WLPZ2 = prescription around standard Class II stream courses
Standard = single tree selection
VR40 = 40 acre variable retention
VR60 = 60 acre variable retention
CommThin = commercial thinning
ConRelease = conifer release


Buckeye Forest Stands and Strata
Strata
BG
CHD1H
CHD1I
CHD1V
CHD2H
CHD2I
CHD2V
CHE1H
CHE1I
CHE2H
CHE2I
CHL1H
CHM1H
CHM1I
CHM2H
COND1H
COND2H
COND2I
CONE1H
CONE2H
CONE2I
CONE2V
CONE3H
CONE3I
CONE3V
CONL1H
CONM2H
GR
HCD1H
HCD1I
HCE1H
HCE2H
HCL1H
HCL1I
HCM1H
HWM1H
N
0
2.25
4.5
9 Miles

Guide to Strata Codes

Category	Class Names	Class Breaks
Percent Conifer Canopy Cover	CON: more than 75% Conifer Crown Cover CH: between 50% and 75% Conifer Crown Cover CH: between 25% and 50% Conifer Crown Cover HW: less than 25% Conifer Crown Cover	25% conifer crown cover bins. The LiDAR-derived crown segmentation was assigned a conifer or hardwood call based on the crown shape.
Percent Canopy Cover ofer 25ft	O (Open): less than or equal to 20% cover L (Low): between 20% and 40% cover M (Medium): between 40% and 60% cover D (Dense): between 60% and 80% cover E (Extremely Dense): over 80% cover	20% canopy cover bins where % cover is defined as the cover of crown elements above 25ft tall.
Mean Tree Height	1, 2, 3, 4, 5, 6, 7	25ft height bins of mean tree height
Tree Height Variablility (Coefficient of Variation of Tree Height)	H (Homogeneous) I (Intermediate) V (Variable)	Homogeneous stands are any stand with CV < .23, Intermediate: .2 3 <= CV < .33, and Variable: CV >= .34

APPENDIX D

THE CONSERVATION FUND

North Coast Forest Conservation Program Policy Digest
Original version August 2010; this version September 2014

TABLE OF CONTENTS

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

Introduction

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

Program Background

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

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

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

Property-specific Background

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

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

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

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

<u>Program Goals</u>

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

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

Unified Management

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

Policies

Existing stand alone policy documents (attached):
TCF Forest Management Policies, revised September 2012
Road Management Policies, revised September 2012
Commitment to Safety and Health, revised September 2012
HCVF RSA Program Memo, revised September 2012
Social Benefit/Impact Assessment, revised September 2012
Certified Product Chain-of-Custody Program, revised September 2012
Herbicide Application and Hardwood Management Policy, revised September 2012

Policies on the following topics are detailed within the respective IRMPs:
Ecological Reserve Network (GRF IRMP, pgs. 41-50)
Aquatic habitat restoration (GRF pgs. 51-66; 259-274; BR/SC pgs. 63-64, 108-192,; GuRF pgs. 61-63; BF pgs. 71-74)
Invasive species management (GRF pgs. 66-68; BR/SC pg. 67; GuRF pgs. 64; BF pgs 75-76.; see also July 15, 2010 Draft "Invasive Plant Management Plan for the Salmon Creek Forest")
Water Quality (GRF pgs. 69-73; 110-117; 145-166; 254-257; 259-274; BR/SC pgs. 29-37; 58-64; 108-192; GuRF pgs. 26-41; BF pgs. 26-51)
Community Use and Involvement (GRF pgs. 105-108; BR/SC pgs. 80-84; GuRF pgs. 3,67-68; BF pgs.78-79)
Monitoring (GRF pgs. 110-117; BR/SC pgs. 77-79; 258-265, 274; GuRF pgs. 50, 55, 61, 64, 68; BF pgs. 60, 65, 71, 76, 79)

FSC/SFI Standards:
In addition, FSC and SFI Standards are available at:
http://www.fscus.org/images/documents/standards/FSC-US%20Forest%20Management%20Standard%20v1.0.pdf and
http://www.sfiprogram.org/files/pdf/sfi_requirements_2010-2014.pdf

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

Contents

I. Program Overview

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

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

This recommendation is based on two key findings:

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

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

[2] Id. at page 131.

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

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

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

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

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

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

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

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

II. Policy Introduction

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

III. Forest Management General Strategy

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

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

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

IV. Critical Landscape Features

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

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

V. Harvest Levels

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

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

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

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

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

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

VI. Silvicultural Objectives

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

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

This silvicultural strategy is also aligned with what we understand about historical disturbance patterns and evolutionary forces in the redwood region. To generalize from many years of complementary academic research, including the Proceedings from the past two Redwood Forest Science Symposiums, it is safe to say the pre-European settlement conditions were very different than the processes of today. Most forests were quite old, in the 500-2000 years in the canopy, with a modest amount of tanoak (10-15% of basal area), with occasional small (under 1000 acre) patches of younger and brushier forest, and relatively limited bareground or early seral stage conditions (caused by flooding, landslides or extreme fires). Fires were frequent (10-20 year recurrence) and low intensity, likely driven by Native American burning as much as lightning strikes. Individual tree mortality was limited, mostly due to self-thinning (competition-induced) and occasional windstorm damage. In general, the redwood forest was fairly stable at large temporal and spatial scales. Our silvicultural practices follow these patterns, emphasizing low-intensity but extensive single-tree selection harvests, similar to what would occur under self-thinning stages of stand development. Our group selection harvests are probably similar in size (1-2 acres) to openings created by landslides, flood scouring or higher intensity fires. Variable retention harvests, especially because we utilize this approach on dryer sites, are probably similar to conditions after a more intense fire. In short, our silviculture should restore and maintain more natural forest conditions and simulate natural disturbance patterns, with the exception that development of true late seral stage characteristics will only occur in the Ecological Reserve, riparian buffers and NSO habitat core areas-- and not across the managed forest.

VII. Silvicultural Decisions

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

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

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

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

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

VIII. THP Operational Realities

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

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

IX. THP Development and Review Process

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

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

Field Consultations are a very important step in our review process because they leverages the combined experience of our foresters and biologists to ensure that only sound and well-planned

THPs that reflect TCF goals and objectives go forward and because it offers an opportunity for everyone to learn from each other, thus helping our program grow efficiently.

X. Retention Requirements

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

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

Downed Wood

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

Actions:

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

Snags and Wildlife Trees

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

Criteria for mandatory retention:

- Snags (all should be retained but only those greater than 18-inch DBH and 20 foot height shall count towards the retention targets);
- Conifers greater than 48-inch DBH;
- Old-growth trees (use MRC definition if in question – see Appendix K [*of Big River/Salmon Creek IRMP*]);
- Raptor nest trees (active or likely to be re-used);
- Any hardwood [*tanoak, true oak, madrone, chinquapin, and alder*] over 20 inches;
- Murrelet habitat trees (use MRC definition if in question – see Appendix K [*of Big River/Salmon Creek IRMP*]);
- Den trees (cavity greater than three inch diameter and greater than ten feet above ground);

- Trees with basal hollows or other significant features (cavities, acorn granaries, significant burn scars, significant or unusual lichen accumulation, signs of deformity, decadence, unusual bark patterns, or other unique structure or features).

Actions:

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

XI. Retention General Guidelines

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

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

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

XI.I. Habitat Retention

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

XII. Hardwoods

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

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

- All true oak (*Quercus* spp.) woodlands are to be preserved [*these occur primarily on GRFand Gualala*].
- All hardwood wildlife trees are to be retained (which includes all hardwoods 20 inches or greater), except where removal is required for safety concerns or necessary for yarding or road corridors.
- Where the post-harvest hardwood basal area would exceed 30 square feet of basal area per acre (averaged across the stand), tanoak shall be controlled through manual falling or girdling or herbicide treatment through direct basal injection ("hack-and-squirt") or stump treatment to provide a post-harvest hardwood basal area of 15 to 30 square feet per acre. This may take more than one entry to achieve.
- Most tanoak reduction will be achieved within a selection or thinning harvest by selective falling (of tanoaks) to release existing conifers. While the tanoak stumps will likely re-sprout, the conifers should have established dominance and will eventually shade-out most of the sprouts. In this type of incremental treatment (selective falling), clumps of hardwoods and individual hardwoods which do not compete with desirable conifers will be left alone. [*This treatment occurred to varying degrees in almost all of THPs prepared to date, the best example of which might be the Jack's Opening THP on GRF.]*
- There are many stands where selective tanoak felling would not be sufficient to meet the desired level of conifer site occupancy. In these situations, a more aggressive treatment will be utilized through an herbicide treatment that kills a majority of the tanoak to release either

existing conifers or seedlings planted shortly before or after the tanoak treatment. Even within these prescriptions, smaller areas of intact hardwoods would be intentionally retained (for biodiversity reasons). Preference for hardwood retention will be given to large trees (greater than 20 inches), true oaks, chinquapins and madrones, and groups of hardwoods. Rehabilitation treatments (including the use of herbicides) are intended to be one-time interventions and should not need to be repeated because of the decreased openings and ground disturbance associated with subsequent harvests. [*An example of this treatment occurred within the Variable Retention units of the Jarvis Camp THP on Big River.*]

- The only herbicide to be used in tanoak control treatments currently is imazapyr (tradename Arsenal). Only licensed and insured contractors with a good track record for safety and compliance may apply herbicides. All herbicide application must be in conformance with label guidelines and applicable laws. Additional herbicides may be considered in the future as they are developed and tested and reviewed with respect to Forest Stewardship Council and Sustainable Forestry Initiative standards.
- Any planned use of herbicide will be clearly identified in the THP and THP summary.
- Reduction in the use of herbicides is an important objective; alternatives to herbicide treatment have been and will continue to be evaluated on a periodic basis. A comparison of herbicide treatment and logging of tanoaks for commercial firewood was evaluated as part of the Jarvis Camp THP. Monumented plots will allow for long-term evaluation of effectiveness but the initial impressions are that the logging method resulted in increased cost and site disturbance (exposed soil and damage to the residual stand). That said, a commercial market for tanoak would be pursued if it develops. Areas with well-established and good quality hardwoods will likely be managed for mature hardwoods instead of attempting to re-establish conifer.
- There will be no tanoak control with herbicides in WLPZs; manual falling or girdling of small tanoak may be used, but only as part of a riparian shade enhancement project (likely with conifer underplanting).
- Priority for rehabilitation treatments will be given to high site, tractor-operable ground, with existing desirable redwood growing stock. Herbicide treatments will be less than 100 acres annually (on a rolling average basis) on Big River. No acreage limitations for herbicide have been adopted for Garcia, Gualala and Buckeye.
- Tanoak control measures will be reviewed periodically and revised as appropriate based on knowledge and experience gained in the field over the next several years. Herbicides will likely also be used to control certain exotic invasive plants, primarily jubata grass and broom. No other uses of herbicides or pesticides are anticipated.
- See also in this Policy Digest “HERBICIDE APPLICATION AND HARDWOOD MANAGEMENT POLICY”

XIII. Pre Commercial Thinning

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

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

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

XIV. Timber Marking Guidelines

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

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

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

Timber marking criteria

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

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

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

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

- Retained trees should be thrifty and of good quality (e.g. minimum 30% crown ratio). Leave best formed trees regardless of diameter and spacing.
- Focus on attaining “target sizes” of 30-36” in redwood and 26-28” in Douglas-fir. This means that you must be very cautious about marking in the 24-28” dbh classes (redwood) and the 22-24” dbh classes (fir), since these will be your “crop trees” at the next entry.
- Assume that 20% of the trees are doing 80% of the growing so it’s not which trees to cut, it’s which trees should be left to grow. Figure out which of the trees are in this 20% grower category, and leave them. (Percentages will vary from stand to stand.)
- Green culls, conk-infected fir, and large rough wolf trees are usually retained for wildlife.
- Trees that have reached ‘crop tree” size should be harvested, along with other suppressed and intermediate trees to capture mortality and improve the growth of the residual stand. Perpetuate the development of a new age class or the growth of existing advance regeneration at each entry by introducing sunlight to the forest floor. Without the new age classes sustainable selection silviculture will not work!
- You can always opt to allow trees to grow larger than crop size; however, when leaving trees 40” dbh +, you must carefully weigh your decision. Are they to be a legacy tree? Remember trees greater than 48” are to be permanently retained and many large trees with large crowns may reduce the growth of seedlings and future crop trees. Suggest no more than 4 large legacy trees per acre in addition to other trees retained for wildlife and snag recruitment.

- Removal of suppressed and intermediate trees with little or no growth potential. Severely suppressed trees (even redwood) do not release significantly (volume wise) or at least should not be counted on to add significant growth. Cutting suppressed trees does not generally benefit growth and timber recovery, but it will significantly increase logging costs. Cut a few with each entry.
- Removal of grand-fir overstory trees to specifically release viable redwood and Douglas-fir understory is appropriate. We will be managing for mixed-species stands but we do need to guard against encouraging grand-fir in the understory - it is shade tolerant and can dominate a redwood forest in the absence of periodic wildfires. Alternatively, grand-fir can be designated for girdling for accelerated snag recruitment (especially in poor market conditions). These treatments are designed to mimic the high natural mortality rate of grand-fir in an unmanaged forest.
- Removal of 25-35% of the stand volume with a re-entry of 10-15 years. In the field, this usually works out to marking perhaps 30-50% of the volume in a redwood clump, and leaving the well-formed trees growing in the open..
- In windy areas, we try to remove less volume and leave some kind of a wind buffer on the windward side of the stand (usually these trees are wind-beat anyway).
- Where only one large tree (e.g. 26"dbh+) occurs in a clump of smaller (12-14" trees), we mark it, especially if it is on the south side of the clump. Cutting one large high-quality tree is preferable to generating the same value by cutting three or four small high-quality trees.
- Spacing improvement becomes more important when we are returning for the 2nd or 3rd time to a stand because the trees are larger and the crowns need room to expand to maintain high growth rates.
- Do not "give up" WLPZ areas and mark them to the extent it is appropriate and consistent with WLPZ Measures in Section XIV, below.
- Mark hardwoods for removal where small redwood or Douglass- fir trees or a sprouting redwood stump will receive more light.
- It is sometimes necessary to have logistics trump silviculture (e.g. we may have to mark the tree that can be physically felled or yarded, even though it may not be the one we really want to cut). This is especially true in WLPZs
- Group selections work in places where there are few if any good trees to leave or where you need to cut volume across a low-to-medium volume stand. Better to lose the growth on 2.5 acres than to over cut 50 acres.
- Likewise, aesthetics may also trump silviculture in given locations (e.g. along county roads).
- Do not become "hung up" on whether you are doing "all age" or "even age" management. If you are truly selecting the best trees to retain for the future and perpetuating the development of the next age class you are probably doing both.

XV. Watercourse and Lake Protection Zone (WLPZ) Measures

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

BR/SC and Gualala WLPZ Protection Measures

[Taken, without editing, from the Big River and Salmon Creek IRMP]

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

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

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

1. Upslope silviculture. Practicing principally uneven-age single-tree selection silviculture to maintain a mature forest across the Forests with minimal openings will reduce the potential hydrologic impacts of even-aged management, which studies at Caspar Creek (http://www.fs.fed.us/psw/topics/water/caspar/) have linked to temporary increases in peak flows, sediment yields, and ambient temperature. Uneven-aged management does, however, require more frequent entries and increased road infrastructure, which is why the next strategy is so important.
2. Increased riparian protection. In addition to standard Watercourse and Lake Protection Zone measures, forest management will include increased canopy retention across all classes of streams.

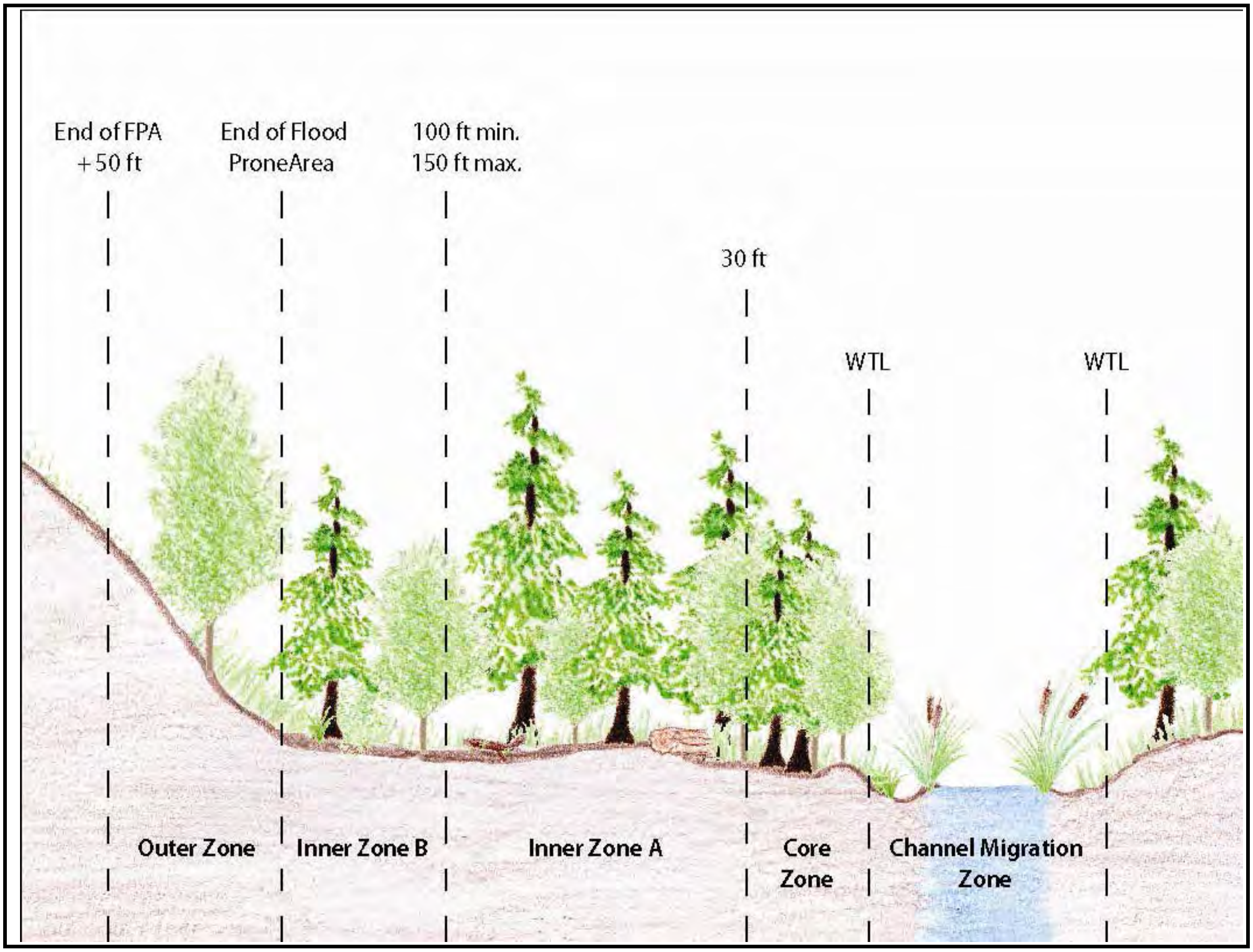
Specific Gualala and Big River/Salmon Creek WLPZ Protection Measures

<u>Class 1 Watercourses:</u>

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

Class II Large:
Core Zone: *30 feet in which no harvest may occur.*

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

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

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

Class III streams: Using the variable width Equipment Limitation Zone (ELZ) defined by the FPR, where there are no overstory retention requirements under the FPR, the Fund will retain at least 50 percent canopy, and a minimum of 25 percent overstory conifer.

[Note: conformance with all canopy requirements will be measured as an average across not less than a 200-foot lineal WLPZ segment—the same as the FPR.]

The Fund believes these three simple measures of increased retention (one per stream class) a) complement the project goals and the process and review requirements of the existing regulations; b) are efficient for foresters to implement in the field; and c) offer higher confidence that aquatic habitat conditions will improve.

In acquisition funding agreements for Big River and Salmon Creek, the Fund committed to management practices that, among other things, “establish riparian buffers that are wider than required under the Forest Practice Rules.” The Fund’s forest management policies meet that requirement by providing greater canopy retention within the WLPZ and increased basal area and canopy retention upslope from the WLPZs. A specific example of the wider buffer is the no-cut buffer along Class I streams which has been expanded from 30 feet to 50 feet from the stream—a significant expansion. Additionally, the predominant silviculture beyond the formal WLPZ buffers will be single-tree selection which substantially extends the effective riparian buffer width.

XVI. Harvesting Operations

One of the key planning aspects for timber harvest operations is choice of yarding method—ground or tractor-based and cable or skyline systems. The yarding method choice for a specific harvest unit should be based on the silvicultural system, and the site-specific topography and access. The two primary yarding methods most commonly employed are tractor yarding and cable skyline yarding. Tractor yarding includes tractors with winches and chokers, tractors equipped with grapples or rubber tired skidders with grapples or winches. Tractor yarding is generally used on gentle terrain up to 55% slope. Tractors may be used on steeper slopes where cable yarding is infeasible due to access problems or on long corners where deflection for skyline logging is inadequate. Cable skyline yarding consists of a running skyline or preferably a standing skyline with a carriage, either system should be capable of elevating the logs above the existing tree canopy. Cable logging is used on steep slopes, generally over 50%, where slopes are long and planer or concave. Cable yarding on convex slopes can result in a ground lead situation which can cause unnecessary damage to residual timber or the logging equipment. The key to successful cable yarding is to ensure that there is adequate deflection in the logging unit to suspend the logs above the ground and tree canopy.

The decision to use cable or tractor logging systems is generally an easy one to make. The coast range is very steep and highly dissected with many drainages which make for easy cable logging settings and the ridge tops are reserved for tractor logging. There is a range of slopes between 50-65% where either method may be judged to be adequate in the eyes of the forester laying out the timber harvest unit. Cable logging may be used on shallow slopes were the logs would otherwise be adverse skidded to a landing above the harvest area and conversely tractors may be employed where there are adequate roads and landings downhill of the harvest area. The decision to use one method over the other in this “gray” area is generally made by using the equipment that is required on the rest of the job for example a shallow slope may be cable logged if the rest of the job is predominately cable logging. Or tractors may be used on steeper slopes if there is so little steep ground that bringing in a cable yarding machine for a few acres is deemed infeasible or uneconomical. Tractor long lining is a common practice where winch lines are pulled down hill and the logs are winched up to the tractor sitting in a stationary position. This technique is generally used when the slopes are very short and do not justify the expense of a cable machine and the tractor itself does not operate on the steep slope. Other methods which are suitable for unevenage management techniques are helicopter or balloon yarding which are used when access is limited or there is no access because of excessive road construction or stream crossings requirements to get road access to a harvest unit.

Yarding method decisions are reviewed by the Senior Forester and are discussed in the field consultations. Yarding method and any unusual access situations are described in THPs and are also included in our more readily-available THP summaries.

XVII. Contractor Selection

TCF will utilize contractors in several roles in the management of these properties—from forestry and wildlife surveys to logging and road maintenance. There are several reasons for this—as a relatively new enterprise TCF is not in a position to take on significant staff obligations and many of the most experienced professionals already have contract businesses set up. Additionally we can not guarantee year-round work in some areas. We will strive to use the highest quality professionals available—from owl calling to bridge repair. At least initially we will put most logging jobs out to bid, although we will select the firm that offers the best combination of price, performance, and experience. Other contracts, such as for road maintenance and security, will likely be negotiated directly with the professionals who have the most experience in the area and want the work. Especially for logging, road, and security contracts, ensuring safe working conditions and selecting contractors with good safety records will be an important concern. Additional forestry project work (e.g. owl surveys, preparing and supervising a THP) will be drawn from the area's experienced consulting biologists and foresters. In those situations we will seek to utilize the consultant as a full team member to solicit their ideas on how to meet our objectives. In all roles we have a strong preference for local expertise because it helps support local communities and the timber-based economy. We are concerned about the relative lack of young professionals in the field and will seek to create opportunities that encourage viable business opportunities for young loggers and technicians. In all our efforts we will strive to pay a good and fair wage, to reward performance, and to encourage professional development.

XVIII Staff Training

The Conservation Fund has taken advantage of the high quality of local contractors and chosen to keep our staff relatively small. TCF recognizes that staff will need training in specific areas, appropriate to their positions. Training will be provided as deemed necessary by a supervisor as the staff person's responsibilities grow, or as requested by the staff person. TCF will train staff to encourage individual strengths. TCF recognizes that the SFI 2010-2014 Standard, Objective 16 and FSC US Forest Management Standard, C4.1b encourages employees to improve their skills in sustainable forestry practices through appropriate training and education sufficient to their roles and responsibilities. Each employee has an annually updated job description outlining individual responsibilities and participates in an annual performance review.

Staff Training Expectations

	Timberlands Manager	Registered Professional Forester	Forestry Technician	Office Manager	Forest Carbon Analyst
Participate in SFI Implementation Committee and other forestry associations	x				
Sustainable forestry principles and SFI & FSC standards	x	x	x	x	x
Best management practices: specific to streamside and road management	x	x	x		
Principles related to	x	x	x		

reforestation, invasive plants and animals, forest resource conservation and aesthetics					
Responsibilities under the US Endangered Species Act, Salmonid Protocol, NSO Protocol and Red Legged Frog Protocol	x	x	x		
Safety precautions	x	x	x	x	x
OSHA regulations	x				
Business Management	x				
Public Outreach	x			x	
Emerging Technologies	x	x	x	x	x
Forest carbon quantification and verification					x
Road engineering	x	x			

XVIV. Forest Certification

The Conservation Fund has committed to seeking dual certification under the Forest Stewardship Council and Sustainable Forestry Initiative programs. All properties are to be managed in compliance with the 2010-2014 SFI Standard, Section 2 and the FSC US Forest Management Standard, v1.0 (available at www.sfiprogram.org and www.fscus.org respectively). The Conservation Fund supports the efforts of the SFI Implementation Committee (SIC) by actively participating in the California SIC meetings and programs and retains records of the SICs submittal of annual data to SFI, Inc. regarding inconsistent practices.

An initial scoping audit was completed on the Garcia River Forest in May 2006. A full audit and annual surveillance audits were successfully competed on the Garcia River, Big River, and Salmon Creek forests in all subsequent years, with a full recertification audit to take place in November 2012 that will include the Gualala River Forest.

XVV. Community Engagement

TCF seeks involvement from the local community at several stages of its activities. A public meeting was held to review the management plan for BR/SC, much like a meeting was held in Point Arena to review the GRF IRMP prior to adoption. Interested parties are invited to participate in a tour of each THP either before or shortly after submission, and again following completion of the operation. In addition, TCF staff is available to respond to questions or concerns raised by the local community. TCF prepares and broadly disseminates an Annual Report that describes major activities on the properties, changes to policies, and monitoring results. Should a dispute arise between TCF and a local citizen, neighbor, partner organization, current or potential contractor, or other interested entity, TCF will first seek to resolve the dispute through open communication, prior to more formal dispute resolution through mediation or litigation. Records of disputes will be made available to the lead certification auditor. In all situations, TCF strives to be a good neighbor and fair employer, and will hold itself to high professional standards in its dealings with the local community, contractors, Native American tribes, public agencies, and all other interested parties.

PROGRAM ON HIGH CONSERVATION VALUE FORESTS, IMPERILED SPECIES, AND REPRESENTATIVE SAMPLE AREAS
The Conservation Fund's North Coast Forest Conservation Program
Primary author: Evan Smith
Original version December, 2008; expanded September 2010, 2011, 2012, 2014

Document background

This program description was prepared to assist the audit team in evaluating compliance with the requirements of the SFI & FSC forest certification systems and to guide the forest planning and monitoring conducted by The Conservation Fund. It builds on an earlier version (12/28/2008) with expanded sections detailing Imperiled Species and Representative Sample Areas. This document references and expands upon the "*Garcia River Forest Integrated Resource Management Plan*," the "*Big River and Salmon Creek Forests Integrated Resource Management Plan*," and "*Conservation Prospects: A review and analysis of existing conservation plans, land use trends and strategies for conservation on the north coast of California*." All three plans are available in the reference documents section of the North Coast Program website-- http://www.conservationfund.org/our-conservation-strategy/focus-areas/forestry/north-coast-conservation-initiative/north-coast-forest-reference-documents/. While some of the material in this summary is duplicative of the management plans it provides additional detail that is of specific interest to FSC/SFI auditors; this is intended to be a stand-alone policy applicable across all properties (and any additional acquisitions in California).

Introduction

The Conservation Fund (TCF) is required to identify areas that because of significant conservation values should have special management practices. This requirement is imposed by TCF's internal forest management planning approach (see Forest Management Policies section IV, Critical Landscape Features) and by the requirements for sustainable forest management certification. For consistency purposes this document will primarily reference language from the Forest Stewardship Council (FSC) US Forest Management Standard, especially Principle 9; we prefer the term "features" over "forest" because many of the highest priority conservation elements are the non-forested features within a forested landscape. This discussion is also linked to Sustainable Forestry Initiative Standard, Section 2, Indicator 4.1.3. The basis for most of this program comes from two important conservation planning exercises, "*Conservation Prospects for the North Coast*" and the Conservation Action Planning assessment in the *"Garcia River Forest Integrated Resource Management Plan,"* described in more detail below.

Conservation Prospects

In August 2005, after two years of research and review, TCF completed "*Conservation Prospects for the North Coast: a review and analysis of existing conservation plans, land use trends, and strategies for conservation on the North Coast of California*." This plan was prepared under a contract for the California State Coastal Conservancy. The principal author of the plan was Jenny Griffin, then a consultant to TCF. "*Conservation Prospects*" systematically identifies the highest conservation values for the region based on a broad set of past conservation plans and develops recommendations for future conservation efforts. The two principal recommendations are to:

- Move quickly to establish "working landscape" conservation management on large, strategically located forest and agricultural properties in resource-rich watersheds in Humboldt, Mendocino and Del Norte counties.

- Focus other fee or easement acquisitions on unique resources that are essential to conserving high-priority coastal resources, such as coastal estuaries, old-growth redwood forest stands, coho salmon refugia, floodplains, and California Coastal Trail segments.

In addition to these general recommendations, the report reviews and catalogs 154 individual conservation plans for the region and provides a detailed spatial synthesis assessment of the seven plans deemed to be the most broadly relevant and instructive. The seven plans were chosen on the basis of data quality, scientific principles, format, and mandate and consist of:

1. *California North Coast Ecoregion Aquatic Conservation Strategy Recommendations,* The Nature Conservancy of California, Fall 2003;
2. *California North Coast Ecoregional Plan,* The Nature Conservancy of California, June 2001;
3. *Completing the California Coastal Trail*, California State Coastal Conservancy, January 2003;
4. *Mendocino County Coastal Conservation Plan*, Mendocino Land Trust, April 2003;
5. *A GIS-Based Model for Assessing Conservation Focal Areas for the Redwood Ecoregion,* Conservation Biology Institute and Save-the-Redwoods League, 1999;
6. *Recovery Strategy for California Coho Salmon*, California Department of Fish and Game, 2004; and
7. *Strategic Plan Update,* Pacific Coast Joint Venture, 2004.

The 13-page chapter of "*Conservation Prospects*" on the Mendocino Coast Hydrologic Unit (which contains all of the TCF properties) draws from 15 local plans in addition to the seven core regional plans. In general, "the Mendocino Coast HU is consistently one of the most highly valued regions of the North Coast" by the conservation plans synthesized. Specific features that are recognized as of high conservation value include pygmy forest, coastal dunes, coastal estuarine wetlands, seabird rookeries, spawning areas for anadromous fish, and old growth forests (note that redwood-Douglas fir and tanoak forests were not identified as high conservation value).

The report was developed over a 24 month period in collaboration with state agencies and conservation groups; 41 organizations or individuals provided technical review for the assessment. The report is frequently cited by newer conservation plans and initiatives on the North Coast.

Garcia River Forest Conservation Action Planning

Occurring nearly simultaneous with the development of "*Conservation Prospects*" was a much more targeted exercise in conservation planning for the Garcia River Forest (GRF) led by The Nature Conservancy and utilizing their "Conservation Action Planning" process (also known as "5-S"). As described in the GRF Integrated Resource Management Plan (Section II, Identification of Conservation Targets and Associated Indicators) this was "designed to help identify conservation targets, develop strategies to protect those targets, take action, measure success, and adapt." Among the numerous features evaluated, five were identified as Conservation Targets: anadromous fish bearing stream, redwood/Douglas-fir forest, oak woodland/grassland, non-riverine wetlands, and Northern spotted owl.

Each conservation target has identified indicators with quantitative monitoring metrics relating to distribution, viability, and quality. For example, the selected indicators for anadromous fish bearing streams include percent fines less than .85mm (spawning sites); percent fines less than 6.5mm (spawning sites); mean weekly average water temperature (Class I streams); mean pool shelter rating (Class I streams); primary pool frequency (Class I streams); riparian canopy cover (Class I streams). Nine additional indicators were identified for further evaluation.

The primary references used in the Conservation Action Planning process were:

- Low, Greg. 2003. *Developing Strategies, Taking Action & Measuring Success. Landscape – Scale Conservation: A Practitioner's Guide*. The Nature Conservancy, Arlington, Virginia.

- The Nature Conservancy. 2005. *Conservation Action Planning Workbook, Version 4b*. The Nature Conservancy. Arlington, Virginia.

The Conservation Action Planning process is the premier tool for conservation and restoration planning within a conservation biology framework. It has been used at thousands of sites across the world.

As part of the GRF Integrated Resource Management Plan (IRMP), the Conservation Action Planning process was led by Mark Reynolds and Jen Carah, ecologists with The Nature Conservancy. The GRF planning team included an additional twelve experts from the fields of forest management, land conservation, and watershed restoration. A well-attended public meeting to solicit comment on the draft plan was held in nearby Point Arena, CA, and numerous additional consultations were provided by recognized experts and the local community. The plan has been approved by the State Coastal Conservancy, the California Department of Fish and Game, and The Nature Conservancy.

Land Acquisition Evaluations

In order to document the conservation values of the property, TCF prepared a Land Acquisition Evaluation prior to commitment of acquisition funding from the state agencies. These documents include detailed descriptions of vegetation types and species occurrences, as well as more general information about physiographic features and local ecology. They are developed in consultation with staff from the California Department of Fish & Wildlife (DFW) and need to be approved by DFW. Land Acquisition Evaluations prepared for each California North Coast forest have formed the basis on ongoing ecological monitoring and planning. Relevant information from the Land Acquisition Evaluations is excerpted below in the sections on specific conservation features.

HCVF definition from the FSC-US Forest Managment Standard (v1.0)

FSC defines High Conservation Value Forests as those that possess one or more of the following High Conservation Values (HCVs):

1. HCV forest areas containing globally, regionally or nationally significant concentrations of biodiversity values (e.g., endemism, endangered species, refugia), including RTE species and their habitats;
2. HCV forest areas containing globally, regionally or nationally significant large landscape level forests, contained within, or containing the management unit, where viable populations of most if not all naturally occurring species exist in natural patterns of distribution and abundance;
3. HCV forest areas that are in or contain rare, threatened or endangered ecosystems;
4. HCV forest areas that provide basic services of nature in critical situations (e.g., watershed protection, erosion control);
5. HCV forest areas fundamental to meeting basic needs of local communities (e.g., subsistence, health); or,
6. HCV forest areas critical to local communities' traditional cultural identity (areas of cultural, ecological, economic or religious significance identified in cooperation with such local communities).

[note: this definition was updated by FSC in 2010, the change in the FSC HCVF definition does not result in changes to the TCF HCVF definition.]

TCF Definition of HCVF

The Garcia River, Big River, Salmon Creek, Buckeye and Gualala River properties were acquired by TCF expressly because of their conservation value. The properties possess significant conservation values, as documented in the Land Acquisition Evaluations prepared for the property, including habitat for numerous endangered species. It could be argued that all of the North Coast should be considered High Conservation Value Forests, but more realistically only the most exceptional and sensitive areas of this exceptional and sensitive landscape should be classified as HCVF. The TCF team used this exercise to identify those elements that deserve more than just recognition and protection as part of a conserved working forest but are truly critical conservation values, <u>significant at a regional level</u>. Based on the analysis done as part of *Conservation Prospects* and the GRF IRMP, TCF has identified the following areas as High Conservation Value Forest features:

a) Oak woodlands and grasslands
b) Pygmy cypress forest
c) Old growth coniferous forest
d) Salmonid spawning streams.

Grasslands and salmonid spawning streams are obviously not "forest," but occur within or on the edge of forests and are recognized as HCVF features because of their critical importance and sensitivity to management practices.

In addition to this list, many additional areas and elements were considered. All portions of the properties have some degree of ecological value—whether it is habitat for the Northern spotted owl or ability to support carbon storage. And all of the properties are used for recreation, public education, and to a limited extent, foraging. And there are many fine-scale elements that have significant conservation value—snags, trails, etc. The above definition is designed to recognize those elements that are <u>regionally-significant</u> and deserve special management attention. The definition also considers the degree of threat—many of the above-listed elements are still vulnerable under current laws and regulations. Public drinking supplies are not present on the property but probably would not be considered as a separate HCVF element because they would likely be correlated with and enveloped by the salmonid spawning area designations and because of the high degree of existing stream and watershed protections under the Forest Practice Rules, Regional Water Quality Control Board requirements, and TCF Forest Management Policies.

<u>TCF Inventory of HCVF</u>

Oak woodlands and grasslands. Oak woodlands and grasslands were mapped on the Garcia River Forest as part of the planning process for the Ecological Reserve Network (ERN). All significant areas (>10 acres) were included in the ERN and are to be managed solely for their ecological value. More fine-scale mapping of the hardwood and grassland community types was completed in 2008 by The Nature Conservancy under a research grant from the USDA Forest Service related to the distribution and control of Sudden Oak Death. This digital imagery-based vegetation mapping has been groundtruthed by TNC staff and represents a significant advancement in the field of plant community mapping. Currently we track 613 acres of Oak Woodland and 369 acres of Grasslands on the Garcia in our GIS—not all Grasslands are natural meadows, a small portion are probably old landings. Big River / Salmon Creek is situated farther west than Garcia and consequently is primarily a coniferous forest with less of these arid forest types. No oak woodlands or grasslands were identified as part of the forest stand typing (using aerial photos) completed by John Nickerson in 2007. Analysis of the Department of Fish & Game California Vegetation database (CalVeg) indicates 6 acres of Canyon Live Oak vegetation type on the Big River tract and 523 acres of Annual Grass/Forbs on Big River and 24 acres on Salmon Creek. CalVeg is notorious for overstating oak and grassland areas because of the difficulty in using remote sensing to differentiate oak from tanoak and early seral forest conditions from native grasslands. Based on initial field review these sites are not true oak woodlands or grasslands, but brushy former clearcuts and landings. Currently we track 0 acres of Oak Woodland and 0 acres of Grasslands on BR/SC in our GIS. Gualala contains 115 acres of Grassland and 91 acres ofOak Woodland. The Buckeye forest has 812 acres of grassland and no designated oak woodland.

Pygmy cypress forest. Salmon Creek contains the only known occurrence (on TCF properties) of this rare natural community type, which are limited to former marine terraces with thin, nutrient-poor, acidic soils underlain by a hardpan. According to CalVeg, there should be 122 acres of pygmy forest on Salmon Creek but the entire area was assessed as part of the field work for the Lower Salmon Creek THP and amendment and only stands 57718 and 57719 (reported as 11 gross acres, but 3 acres of roads/landings) were identified as having pygmy cypress forest characteristics. This community type does not usually grade into commercial forest types; typically there is a fairly sharp demarcation, but field staff are knowledgeable of the characteristics of pygmy forest and will readily observe any additional stands if they are present. If field surveys reveal additional pygmy forest areas, they will be added to this inventory. Currently we track 8 acres of Pygmy Cypress Forest in our GIS, a single location on Salmon Creek near the Iron Gate access point.

Old growth coniferous forest. Unfortunately, due to the extensive logging of coastal Mendocino County, there are no old growth stands on the property. Old growth stands are defined as having the majority of the canopy in trees established prior to 1800—even if harvest or other disturbance has occurred within the stand. Individual old growth trees do occur on these properties—although to a very limited extent. They usually result from the release in the early to mid-1900s of suppressed trees when the old growth overstory was removed. They are not mapped but are fully protected under the wildlife tree retention requirements (see TCF Forest Management Policies). Currently we track 0 acres of Old Growth in our GIS.

Salmonid spawning streams. While there is excellent mapping of fish-bearing streams (Class 1 watercourses) and there is decent understanding of salmonid distribution within these watersheds, there has not been a detailed assessment of individual spawning areas. Precise location of spawning areas is not critical to the HCVF policies but will likely be the subject of future monitoring. Surveys by Department of Fish & Game, The Nature Conservancy, and North Coast Regional Water Quality Control Board have indicated coho presence in North Fork, Signal, Blue Waterhole, and Inman creeks on the Garcia River Forest (as well as the mainstem), whereas steelhead are widely documented (assume they are using just about every Class 1 stream on our properties). On Big River, coho are documented in the mainstem, Two Log, North Fork and Laguna Creek. Coho are documented along most of the length of Salmon Creek and Hazel Creek. On the Gualala River, coho are documented on the North Fork Gualala River and Dry Creek. The Buckeye Forest Baseline Report states that coho salmon have been identified on the property but does not name specific streams. Currently we use our GIS to track the number of miles of Class I stream (36 on Garcia, 24.5 on Big River, 10 on Salmon Creek, 16 on Gualala and 29 on the Buckeye Forest.); this approach slightly overstates the amount of actual salmonid spawning streams, because some portions of Class I streams are above fish passage barriers, but is the best information currently available. The most significant barrier is a waterfall and logjam in the upper North Fork of Garcia; other anthropogenic barriers (usually culverts, but a couple of log jams as well) are being inventoried and repaired as they are discovered.

<u>TCF Protection Measures for HCVF</u>

General measures. The most significant threats to any HCVF element would be residential development, forest fragmentation, vineyard conversion or grazing—all have been prohibited by TCF's acquisition and the permanent conservation restrictions on the properties. This limits the number of potential threats to the much smaller subset of forest management, road building and/or maintenance, recreation, trespass and neglect. Appropriate protection measures for HCVF are incorporated in the TCF Forest Management Policies, as described below. New road building projects carefully reviewed by TCF staff (both because of its expense as well as the potential environmental impact) and are included in proposed THP's or Department of Fish and Game projects such as Fisheries Restoration Grant Projects. Guidelines for road construction and maintenance are described in the TCF Road Management Plan. Recreation policies have been developed for these properties, to date we have a pedestrian and equestrian access permit system for Big River and Salmon Creek. Garcia is favored for hunting and a small number of permits to hunt are issued each year, primarily to neighbors. Trespass is a major concern on the property, particularly as it relates to illegal marijuana cultivation. All the properties are actively patrolled by TCF staff and contractors and thoroughly gated to discourage trespass. Fortunately, marijuana cultivation is not common in pygmy cypress or oak woodlands and grasslands. Sudden Oak Death does occur on the Garcia and Gualala Forests and will likely infect the HCVF oak woodlands. At this time SOD occurs in isolated areas and does not appear to significantly threaten the oak woodlands. There is no effective and affordable treatment or vaccination against SOD in a forested setting, so treatment will consist of maintaining an ecologically balanced and healthy forest. For all these reasons, protection of the HCVF is well-integrated with the design and implementation of the projects. Additional specific references are provided below.

Oak woodlands and grasslands. TCF Forest Management Policies (Section IV) states, "All true oak (Quercus spp.) woodlands and native grasslands are to be preserved." In addition, the vast majority of the oak woodlands and grasslands on TCF property are included within the Ecological Reserve Network (ERN) on the Garcia River Forest. Management of the ERN is described in the GRF IRMP but all management activities must be designed and implemented to further the ecological goals. In the case of oak woodland and grassland this means that prescribed fire or selective harvest to address conifer encroachment or to control the spread of Sudden Oak Death would be permitted under direction of TNC.

Pygmy cypress forest. TCF Forest Management Policies (Section IV) states, "All pygmy forest is to be preserved." Salmon Creek contains the only known occurrence of this rare natural community type on TCF properties. The area northwest of the Lower Salmon Creek THP Unit A (also mapped as stand #57719) and north of Units D and F (approximately mapped as stand #57718) are to be protected from future harvest and monitored for potential impacts. Pygmy forest occurs along a gradient, according to soil and hydrological variations, and there may be pygmy characteristics within the adjoining managed forest. Unique pygmy features that are encountered within a harvest area would be retained under Forest Management Policies Section X, Retention Requirements.

Old growth coniferous forest. Unfortunately, this does not exist within the TCF ownership. Should any new stands be identified or new property be acquired, all old growth coniferous forest would be preserved. Individual old growth trees are preserved on TCF property whenever they are encountered.

Salmonid spawning streams. Protection for salmonid spawning streams is provided for by the Forest Management Policies Section XIV, WLPZ Protection Measures, and includes measures related to upslope silviculture, road improvements, and increased riparian buffer protection. Additional details are available within the Forest Management Policies and the GRF Site-Specific Management Plan approved by the North Coast Regional Water Quality Control Board.

TCF Monitoring of HCVF

Periodic monitoring of HCVF will be integrated into ongoing monitoring activities on the properties and will occur at different scales and timeframes as necessary. Two categories of monitoring will occur: 1) biophysical—related to the distribution and condition of the HCVF features, and 2) programmatic—related to the effectiveness of the protection measures.

Biophysical monitoring will consist of:

- Ongoing vegetation mapping as part of forest inventory updates and Timber Harvest Plan preparation, with updated forest stratification approximately every ten years.
- Ongoing rare plant surveys in the areas within and adjoining planned Timber Harvest Plans and Road Improvement or Decommissioning Projects.
- Occasional evaluations of Sudden Oak Death distribution and mortality on Garcia River Forest by The Nature Conservancy and or TCF.
- Aquatic habitat typing by The California Department of Fish and Wildlife have been completed on TCF forests, and are tentatively scheduled to be re-assessed approximately every ten years.
- EMAP aquatic monitoring on Garcia River Forest by The Nature Conservancy and the North Coast Regional Water Quality Control Board—initial assessments completed, re-assessments in approximately ten years.

- Annual summer season stream temperature monitoring at multiple sites on all properties (multiple partners).

Programmatic monitoring will consist of 1) an annual evaluation of whether the HCVF features are being sufficiently protected and if there are any new threats to consider and 2) a long-term evaluation of the water quality and stream habitat condition response to TCF forest management and watershed restoration practices. The former will occur as part of the Annual Program Review; the latter will be developed over the next decade based on observations in the habitat assessment and EMAP measurements (see the GRF Aquatic Monitoring Plan in the IRMP).

Representative Sample Areas. Ecosystem type definition

Identification and protection of Representative Sample Areas (RSA) are explicitly required as part of the FSC-US Forest Managment Standard (C6.4) in order to ensure the conservation of ecosystem types that are not protected through HCVF or other requirements. [Definition from FSC Standard*: **Representative Sample Areas (RSAs)** are ecologically viable representative samples designated to serve one or more of three purposes: 1) To establish and/or maintain an ecological reference condition; or 2) To create or maintain an under-represented ecological condition (i.e., includes samples of successional phases, forest types, ecosystems, and/or ecological communities); or 3) To serve as a set of protected areas or refugia for species, communities and community types not captured in other Criteria of this Standard (e.g., to prevent common ecosystems or components from becoming rare)*]. In the context of the North Coast there are many ecosystem types and conditions present, from ocean shore to old growth forest. The TCF Forests all occur within the Northern California Coastal Forest Ecoregion (NA0519), as defined by Rickets et al, "*Terrestial Ecoregions of North America: a conservation assessment*" (Island Press 1999). More traditional forest classification systems show similar categorization, e.g. Northern California Coast Section (263A) in "*Description of the ecoregions of the United States*" (Bailey, R.G., US Forest Service, 1995).

Northern California Coastal Forest Ecoregion conservation status

Rickets et al describe the Northern California Coastal Forest Ecoregion as a Class 1 ecoregion, or "Globally outstanding ecoregion requiring immediate protection of remaining habitat and extensive restoration." Urgent action priorities developed by the WWF include greatly increasing "…the number of certified forests where timber is being harvested sustainably," which is "…essential for maintaining the integrity of ecosystems outside protected areas." At 18.7% protected, the Northern California Coastal Forest Ecoregion is one of the most protected forest types in the world (Schmitt, C.B., et al. "*Global analysis of the protection status of the world's forest*," Biological Conservation, 2009). The Convention on Biological Diversity targets 10% protection of each ecoregion as necessary to maintain biological diversity, thus the Ecoregion can be considered well-protected.

The vast majority of the Northern California Coastal Forest Ecoregion is analyzed as part of "*Conservation Prospects*," which recognized two principal recommendations as conservation priorities

- Move quickly to establish "working landscape" conservation management on large, strategically located forest and agricultural properties in resource-rich watersheds in Humboldt, Mendocino and Del Norte counties.
- Focus other fee or easement acquisitions on unique resources that are essential to conserving high-priority coastal resources, such as coastal estuaries, old-growth redwood forest stands, coho salmon refugia, floodplains, and California Coastal Trail segments.

It does not recommend the additional preservation of redwood forest unless it contains some of the high value features (where they occur, those same features are protected within the TCF Forests through the HCVF program).

Identification of Representative Sample Areas
For the purpose of this program we classify the following as Representative Sample Areas—Mendocino Headlands State Park, Jackson State Demonstration Forest, Maillard State Reserve, and the Ecological Reserve Network of the Garcia River Forest. These are large-scale formally-protected landbases containing a diversity of representative natural habitat conditions.

There are countless habitat conditions and successional stages that could be considered for the purpose of defining Representative Sample Areas. The most significant of these, such as oak woodlands, are protected through the HCVF program described above. Less significant examples could include riparian alder stands and natural (not herbicided and planted) early successional stands. Within the portion of the Northern California Coastal Forest Ecoregion that is actually forested (so setting aside the coastal scrub, pygmy cypress, oak woodlands and other non-forest ecosystem conditions) there is relatively little spatially-explicit variation—almost everything is dominated by redwood, Douglas fir, and tanoak and is less than 100 years old. Other tree species do occur but are almost never a large component of a stand. In addition to vegetation typing, certain ecological processes create significant features to consider, for example forest fires and landslides can and do create successional pathways with some different characteristics.

The process of identifying RSAs within this somewhat indistinctive landscape becomes somewhat irrelevant when looking at the conservation status and management of surrounding lands. In addition to all TCF properties being permanently conserved, there are a number of other large landholdings with similar features which are also permanently conserved. For example, adjoining the Big River property is the Big River unit (7,334 acres) of the Mendocino Headlands State Park and the Jackson Demonstration State Forest (48,652 acres). Due to the shared management history, the State Park is almost identical in conditions to TCF's Big River tract, and is permanently protected with little to no harvesting or road building expected. Comparatively, the State Forest is thirty to fifty years more developed, with significantly older and denser forest conditions prevalent, and will be managed for both continued late-seral forest development as well as some modest level of harvesting (both even-aged and uneven-aged). While the Garcia River Forest does not have the same level of protected land nearby it does adjoin an old growth reserve and contains a 8,264 acre Ecological Reserve, which in addition to being permanently protected from development and conversion can also only be managed for late-seral and other desired ecological conditions. Looking beyond the protected lands, due to the significant land use and forestry restrictions imposed on the surrounding landscape a wholesale change in ecological patterns is unlikely.

As it relates to designating RSAs, it is possible that some existing but niche habitat type is unlikely to persist on the landscape. For example red alder stands less than 30 years old are very uncommon because red alder stands are almost exclusively located in riparian zones and due to the Forest Practice Rules (dating to the 1970s); new clearings in riparian zones are relatively rare (only triggered by flood scouring). They provide a unique and valuable wildlife habitat and enrich stream nutrient conditions, however it would likely be illegal to try to encourage the development of new alder stands and it would certainly be impractical to try to freeze in time the existing stands. The habitat types that are most likely to decrease in abundance are early successional stands, due to the decrease in even-aged management practices. However early successional stand conditions are still being perpetuated to some extent on private lands and were likely an almost non-existent component of the pre-European landscape. The ecological process least represented is probably fire, due to 50+ years of aggressive fire suppression. Reintroducing low-intensity ground fires is a long-term objective for TCF but will require a significant shift in forest structure and community acceptance. And despite the suppression efforts, fires still occur, as shown by the summer of 2008 when over 54,000 acres burned in Mendocino County—so recently burned areas are not lacking and will continue to persist on the landscape. The more pervasive threat to habitat conditions and distribution will likely be climate change, which cannot be prevented through the designation of RSAs, and the extensive network of protected lands already provides the best hope for adaptation and species persistence.

In summary, numerous forest stand types and processes were considered for RSA designation, and the following summarizes the salient conclusions.

1. Old growth forests and Oak woodlands and native grasslands are important and would receive RSA designation if they were not already recognized and protected through the more-stringent HCVF designation.
2. Late-seral conditions are the highest priority feature in the coniferous forest, even when not occupied by Northern spotted owl or marbled murrelet. At the site-scale, protection of existing individual features is recommended by the California Department of Fish and Game and occasionally required during Timber Harvest Plan review, as well as required in TCF's retention policies. At the landscape-scale, over 100,000 acres of similar coniferous forest in Mendocino County is managed for development and retention late-seral habitat conditions, which is in excess of conservation biology guidelines for maintaining biodiversity.
3. Young coniferous forest has not been identified as high wildlife or social importance and will continue to be created on the landscape through ongoing even-aged harvesting activities on private lands; therefore it is unnecessary to include in a RSA.
4. Hardwood riparian stands (of all ages) are gradually being succeeded by coniferous stands. They are a unique and valuable type but impractical to deliberately maintain as a RSA.
5. Fire is the most significant process that is under-represented on the landscape and burned conditions and features are probably under-represented compared to pre-European settlement conditions. TCF is taking steps to be able to re-introduce fire (and by extension, burned conditions) but is decades away from safe implementation.

To summarize, because of the widespread protected nature of the region, the extensive regulatory system restricting land use change and harvest practices, and the existing pattern of habitat conditions and ecological processes present on the landscape, our conclusion is that the designation of additional Representative Sample Areas is not necessary and would not be ecologically beneficial. This conclusion will be re-evaluated at least every ten years, with stakeholder input, as part of a planned update to TCF's Management Policies.

Protection and management of Representative Sample Areas

Ongoing preservation and management of the Representative Sample Areas is the responsibility of the landowner, California State Parks Department, California Department of Forestry and Fire Protection, and The Conservation Fund, respectively. All properties are covered by management plans consistent with the public mission of the organization; in addition management plans and actions are reviewed by outside advisory groups. The adequacy of these protection measures will be re-evaluated at least every ten years, with stakeholder input, as part of a planned update to TCF's Management Policies.

Consultation regarding HCVF and RSAS

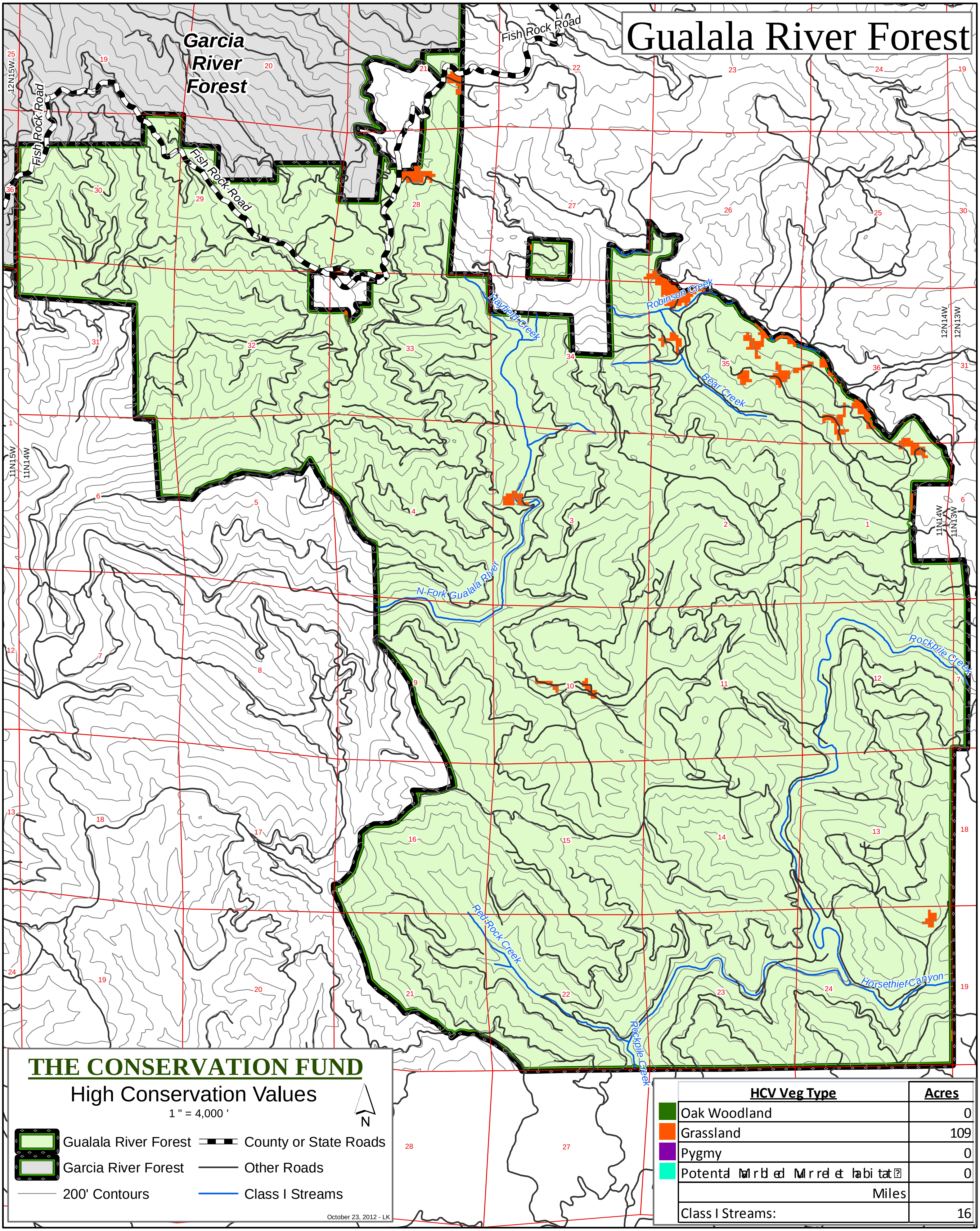
The FSC-US Forest Management Standard explicitly expects some level of stakeholder consultation as part of the HCVF and RSA identification and protection process. As described above, the identification of the four HCVF features was based on two well-respected conservation biology planning efforts which were openly developed, are publicly available and have been thoroughly reviewed by natural resource agencies, environmental organizations and the local communities. In addition the HCVF/RSA features descriptions and protection measures have been part of the TCF Policy Digest, which is a publicly available document that has benefited greatly from community and agency review, including by our Advisory Council. The most significant contributors to the policies include: Jen Carah (The Nature Conservancy), Linda Perkins (Sierra Club), and Alan Levine (Coast Action Group). The TCF Forest Management Policies are discussed as part of every THP field review (which includes both an internal staff and an open tour); the public tours draw a broad range of stakeholders, including students, neighbors, and local environmentalists. More recently, we have also benefited from the extensive HCVF and RSA consultation and analysis conducted by the Mendocino Redwood Company which manages an adjoining and much larger landbase and came to very similar conclusions regarding high priority features and protection measures.

Imperiled Species

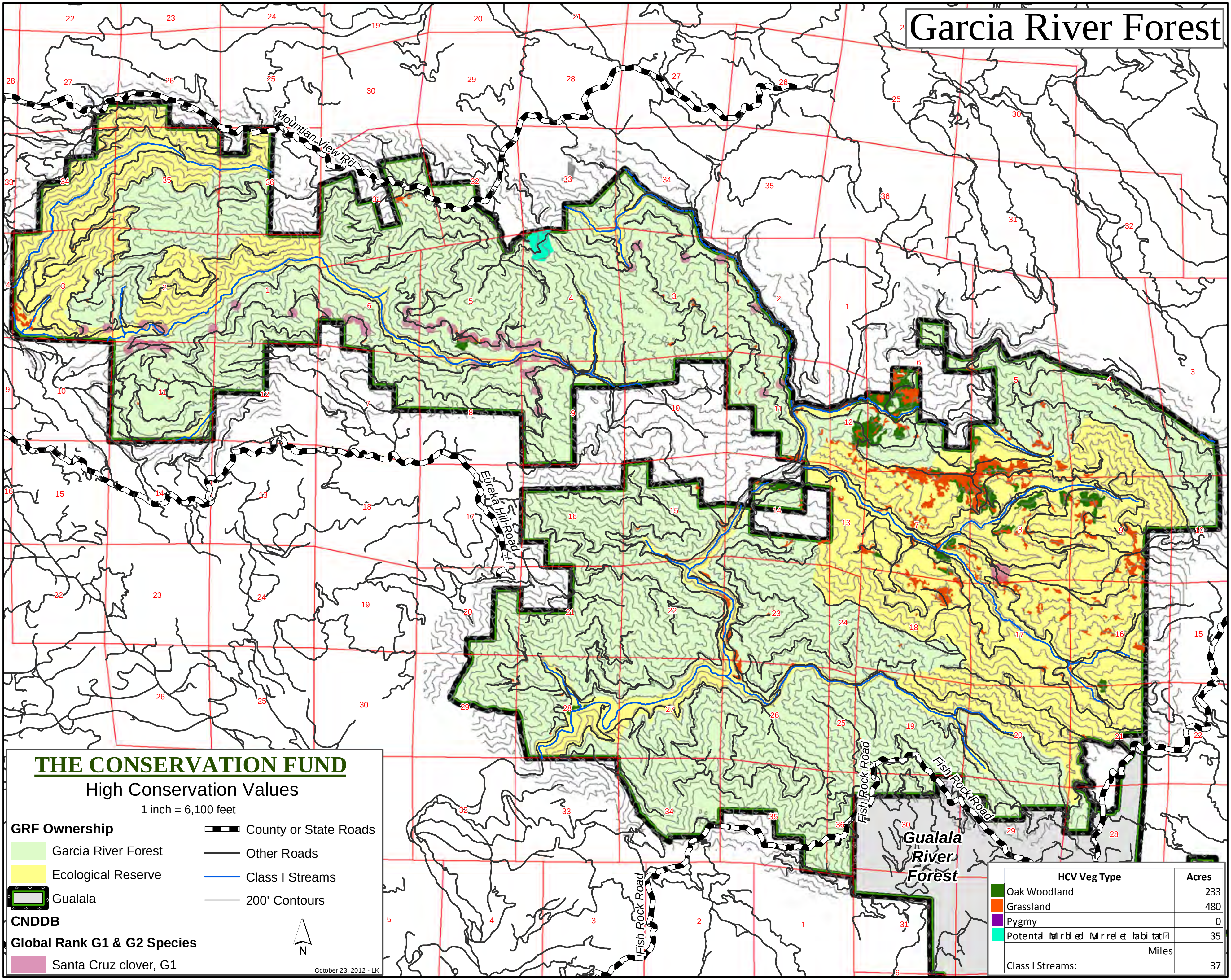
The SFI standard specifically requires identifying and protecting species that have been identified as Globally Critically Imperiled and Globally Imperiled (G1 and G2 status, respectively). The California Natural Diversity DataBase (CNDDB) maintains all recorded sitings of G1/G2 species, as well as other listed species and species of concern. The following G1/G2 species have been identified on TCF properties:

Species name	Common name	Location	Notes and protection measures
Trifolium trichocalyx	Monterey clover	Big River, in a road cut bank near the Elephant Seal and ELF THPs	This G1 and state and federally endangered plant was identified by TCF in 2011 prior to a road upgrade project. Per CDFG permit, the single location was fenced and protected, and will be monitored. It is the only location known outside of a handful of sites in Monterey County.
Agelaius tricolor	Tricolored blackbird	McGuires Pond, private property adjoining Big River	The detection of this G2/G3 species is from a single day in 1992 and it has not been observed since. Given their preference for open riparian and field habitats they are unlikely to be found on TCF property or impacted by TCF management.
Hesperocyparis pygmaea	Pygmy cypress	Salmon Creek, between the Lower Salmon Creek THP and the property border	This G2 plant species is not state or federally listed. Within TCF ownership, it occurs in one stand, and is protected as part of the pygmy forest HCVF area.
Trifolium buckwestiorum	Santa Cruz clover	Garcia and Gualala, along mainline roads	This G1 species was detected by TCF botanists and has been confirmed along multiple sections of road. Per CDFG recommendations, several sites have been fenced for protection and all locations are monitored.

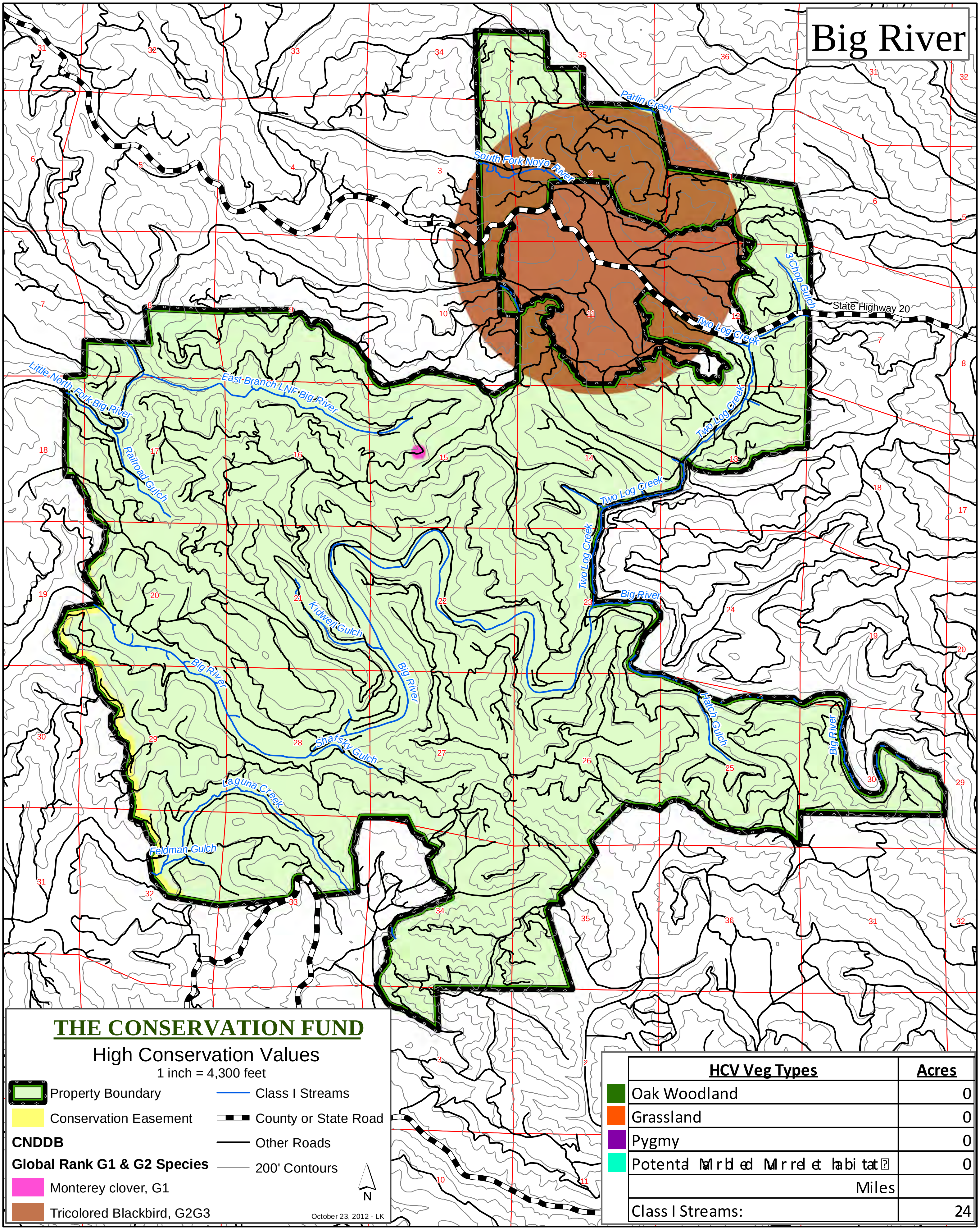
There are a few other rare plants that may yet be found on the property, but given the extensive surveys by TCF botanists prior to any ground disturbing activity, it seems highly unlikely they will go undetected.



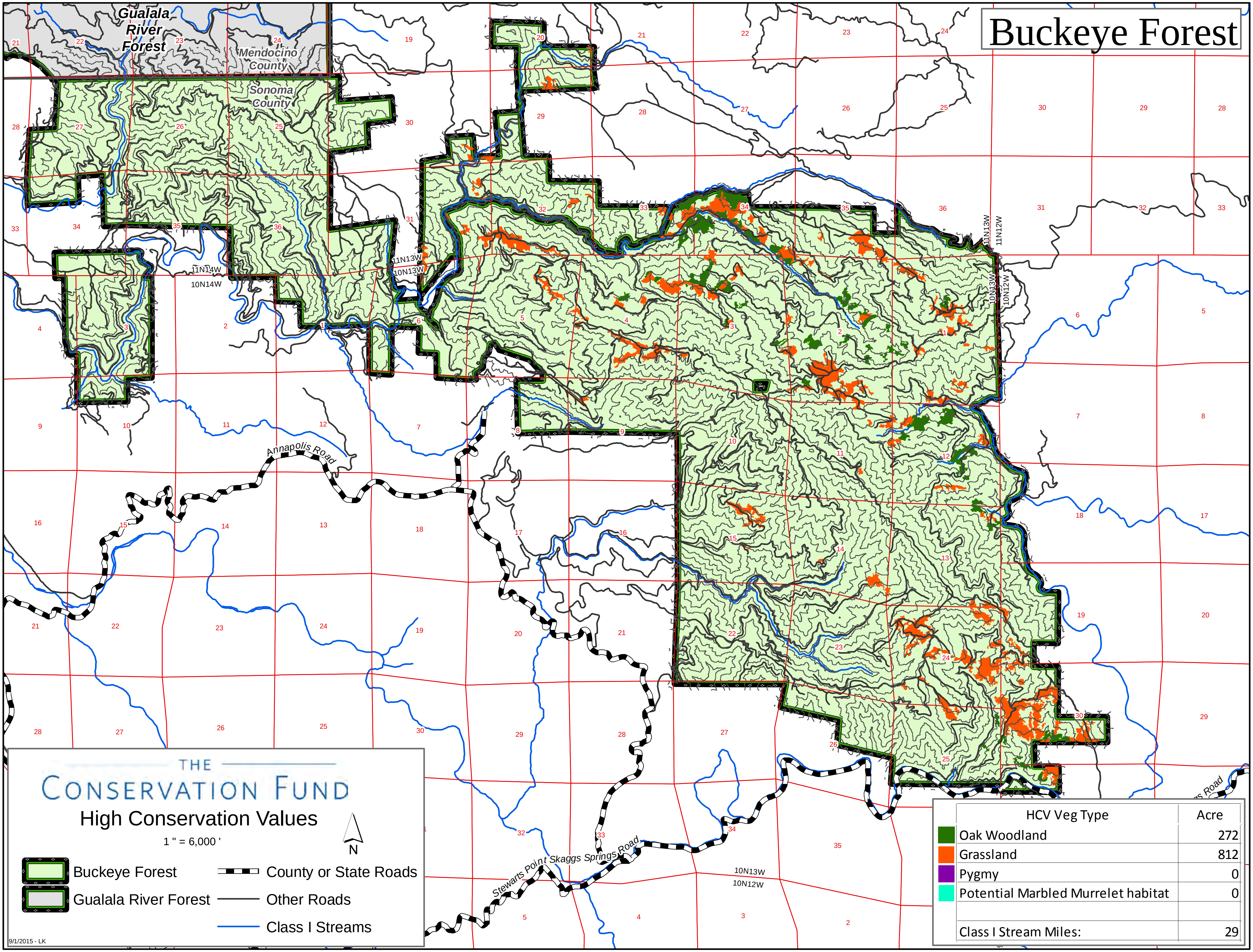
HCV Veg Type	Acres
Oak Woodland	0
Grassland	109
Pygmy	0
Potential Marbled Murrelet habitat	0
Miles	
Class I Streams:	16

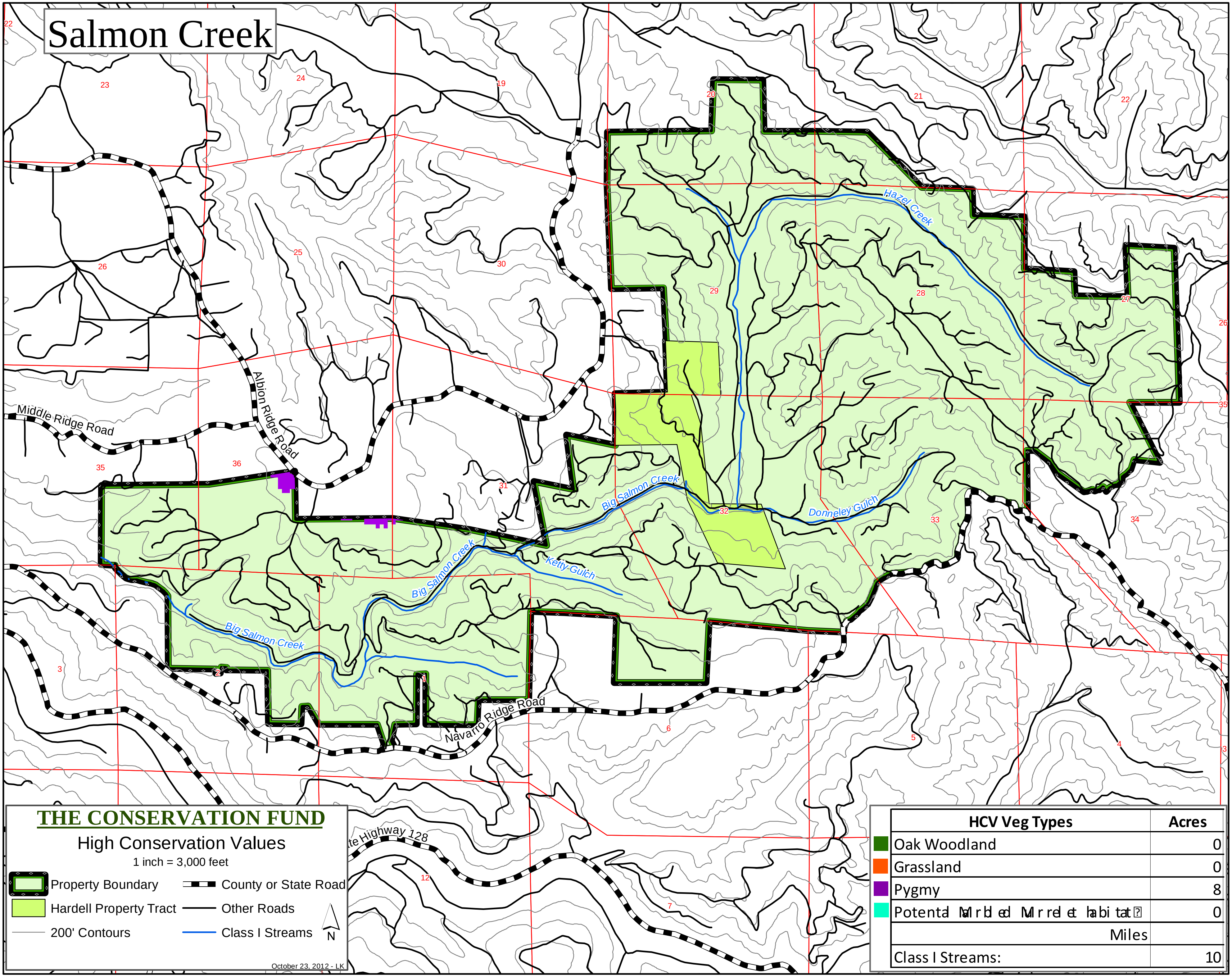


HCV Veg Type	Acres
Oak Woodland	233
Grassland	480
Pygmy	0
Potential Marbled Murrelet habitat	35
	Miles
Class I Streams:	37



HCV Veg Types	Acres
Oak Woodland	0
Grassland	0
Pygmy	0
Potenta Mrbled Mrrelet habitat	0
Miles	
Class I Streams:	24


Buckeye Forest
Gualala River Forest
Mendocino County
Sonoma County
Annapolis Road
Stewarts Point Skaggs Springs Road
11N14W
10N14W
11N13W
10N13W
11N12W
10N12W
THE CONSERVATION FUND
High Conservation Values
1 " = 6,000 '
N
Buckeye Forest
Gualala River Forest
County or State Roads
Other Roads
Class I Streams
9/1/2015 - LK
HCV Veg Type | Acre
Oak Woodland | 272
Grassland | 812
Pygmy | 0
Potential Marbled Murrelet habitat | 0
Class I Stream Miles: | 29



HCV Veg Types	Acres
Oak Woodland	0
Grassland	0
Pygmy	8
Potenta Mrbled Mrrelet habitat	0
	Miles
Class I Streams:	10

HERBICIDE APPLICATION AND HARDWOOD MANAGEMENT POLICY
For The Conservation Fund's North Coast Forest Conservation Program
Principal authors: Madison Thomson and Scott Kelly
October 2012

Overview

The Conservation Fund acquired the Garcia River Forest in 2004, Big River and Salmon Creek Forests in 2006, the Gualala River Forest in 2011 and the Buckeye Forest in 2013. Exotic invasive species such as French Broom and Jubata Grass were introduced on the properties as a result of past management activities and continued due to lack of control. Controlling the spread of invasive exotics is a priority for the Fund. All of the Forests have been harvested in the past for forest products and some of the second growth stands have unnaturally high proportion of hardwoods, especially tanoak, as a result of the previous harvests. Control of the tanoak composition within the Forests is a priority for The Conservation Fund and is also required by the California Forest Practice Rules.

Tanoak control can be difficult. The common approaches to tanoak control are: direct herbicide treatment of the tree or sprouted stump; manual felling, also known as "high stumping" or logging. To date herbicides have been our primary method of tanoak control but other methods have been tested and used by the Fund and are described below.

Herbicides are also used for the control of invasive exotics but other methods such as manual removal are also employed. Specifically on Salmon Creek; French Broom and Jubata Grass are removed annually by hand with the volunteer cooperation of the Salmon Creek Project Team. In areas with extreme infestations of exotics such as those found on Big River, we believe that herbicide application is the safest and most cost effective alternative for the control of those species. Reduction in the use of herbicides over time is an important objective for The Conservation Fund and alternatives to herbicide treatments have been, and will continue to be, evaluated. In addition, we will strive to stay informed as new research becomes available related to the efficacy and environmental impacts of various herbicides. The following document has been prepared to outline our herbicide application and use policies to control tanoak and exotic invasive species on the north coast forest properties.

Various precautions are taken with all herbicide applications to ensure that adverse impacts to the environment and human health are minimized. The following is a list of guidelines that are to be followed with all herbicide applications:

1. All applications must be by a licensed pesticide applicator with a good safety track record and in compliance with EPA-approved label recommendations.
2. Work orders will include detailed contract specifications (to minimize risk of over-application or misapplication).
3. Indicator dye will be used to enable better monitoring, and applications areas will be flagged in advance,
4. No herbicides will be applied within 50' of neighborhood property lines.
5. Work will be closely supervised by TCF staff or consulting foresters.

6. Notification signs will be posted in logical locations at least 30 days prior to applying herbicides.
7. Records on all applications will be compiled by TCF staff and available upon request.
8. The effectiveness of treatments will be monitored by TCF staff.

Tanoak Management

Hardwood species, including tanoak, pacific madrone, chinquapin, California bay and alder, are an important ecological component of north coast forests. Hardwood mast is an important source of food for a variety of wildlife species and the trees often possess a variety of structural attributes (basal hollows, cavities, large limbs, etc) which are extremely valuable for wildlife habitat. However, past management practices have resulted in an unnaturally high abundance of hardwoods, specifically tanoak in many areas that historically were dominated by conifers. As such, TCF is committed to pursuing management practices that reduce the tanoak component, increase conifer site occupancy, and transition our forests toward a more historically appropriate species composition while retaining high quality hardwood stands and individual trees for wildlife habitat.

Before discussing specific management practices, it is important to understand the physiological attributes of tanoak and how these attributes contribute to the structure and composition of stands at different points in their development. Tanoak's unique physiological attributes allow it to be a component of north coast forests at a variety of successional stages. Tanoak is extremely shade tolerant meaning that it can persist and grow at relatively low light levels. Because of this characteristic, tanoak regeneration is often ubiquitous in the understory of stands with moderate to high overstory crown cover. Redwood and Douglas-fir are less shade tolerant than tanoak and regenerate poorly under partial canopy. When overstory trees are removed through timber harvest or natural disturbances, the tanoak in the understory "releases" and grows upward to occupy the vacated growing space. As this occurs, redwood and Douglas-fir regeneration and growth is often hindered. Tanoak also sprouts vigorously when cut or damaged, allowing it to rapidly colonize sites after fire, logging, and other disturbances. Because of tanoak's ability to sprout and grow in shade or low light conditions, many stands across TCF ownership that were once conifer dominated now possess an unnaturally high composition of tanoak due to repeated overstory harvests with no tanoak control treatments.

The California Forest Practice Rules require that the site occupancy provided by Group A species (redwood, Douglas-fir, grand fir, western hemlock and sugar pine) shall not be reduced relative to Group B species (tanoak, pacific madrone, chinquapin, California Bay, alder) as a result of timber harvest [see 14 CCR 912.7(d)]. The Conservation Fund's timber harvests primarily involve the harvest of Group A species (since they have commercial value), therefore some treatment of Group B species may be necessary in order to maintain relative site occupancy of Group A species following harvest. Hardwood reduction activities (without any commercial timber harvest) may also be pursued in areas outside Timber Harvest Plans where stands are overstocked with hardwoods.

Many tanoak dominated stands on our tracts were treated with Imazapyr or Triclopyr by previous owners. Those treatments were successful in that they reduced hardwoods and allowed for improved conifer growth but were broad in scope killing all hardwood species at the expense of other forest values. The herbicide application policies described below are intended to reduce tanoak while considering other forest values such as wildlife habitat, aesthetics and fire danger and also reducing our reliance on herbicide use for tanoak control in the future. We have no desire to remove tanoak from the forest or a stand. In fact, tanoak is a necessary forest component in a healthy redwood forest. However due to its physiology it will be necessary to control tanoak in the forest for the foreseeable future. We expect that as the forest matures and the conifer canopy closes that hardwood reduction treatments will no longer be needed, but this is a process that may take multiple entries or 30-40 years.

Depending on the structure and composition of a given stand, there are a variety of approaches that we may take toward tanoak management. The following is a summary of management policies that we use to drive the decision making process on a stand by stand basis. These generalized policies are subject to change as new information becomes available and the results of previous tanoak reduction projects become apparent.

- All true oak (Quercus spp.) woodlands and individual trees are to be preserved.
- Where the post-harvest tanoak basal area would exceed 30 square feet of basal area per acre (averaged across the stand), hardwoods shall be controlled through manual falling or herbicide treatment through direct basal injection (hack-and-squirt) to provide a post-harvest tanoak basal area of 15-30 square feet per acre. (This may take more than one entry to achieve).
- In stands with a moderate tanoak component where conifers are well established in the overstory, selective falling of tanoaks to release existing conifers will be employed. While the tanoak stumps will likely resprout, the conifers should have established dominance and will eventually shade-out most of the sprouts. In this type of incremental treatment (selective falling), clumps of tanoaks and tanoaks, which do not compete with desirable conifers, will be retained.
- In stands with a significant tanoak component which also possess a substantial conifer component in equal and lower crown classes, selective herbicide treatments will be employed. Stands that fall into this category generally have over 75 square feet of tanoak basal area/acre and over 75 square feet of conifer basal area/acre. Tanoak trees that are directly competing with healthy, established conifers will be targeted for treatment. Those tanoaks that are not directly competing with established conifers will be retained. Selective falling of tanoaks can cause excessive damage to residual conifers when numerous hardwood trees are cut. Because of this, herbicide will generally be the primary method of tanoak reduction in stands with both significant tanoak and conifer components.
- In stands with a significant tanoak component and minimal conifer stocking, a more broad scale herbicide treatment coupled with conifer planting will be employed. With this type of treatment, the majority of the tanoak in a given stand

will be treated and conifer seedlings will be planted either shortly before or shortly after tanoak treatment.

- Tanoak logging may be pursued as an alternative to herbicide in certain cases if a market for tanoak logs develops and the tanoak can be harvested without damaging the residual conifers. Tanoak logging tends to generate huge amounts of slash and there is often extensive residual stand damage due to the large crowns of individual tanoak trees. Also, at this time, demand for tanoak logs is low and current prices are insufficient to cover logging and hauling costs. Even where hardwood logging is utilized, there may be a need for post harvest herbicide treatment in order to control tanoak sprouting and prepare the site for conifer regeneration.
- The Big River and Salmon Creek tracts posses a number of young plantations (less than 15 years old) that were established by the previous landowner. In these stands, tanoak reduction will be accomplished in conjunction with precommercial thinnings using brush or chain saws. In addition to tanoak, other brush species such as Blue Blossom, and small trees are cut in order to create growing space for the healthiest, best formed conifer specimens. Mechanical thinning is generally preferred to herbicide application in these stands due to the greater control of spacing and species composition.

The herbicide primarily recommended for use of tanoak control is imazapyr. The primary application method will be via “hack and squirt.” Using this method, a series of cuts are made around the stem of the tree and the herbicide is applied directly to the tree’s vascular tissues. This application method greatly reduces the total quantity of herbicide required and minimizes the risk of drift onto non-target species and other resources. Additional herbicides for tanoak control may be considered in the future as they are developed and tested. Where herbicide will be used for tanoak reduction, the following guidelines will be followed.

- No hardwood species other than tanoak shall be treated
- Retain all hardwoods (>18” DBH) per acre. These larger hardwood trees are of the highest value to wildlife because they tend to be the most prolific mast producers and they possess more desirable structural attributes than smaller trees. Exceptions to the general retentions guidelines may be adopted on a site specific basis if in the opinion of the project forester the general guidelines are not adequate to reduce the hardwood component to a level low enough to allow conifer regeneration and growth.
- There will be no hardwood control with herbicides in Class I, II or IV WLPZs or within 25 feet of a class III watercourse; manual falling or girdling of small hardwoods may be used within these restricted areas as part of a riparian shade enhancement project designed to increase conifer site occupancy and growth.

The results of different tanoak control techniques will be monitored over time and our policies will be revised as new information becomes available. We recognize that because of soils and aspect some sites are naturally dominated by tanoak and we will avoid tanoak reduction activities in these stands. Tanoak reduction projects will be focused on the more productive sites with evidence of past conifer dominance (i.e. stumps, suppressed conifer regeneration).

Exotic Invasive Species Management

In addition to tanoak management, herbicides will be used to control certain exotic species, primarily pampas grass, French broom, Italian thistle, and bull thistle. Alternatives to herbicide application, such as pulling, scalping and direct shading have been attempted in areas with some success and will continue to be used in the future. Non-herbicide treatments of invasives are preferred to control small localized colonies and will be utilized wherever feasible. Herbicide applications for invasive control will primarily be utilized for large infestations where mechanical or other alternative methods are impractical.

ROAD MANAGEMENT POLICIES
For The Conservation Fund's North Coast Forest Conservation Program
Primary author: Scott Kelly
May 24, 2007, revised September, 2012, 2014

Introduction

The Conservation Fund owns approximately 54,000 acres in Mendocino County and 19,500 acres in Sonoma County California. The tracts consist of the 24,000 acre Garcia River Forest, the 12,000 acre Big River Forest the 4,000 acre Salmon Creek Forest, the 13,900 acre Gualala River Forest and the 19,500 acre Buckeye Forest. The Garcia River Forest was acquired by The Conservation Fund in 2004; the previous landowner conducted some minor road maintenance activities and remediation projects however the forest land and roads have been essentially inactive since 1998. The Conservation Fund acquired the Big River and Salmon Creek forests in 2006 from Hawthorne Timber Company in Fort Bragg who were actively managing the forest for timber production. The Conservation Fund acquired the Gualala River Forest in 2011 and the Buckeye Forest in 2013 the previous landowners conducted some minor road maintenance activities and remediation projects however the forest land and roads have been essentially inactive since 1998. A 17 acre vineyard and pond were developed on the Buckeye Forest in the early 2000's however no other management activities have occurred. The Conservation Fund intends to actively manage the timber resources on all five properties to improve stocking and growth across the ownership and to actively manage the road system and riparian conditions to improve watershed health and use by anadromous fish. Therefore, it has become a priority to improve and maintain access to the timberlands from the existing road system.

It has been documented that forest roads can contribute significant sediment to streams. Increased stream sediment can result in cemented gravels reducing salmonids ability to spawn and/or inhibiting salmonid fry emergence. High sediment levels can also cause pool filling and associated reduction in pool habitat. Extreme sediment loads can cause stream temperatures to be elevated due to the reduction in stream depth. Near stream roads can also reduce stream shading where the road is very wide or very close to the stream. Reduced stream shading has been linked to increased water temperature which stresses juvenile salmonids.

The Garcia River, Gualala River and Big River have been identified by the EPA and are on the 303(d) list of impaired waterbodies. The listed stressors include sediment and temperature. The Gualala is also listed for Aluminum on the mainstem downstream of The Fund's property. Placement of a waterbody on the 303(d) list acts as the trigger for developing a sediment control plan, called a TMDL, for each water body and associated pollutant/stressor on the list. At this time the Garcia River is the only river that has an action plan for the TMDL and many of the sediment reduction activities in this document have been adopted to conform to the Garcia TMDL and are implemented throughout the ownership.
Recent management practices by TCF and previous landowners have reduced road related stream sedimentation and improved long-term road stability. Specifically many bridges and multi-plate culverts have been installed to replace standard culverts on class I streams. Class II watercourse crossings have been rock armored and new culverts buried to grade. Watercourse and Lake Protection Zone (WLPZ) roads have been rocked or otherwise improved to reduce stream sedimentation caused by near stream roads. Many other forest roads have been rocked and drained by outsloping or use of rolling dips. The use of ditch reliefe culverts is being minimized to reduce the potential for culvert failure and road maintenance costs.

Objectives

The Conservation Fund is committed to continue this trend of road improvement over time and has developed and will continue to refine this Road Maintenance and Improvement Plan to:

1) Reduce sediment inputs resulting from the existing road network as well as reduce inputs from new roads.
2) Develop proactive measures to help reduce stream sedimentation as a result of road runoff and cooperate with regulatory agencies involved with timber harvest planning.
3) Develop a timeline for road maintenance activities.
4) Act as a guide to foresters who are actively developing timber harvest plans or other projects on the properties.

Planned road maintenance will be in conformance with The Conservation Funds overall forest management goals. The Conservation Funds immediate goal for new properties is to maintain access through grading and maintaining existing mainline roads. These roads form the core of the road system and provide access for fire suppression, log hauling, wildlife surveys, future road improvement and abandonment projects and other management activities. It is expected that maintenance and improvements of secondary roads will be carried out in conjunction with Timber Harvest Plans or as part of larger Watershed Improvement projects.

Timeline

It is The Conservation Fund's goal is to develop a road system which provides access to the property for timber harvest, fire protection and wildlife resource monitoring while reducing annual maintenance activities and expense and potential watershed impacts. It is expected that the property will generally be managed with unevenage silvicultural systems and a 10-20 year re-entry period. Most road improvement projects will generally be done in conjunction with THP's and therefore the timeline to rotate through the property with road upgrades will be similar as the overall harvest schedule (within the first 20 years). Projects which require a 1603 stream alteration permit and do not otherwise qualify as an emergency repair will necessarily be conducted in conjunction with timber harvests or another CEQA project.

The Conservation Fund will conduct property wide assessments of all the roads on each tract using the road inventory and assessment system developed by Pacific Watershed Associates and others. The assessments will be used as a planning tool to prioritize sites for repair and to assist in the evaluation procedure for road decommissioning.

Road Maintenance and Improvement Guidelines

The purpose of this section is to aid resource professionals to identify forest road attributes that will assist in determining whether a road should be maintained in its current configuration, reconfigured with upgraded drainage structures or decommissioned. Some of the primary objectives and constraints identified during land management planning were: 1) Improve fisheries and wildlife habitat. 2) Maintain or improve the current level of access. 3) The landowner is willing to bear higher management costs in the future that arise from reconfiguring the roads if it results in other operational and environmental benefits.

To reduce sediment delivery from the road surfaces emphasis will be placed on increasing the number of drainage points along roads and reducing the potential for diversion at culverted watercourse crossings. On low gradient roads (0-4% grade) roads will be primarily drained by outsloping with occasional dips or ditch relief as necessary. On higher gradient roads (5-10+% grade) roads will be drained primarily with rolling dips in combination with outsloping and inboard ditch relief culverts as necessary. It is expected that most roads will be improved so as to be drained by a combination of out sloping with rolling dips. However ditch relief culverts cannot be completely abandoned and will be used where necessary. To reduce sediment from watercourse crossings up to 3 criteria will be met: 1) New culverts and culverts proposed for replacement will be sized to meet the 100 year storm event. 2) New or replaced culverts will be installed such that the culvert is at stream grade and deep enough that a critical dip can be constructed to provide protection against stream diversions. 3) A trash rack or stake shall be installed upstream of the culvert to catch or turn debris prior to reaching (and blocking) the pipe.

New roads will be designed with gentle grades wherever possible and long rolling dips will be constructed into the road or the road shall be outsloped to relieve surface runoff. Where possible watercourse crossings will be designed such that road grades dip into the crossing and then climb out of the crossing, eliminating the need for abrupt critical dips. Crossings will be rock fords or temporary crossings on secondary roads which see only periodic activity to reduce maintenance requirements. Minor crossings on permanent roads can be converted to rock fords over time.

The Handbook of Forest and Ranch Roads prepared by Weaver and Hagans 1994 will be used as a guideline for all proposed road construction and improvement projects. Specific projects and locations will be mapped and site specific prescriptions for each project will be included in the appropriate THP, TMDL, SSMP or other guiding document.

Road Abandonment Plan

There are three criteria to consider in determining which roads can be abandoned. The first is focused on environmental considerations. Roads located near (within the WLPZ) of a class I or class II stream or constructed on unstable slopes such as active landslides or headwall swales are likely candidates for abandonment due to their potential contribution to in-stream sediment. Road construction across headwall swales and unstable slopes can result in mass wasting events, delivering large amounts of sediment to the watershed. They pose an ongoing maintenance problem caused by constant bank sloughing which block roads and plug ditches and culverts.

The second criterion is that roads to be abandoned must not cut off or substantially reduce access to areas where future management is anticipated. In the case where a road has been determined to be undesirable due to its location but access is still required the landowner is obliged to maintain the existing road or find another route. Reconfiguring the road network is a difficult, time consuming and costly task and will have long term effects on management activities. The likely result is that any new road system will be designed for yarder logging and to minimize the total road mileage.

The third criteria is that road abandonment does not result in the construction of a replacement road that is environmentally unsound. Removing a road from a stream zone with the intent of moving upslope can require that the landowner make a value judgment between, for example, a near stream road and a road constructed on steep slopes with multiple watercourse crossings. Improving existing roads with rock surfacing, rolling dips and oversized culverts or bridge installation is generally the least costly alternative compared to relocating a road system and should be considered when no clear beneficial alternative is available.

In areas with excess roads it may be desirable to abandon or decommission roads or reduce their status to “temporary” to reduce potential sediment delivery. Temporary roads and decommissioned roads are similar in that permanent and temporary watercourse crossings are removed for an indefinite period of time. Road decommissioning differs from abandonment in that a decommissioned road may be rebuilt at a later date if in the opinion of the land owner it is the least damaging alternative.

The economics of road abandonment also contributes to the decision making process. Unfortunately it is not practical to use a “one size fits all” prescription for road abandonment. Some roads, which appear to be poorly located, may have to remain in place because they service a larger area with good arterial roads. While it may be physically possible to relocate a road it may not be in the best interests of the landowner to do so due to the excessive cost involved . The types of roads which will be a priority to evaluate as potential candidates for abandonment are listed below.

1. Roads that parallel watercourses and dead end in landings are good candidates for abandonment or repair because of their proximity to streams and their lack of arterial roads. These are the highest priority because they can be abandoned or decommissioned without impact to future management.
2. Roads that cross unstable areas or headwall swales can be abandoned if alternate routes exist to both ends of the subject road. Roads crossing unstable areas are deemed to be the second priority for abandonment because there are fewer roads on unstable slopes than WLPZ roads and the management implications and fieldwork necessary to make an informed decision will delay the decision making process.
3. Long term plans should include abandonment and replacing or upgrading roads that are poorly located but are necessary in the short term for forest management.

It is felt that proper implementation of this plan will reduce the potential for excess runoff and diversions common to forest roads. Over the long term the reduction in stream sedimentation will improve salmonid habitat conditions and reduce yearly maintenance costs.

CERTIFIED PRODUCT CHAIN-OF-CUSTODY PROGRAM
For The Conservation Fund's North Coast Forest Conservation Program
March 1, 2010, revised September 2012

Note to Licensed Timber Operators, Log Haulers, and Log Buyers

This document is being provided to you because it is required by The Conservation Fund's certification under the Forest Stewardship Council standard for forest management and chain-of-custody for logs. The purpose of this policy is to ensure that wood products which originate on our properties are appropriately accounted for and do not become inappropriately labeled. All logs generated on our Mendocino properties are certified under the Forest Stewardship Council US Forest Management Standard (v.1.0) and Sustainable Forestry Initiative Standard (section 2). Use of the Forest Stewardship Council logo or other origin claims is restricted to those facilities that have undergone an independent certification of their compliance with the Forest Stewardship Council Chain-of-Custody standard. The Conservation Fund's participation in this program should not impose any additional burdens on our contractors and customers other than standard log security and accounting. If you have any questions about this policy, please contact Scott Kelly at (707) 272-4497.

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Forest Certification Status

The Conservation Fund's North Coast timberland (Garcia River, Big River, and Salmon Creek, Mendocino County, California) were certified as sustainably managed by the Forest Stewardship Council and the Sustainable Forestry Initiative on October 12, 2007. The Gualala River Forest was certified in 2012. Buckeye Forest, Sonoma County, California will be certified in 2014. Audits are conducted annually to ensure continued eligibility and are available at http://www.conservationfund.org/our-conservation-strategy/focus-areas/forestry/north-coast-conservation-initiative/north-coast-forest-reference-documents/

Section 1, Control System Documentation

1.1 The Conservation Fund has implemented a documented control system in order to responsibly track log sales under Generally Accepted Accounting Principles (GAAP) and to address the Principles of Chain-of-Custody control as set forth by the FSC.

1.2 The Conservation Fund's designated Chain of Custody Control Administrator is Scott Kelly, the senior forester responsible for, among other things, log sales and harvest administration. Scott Kelly is responsible for education of employees and contractors, as well as for implementation of the documented control system for Chain of Custody of FSC-certified wood products sold by The Conservation Fund from its properties in Mendocino County, California.

1.3 Scott Kelly is assisted in this documentation by Margery Hoppner, staff accountant, who manages the log sale accounting process and reconciles trip tickets, scale records, mill receipts, and contractor payments.

1.4 A sample Trip Ticket and Log Sales Record are attached at the end of this document. Instructions for the trip ticket are provided to the log hauler. Instructions for the Log Sales records are contained in The Conservation Fund's accounting procedures manual.

Section 2, Confirmation of Inputs

2.1 The Conservation Fund is engaged in the business of selling logs and does not purchase logs or any other FSC-certified wood products. Therefore, confirmation of inputs is not applicable, except that The Conservation Fund will be responsible for ensuring that log decks in the forest contain only logs originating on that property and that log trucks exiting the property only contain logs that originated on the property.

2.2 It may be required for The Conservation Fund or its partners to purchase small quantities of conifer logs for installation in streams as restoration projects. Those logs are intended for permanent installation and will not be considered an input for the purpose of Chain of Custody accounting.

Section 3, Separation/Demarcation of Inputs

3.1 The Conservation Fund has a system for ensuring that FSC-certified products are clearly identified. The Conservation Fund timber harvest and log sale activity is only conducted for The Conservation Fund's properties, all of which are certified. Thus, there are no non-FSC products involved.

3.2 Physical separation/segregation of certified and non-certified products is achieved by not involving any non-certified logs in The Conservation Fund's activities. There are no inputs (either certified or not), thus no non-certified logs will ever be brought on the property and mixed with certified logs.

3.3 Logs are identified as certified through paperwork supplied by The Conservation Fund to the purchasing mill.

Section 4, Secure Product Labeling

The Conservation Fund does not use on-product labels during the sale of logs. The Conservation Fund accepts the responsibility to ensure that the FSC Logo Pack and labels are not used by unauthorized users or for any unauthorized use.

Section 5, Identification of Certified Outputs

Certified products are identifiable by field marking and trip ticket paperwork that clearly identifies the purchaser and seller of the logs. The certified status of the logs is communicated in writing (through the log sales agreement and by sharing this document) by The Conservation Fund to the purchaser.

The Conservation Fund operates an accounting system that records log species, volume, and grade information for all log deliveries. This includes reconciliation between the trip tickets provided by the LTO and log hauler, scale records provided by the scaling bureau, and payment receipts provided by the purchasing mill.

Payment is issued by the purchasing mill upon receipt (and scaling) according to the terms of the log sales agreement. Because no invoices are issued it is incumbent on The Conservation Fund to communicate the certified status of the logs to the purchaser (which is done through this document and the log sales agreement). A copy of The Conservation Fund's Chain of Custody certificate will be provided to the purchasers upon request.

Section 6, Record Keeping

6.1 The Conservation Fund maintains appropriate records of all log sales (which is the same as outputs of certified products) in accordance with Generally Accepted Accounting Practices (GAAP).

6.2 The Conservation Fund's records are sufficient to satisfy a financial auditor or an independent assessor seeking to trace back any given certified product output pool or load back to the specific certified forest of origin.

6.3 The Conservation Fund's records are sufficient to allow an independent assessor to determine the rate of production of certified logs from the certified forest, as well as to determine the certified product delivered to each manufacturing facility.

6.4 All records related to certified products sold by The Conservation Fund will be kept for a minimum of five years.

Section 7, Training

7.1 The Conservation Fund will supply this procedure to all contractors and explain the COC procedures.

7.2 The Conservation Fund will include this COC procedure as an exhibit in all timber sale contracts, and train all contractors, buyers and loggers on the procedure.

7.3 The Conservation Fund will maintain a database of all personnel who have received the COC procedure and related training.

7.4 Distribution of the procedure and related training will take place with all new contractors and loggers at the beginning of a new contract or sale. Personnel who are already familiar with the procedure will receive it in each additional contract.

THE CONSERVATION FUND
TEMPLATE -- TRIP TICKET:

THE CONSERVATION FUND

America's Partner in Conservation

14951 "A" Caspar Road, Box 50, Caspar, CA 95420 (707) 962-0712

TRIP TICKET

150

DATE _____/_____/_______ TRUCK NO./ DRIVER ________________

TRACT NAME ____________________ THP NAME ______________________

FSC/SCC COC-00102N
FSC 100%

LOGGER ________________________ SOURCE CODE _________________

BUYER _________________________ DESTINATION ____________________

OF LOGS RW___ DF___ WF___ ww___ HW___ OTHER_______________

RECEIVED BY_______________________________________ DECK NO._____________

White - Logger Canary - Trucker Pink - Mill Goldenrod - Owner

COMMITMENT TO SAFETY AND HEALTH OPERATING POLICY,
The Conservation Fund's North Coast Forest Conservation Program
Primary authors: Evan Smith and Scott Kelly.
November 28, 2011, revised September, 2012

Commitment to Safety and Health

A. Safety and Health Policy

The Conservation Fund (TCF) is firmly committed to maintaining a safe and healthful working environment across all its offices and programs. This document guides TCF activities on its California timberlands to ensure safe operations. To achieve this goal TCF has implemented a comprehensive Injury and Illness Prevention Program. This program is designed to prevent work place incidents. The designated Safety Coordinator is responsible for monitoring the performance of each team member to ensure compliance in conducting an affective Injury and Illness Prevention Program.

Special statement on forestry-related risk--The field of forest management inevitably involves travel, heavy equipment, challenging terrain, and variable weather conditions—all serious contributors to risk. All employees and contractors should be cognizant of those risks and develop the judgment to evaluate conditions and act in a safe manner. Driving to and from the forest is probably the most dangerous activity we engage in—it is very important that we slow down and pay attention. The most important piece of safety equipment is what sits under the hardhat, behind the safety glasses, and between the ear plugs—use your brain! Every team member is responsible for thinking about the safety of themselves and everyone else present. TCF's North Coast program is a loosely-organized team of employees, contractors, consultants, partners, and volunteers—we rely on these individuals to exercise good safety skills. It is critical that we be cognizant of the conditions around us and the safety preparedness of those around us and those that might visit the site later. We owe it to ourselves and the families of those we work with to conduct all our activities safely.

Each individual is responsible for their own safety at the work place. The safety coordinator can assure that programs and policies are in place to provide for a safe working environment however it is the responsibility of the individual to implement the safety policies and make their own working environment as safe as possible.

Specific policies—

1. *No alcohol or drug use on the property.*
2. *Maintain a daily log of where people are working and an emergency contact system in the event of an emergency or someone not returning in a timely fashion. Each employee has been issued a SPOT GPS device, which tracks an employee's location and allows an emergency signal to be sent. This device has essentially replaced the daily log.*
3. *Remind visitors and tour participants of potential risks and necessary precautions.*

4. *Annual safety training will be developed for everyone that works in the woods if it is not already part of their professional licensing requirements (eg Licensed Timber Operator).*
5. *First Aid Kits are available in the TCF office and vehicles.*
6. *Indications of illegal marijuana cultivation will not be investigated by field staff but reported to the property's security patrol who will report it to law enforcement personnel.*

B. Vehicle Operation

Driving to and from the forest is probably the most dangerous activity we engage in it is very important that we slow down and pay attention while operating company vehicles on the street or on company lands. Driving in the forest exposes the driver to narrow winding gravel roads which can be very slick when wet and require extra caution when operating a motorized vehicle.

- All persons operating a vehicle on company property are required to possess a valid driver's license.
- All persons operating an ATV or other off road vehicle shall have received proper training from a certified ASI Rider Course Instructor or equivalent. To enroll in an ATV Rider Course, call the national, toll-free enrollment number, 1-800-887-2887.
- Use common sense, do not drive in dangerous conditions or terrain beyond your ability to safely operate the vehicle, when in doubt, slow down or walk.

C. Chainsaw Operation

Staff is required to read the owner's manual carefully before operating a chain saw. Wearing proper safety equipment and protective clothing is required. When using a chainsaw be sure to keep the cutting area clear of spectators, note any overhead hazards, including hanging tree limbs and utility lines, keep the chain clean, sharp and lubricated, keep both hands on the saw handles, and let the saw come to a complete stop before reaching for the chain or blade. For further safety regulations regarding chainsaw usage please consult http://www.osha.gov/OshDoc/data_Hurricane_Facts/chainsaws.pdf

D. Herbicide Application

Only Certified Pesticide Applicators may apply herbicides. Staff will read and follow all chemical label directions. Apply herbicides at minimal levels in accordance with the label and targeted to specific weed problems. Wearing proper safety equipment and protective clothing is required. A notice of intent must be submitted to Mendocino County 24 hours prior to application; a pesticide use report must be filed by the 10th of the month; herbicides should be contained and not be allowed to drift unto a neighboring property; and immediately notify Mendocino County Agriculture Commissioner of any changes to our permit. To promote transparency and communication, TCF will post signs in the forest at the locations where herbicides are proposed for use 30 days prior to their

application. For more information please consult
http://www.epa.gov/oppfead1/safety/resource.htm

E. Personnel Safety

Many minor injuries such as cuts, scratches, bee stings, and ankle sprains can be prevented by wearing proper safety equipment or protective clothing. When working in the woods around heavy equipment all personnel shall wear hardhats and boots. Long pants are also required while working in the forest. Other recommended personal safety items include:

- Eye Goggles
- Ear Plugs
- Long sleeve shirt
- Gloves
- Tecnu or other poison oak prevention treatments.

F. Contractor Safety & Training Policy

The Conservation Fund shall only employ contractors that have good safety records and up-to-date training. Specifically, only Licensed Timber Operators in good standing may conduct timber harvesting operations and only Certified Pesticide Applicators may apply herbicides. Prior to the start of each work project (e.g. logging job, road opening, weed control treatment, etc) the Safety Officer will conduct a discussion of the safety concerns and ensure contractors are aware of TCF's safety expectations. For professions that do not have formal licensing requirements that address safety, such as consulting biologists and botanists, The Conservation Fund will emphasize the importance of accident avoidance and communication and seek to resolve any safety concerns they may have.

G. Company Housekeeping Policy

Good housekeeping is a critical part of the safety program. Keeping work areas neat and clean reduces the risk of on the job injuries. Well organized work areas increase the ability of employees to perform their jobs efficiently and safely. In addition a clean workplace is a source of good morale, improved quality and partner satisfaction. Each employee is responsible for keeping his or her work area neat and orderly. Housekeeping inspections may be conducted as part of regularly scheduled or impromptu safety inspections.

II. PERSON(S) WITH AUTHORITY AND RESPONSIBILITY FOR IMPLEMENTING THE PROVISIONS OF THIS INJURY AND ILLNESS PREVENTION PROGRAM (IIPP)

The North Coast Timberlands Manager shall serve as the Safety Coordinator, with authority and responsibility for implementing the provisions of this program.

Responsibilities assigned to the Safety Coordinator, Site Supervisors, and Employees are described in general on the following pages.

All employees and contractors of TCF are responsible for working safely and maintaining a safe and healthful work environment. It is a condition of employment.

The North Coast Timberlands Manager will assume the overall responsibility for this program as the Safety Coordinator. These duties include:

- Ensuring that adequate financial, personnel and material resources are available, including identifying safety leaders for projects and training needs.

- Ensuring employees receive specific training for each task they are expected to perform, and whenever new processes or chemicals are introduced into the workplace.

- Leading by example.

- Recognizing safe work practices as part of performance reviews.

- Encouraging employee involvement.

- Investigating and correcting any unsafe action or condition reported to them.

- Holding employees accountable for poor safety performance by utilizing re-training and company disciplinary procedures.

All TEAM MEMBERS (employees, contractors and lead partners) will be responsible for the implementation of this program at his/her work area. These duties include:

- TAKING PERSONAL RESPONSIBILITY FOR THEIR OWN SAFETY AND THE SAFETY OF OTHERS.

- Understanding that working safely is a condition of employment.

- Participating in developing safety rules, procedures, and improvements.

- Obeying safety rules, procedures and work practices.

- Wearing all required Personal Protective Equipment (PPE).

- Reporting all injuries, no matter how minor, to their supervisor immediately.

- Reporting all “near-misses” and hazardous conditions to their supervisors.

- Participating in the safety effort by demonstrating an understating of training received and the ability to perform tasks safely.

- Participating in tailgate and general safety meeting.

- Learning to manage “self-safety” by developing proactive (prevention) skills in decision-making.

- Communicating safety suggestions to supervisors or contract representatives.

III. **SYSTEM FOR ENSURING THAT ALL WORKERS COMPLY WITH SAFE AND HEALTHY WORK PRACTICES:**

A. Informing employees of the provisions of our Injury and Illness Prevention Program (IIPP):
B. Recognizing employees who perform safe and healthful work practices.
C. Training employees whose safety performance is deficient; and
D. Disciplining employees for failure to comply with safe and healthful work practices.

IV. **SYSTEM FOR COMMUNICATING WITH EMPLOYEES:**

A. Safety Meetings

TCF requires frequent tailgate meetings with individual work-groups to discuss safety issues and resolve problems. At a minimum, employees will be exposed to ½ hour per month of safety training/discussion. Also, tailgating will be held whenever work conditions change – e.g. foresters moving from burning to marking trees, contractors working at a mill site in an area which affects employees, special construction or maintenance projects are taking place, etc. to alert and/or remind employees to potential hazards.

B. Training

All employees will receive an overview of the IIPP during their initial orientation and can review a copy provided by their supervisor. Additional training, such as First Aid and Interagency Wildland Fire Certification, will be made available on an as needed basis. Employees and contractors that desire additional training should notify their supervisor or the Safety Officer.

C. Written Communications

TCF produces informational memos and handouts covering various safety topics. These sources of communication are posted for review by all employees. They include safety inspection reports and safety committee meeting minutes.

TCF's written IIPP is also assessable to all employees.

D. Anonymous Notification Procedures

TCF has a system of anonymous notifications whereby an employee who wishes to inform TCF of work place hazards may do so anonymously by notifying Safety Coordinator in writing or over the phone. The Safety Coordinator shall investigate, or cause to be investigated, all such reports in a timely manner.

V. HAZARD IDENTIFICATION

TCF will identify and evaluate work place hazards when the program is first established; whenever new substances, processes, procedures, or equipment are introduced to the work place that represents a new occupational safety and health hazard and whenever TCF is made aware of a new or previously unrecognized hazard.

A. General Elements To Identify and Evaluate Work Place Hazards
   1. Review of applicable General Industry Safety Orders and other safety orders that apply to the operation.
   2. Review of industry and general information (including Material Safety Data Sheets for chemicals used) about potential occupational safety and health hazards.
   3. Investigation of all incidents and unusual events that have occurred at these facilities.
   4. Periodic and/or scheduled inspections of general work areas and specific work stations.
   5. Evaluation of information provided by employees.

B. New Safety and Health Concerns

It is a requirement of all employees and contractors to notify the Safety Coordinator and provide appropriate documentation (location, MSDS, potential hazards, etc.) regarding any new substance, process, or equipment prior to its introduction to the workplace.

C. Employee Reporting of Hazards

Employees are required to immediately report any unsafe condition, unsafe action or other hazard that they discover in the work place to their supervisor or any safety committee member. No employee will be disciplined or discharged for reporting potential work place hazards or unsafe conditions.

Employees who wish to remain anonymous may report unsafe conditions as described above.

VI. PROCEDURE TO INVESTIGATE OCCUPATIONAL INJURY OR ILLNESS

A. Employee Responsibility

Employees shall immediately report all injuries occurring at work, no matter how slight, to their supervisor.

B. Supervisor's Responsibility

It is the Supervisor's responsibility to complete an Incident Investigation Report and, IF THE INJURED NEEDS TO GO TO A MEDICAL PROVIDER OFF-SITE, TO ACCOMPANY THE INJURED. The Supervisor will immediately alert the Safety Officer of any injuries requiring treatment other than first aid.

C. Incident Investigation Procedure

Incident where a hazard or condition persists after the occurrence of an incident, incidents where there is a potential for recurrence, and incidents where the Safety Officer judges that procedural or training deficiencies may have contributed to the incident will be investigated.

They may be investigated by the supervisor and employee only, an appointed investigator, or an incident review team depending on the nature and/or severity of the incident.

Employees have the right to an independent investigation by someone other than their supervisor if they feel additional investigation is necessary. All incidents will be investigated at the time of occurrence, or as soon thereafter as possible, but in no case later then twenty-four hours.

When appropriate, these investigations may include complete statements from the employee(s) involved, any witnesses to the injury and the injured employee's supervisor. A copy of all Incident Investigation Reports will be forwarded to the Safety Officer for review. Employees who do not cooperate with incident investigations will be subject to TCF's disciplinary policy.

VII. PROCEDURE TO CORRECT UNSAFE OR UNHEALTHYCONDITIONS, WORK PRACTICES, AND WORK PROCEDURES IN A TIMELY MANNOR BASED ON THE SEVERITY OF THE HAZARD.

A. Workplace Hazards

The causes of all incidents will be documented and reviewed immediately. Corrective actions including condition repair/modifications, retraining or disciplining for unsafe actions will be initiated immediately. Safety procedures will be reviewed, if necessary, by the combined efforts of the affected employees, supervisors and safety manager and or safety committee. Training programs and safe job operating procedures will also be modified, if appropriate, to prevent reoccurrence.

B. Imminent Hazards

When an imminent hazard exists which cannot be immediately abated without endangering employees and or property, all exposed employees will be removed from the area except those necessary to correct the existing condition. Employees needed to correct the hazardous condition shall be provided with the necessary training and Personal Protective Equipment. All such actions taken and dates they are completed shall be documented.

VIII. PROVISIONS FOR TRAINING AND INSTRUCTION

A. Policy

Awareness of potential health and safety hazards as well as knowledge of how to control such hazards is critical to maintaining a safe and healthful work environment. TCF is committed to instructing all employees in safe and healthful work practices. To achieve this goal, TCF shall provide training to each employee with regard to general safety and emergency procedures. Training shall also be provided by the effected employees' supervisor for any hazard or safety procedure specific to the employees work assignments as mandated by regulations or company safety programs. Records of all training shall be maintained in employee files.

B. When Training Will Occur.

1. When the program is first established.
2. To all new employees.
3. To all employees given a new job assignment for which training has not previously been received.
4. Whenever new substances, processes, procedures or equipment which represent a new hazard are introduced into the workplace.
5. Whenever TCF is made aware of a new or previously unrecognized hazard.
6. Whenever an employee, through observation or investigation is found deficient, they will be retained.

Supervisors must familiarize themselves with the safety and health hazards to which employees under their immediate direction and control may be exposed. Supervisors *shall be responsible to provide their employees with safety training to minimize or eliminate such exposure.*

C. Areas of Training

All areas or items identified in the IIPP.

All areas or items identified as specific to the performance of any task.

IX. RECORDS OF THE STEPS TAKEN TO IMPLEMENT AND MAINTAIN THE PROGRAM

Records of scheduled and periodic inspections to identify unsafe conditions and work practices, including person(s) conducting the inspection, the unsafe conditions and practices that have been identified and the action taken to correct the identified unsafe conditions and work practice. These records shall be maintained for at least one year. Documentation of safety and health training for each employee, including employee name or other identifier, training dates, types of training, and training providers. This documentation shall be maintained at least one year.

Social Benefit/Impact Assessment Memo
The Conservation Fund's North Coast Forest Conservation Program
Primary authors: Jenny Griffin and Evan Smith
Original: August 25, 2008; Updated September 2012

social: L socialis, fr. socius companion, ally, associate; akin to L sequi to follow. Of or relating to human society, the interaction of the individual and the group, or the welfare of human beings as members of society (Websters Seventh New Collegiate Dictionary, 1972).

The Conservation Fund's North Coast Forest Conservation Program endeavors to have a very positive impact in our local community. This is due in part to our charitable mission as a non-profit organization, which is broader than just environmental protection, and references economic development and education. It is also explicitly addressed as part of the Garcia River Forest Integrated Resource Management Plan:

"The Plan identifies and describes in detail the following general management goals:

- *Improve ecological conditions by increasing the viability of selected "conservation targets" identified during the planning process.*
- *Generate sufficient revenue to cover the costs of property taxes, on-site maintenance, management and restoration projects and, potentially, generate net revenues for other conservation initiatives.*
- *Practice continual improvement through adaptive management based on monitoring of ecological, financial and social values.*
- *Support the local business community by utilizing local contractors and suppliers.*
- *Engage the local community by providing compatible public access, educational and recreational opportunities."*

We pride ourselves on being very cognizant of and sensitive to the potential social impacts (positive and negative) of our forest management activities and the role we play in the community.

We have identified five primary social elements as integral to our program and organize our evaluation of potential social impacts/benefits around these elements. We have not had a formal prioritization of these elements—all are important for our evaluation and monitoring. The five elements, and examples of how they are addressed, are:

- Creative arts (eg. College of the Redwoods and Mendocino Art Center photography and painting workshops, elementary school writing and art projects, etc.)
- Economic/financial (e.g. employment, log sales, carbon sales, etc.)
- Recreational (e.g. interpretive walks, passive recreational access, Boy Scouts and Sierra Club hikes, Audubon trips, etc.)
- Science/education (e.g. EMAP project, UC Davis research, Humboldt State and other surveys, SONAR projects, PWA workshops, stakeholder tours, etc.)
- Spiritual (e.g. open space values, Children and Nature programs, Leopold and Thoreau philosophy-based programs, and access/utilization by Native tribes)

We consider social benefits as an integral part of our management planning. The social elements are assessed and described in various sections of our forest management plans, which include policies on such issues as recreational access, scientific monitoring priorities, and preference for local goods and services. In addition to management planning, our operational decision-making also includes evaluation of potential social impacts—ranging from maintaining a viable logging industry to resolving the concerns of a neighbor. Our forest management policies have very clear requirements for community engagement and local procurement—we require that every timber harvest plan and major watershed restoration project have publicly available summaries and provide opportunities for field tours before and after operation. We continually ask for feedback from the local community through tours and informal meetings and routinely adjust programs or projects to address concerns. As described above, having a positive impact in the community is a program objective; we evaluate our success at meeting this objective as part of our annual operations review. The discussion and results of the annual operations review then inform the next year's workplan and as appropriate will be included in updates to the management plans.

As part of our annual monitoring, we publicly report (via the Annual Review) our data on key activity metrics. Most relevant to this topic is reporting on local economic contribution, participants in our public access program, and number of public tours we host. In addition to these three metrics that seem to best track the community interest, we usually also include short features on specific harvests, restoration projects, or safety issues. We also keep a log of any criticisms the program receives and how those are resolved. These metrics and concerns are also reviewed annually by the local Advisory Council.

APPENDIX E

The Conservation Fund
North Coast Forest Conservation Program
2014 Fire Plan

This Fire Suppression Resource Inventory is being submitted to comply with 14CCR 918.1. Specific rule requirements cited in the plan are to be followed by contractors working in the woods at all times. This plan should not be construed to mean that untrained contractors or their personnel are required to actively fight wildland fires that occur on The Conservation Fund property.

The plan is to be kept with each employee or their assigned vehicle at all times. Copies to be provided to all Conservation Fund (TCF) employees and logging/road maintenance contractors operating on company managed lands. Copies provided to California Department of Forestry and Fire Protection (CAL FIRE) Northern region headquarters in Santa Rosa and on a CD to Mendocino ranger unit office in Willits (Howard Forest).

INTRODUCTION

The Conservation Fund owns and manages approximately 74,000 acres of timberland in five tracts on the Big River, Salmon Creek, Garcia River, Gualala River and Buckeye watersheds. Due to the risk that uncontrolled fire poses to its assets, The Conservation Fund manages its properties with careful and thorough consideration toward fire prevention, planning, and control. This Fire Plan is provided to acquaint all personnel with the policies and procedures for the current fire season. The policies and details listed in the following Plan apply across the entire TCF ownership and are not specific to any tract or area. Tract and area specific issues are conveyed through the maps attached at the end of the document. These maps display specific fire prevention and mitigation infrastructure, such as access points, roads, drafting sites, and helicopter landing sites.

POLICY STATEMENT

The Conservation Fund will respond within its capacity to all fires occurring within its ownership, as well as any uncontrolled fires which may threaten its ownership. TCF response will commence upon notification of a fire on or near TCF property, and with utmost concern for the safety of everyone involved.

TCF employees will take the immediate action necessary to contact appropriate fire control agencies once a fire is identified.

TCF employees will not place themselves or contractors at unreasonable risk during any response to a fire or during the course of fighting a fire. Safety is our first priority.

Appropriately-trained TCF employees and contractors may work at their discretion to contain and extinguish fires until the fire is taken over by the California Department of Forestry and Fire Protection (CAL FIRE) or some other responsible party.

TCF will cooperate with, and follow the direction of CAL FIRE or local fire protection departments responsible for fire protection on private lands.

To the extent information is available; relative humidity, temperature, wind direction and speed, overall fire season trends, and availability of resources shall be considered when determining appropriate action should an ignition occur.

TCF shall strictly enforce all laws, rules, and regulations governing logging operations during Fire Season.

TCF shall attend an Annual Fire Meeting at the beginning of the Fire Season, with representatives from CAL FIRE, logging contractors, and major adjacent forest landowners.

EMERGENCY TELEPHONE NUMBERS

TO REPORT A FIRE:

1. Call CAL FIRE Dispatch Howard Forest (707) 459-5336 or 459-7404 or Dial 911

   a) Give CAL FIRE the legal description (Township, Range & Section no. to the nearest ¼ section) and the approximate size of fire.

   b) Name of person reporting fire.

   c) Best access route(s) to the fire.

2. Call TCF emergency contact personnel in the order delineated below until a TCF representative is contacted in person:

   a) The TCF Office (707) 962-0712

   b) Scott Kelly, Timberland Manager (707) 272-4497

   c) Madison Thomson, Forester (707) 357-3919

   d) Don Miller, Security Patrol (707) 489-0315

   e) Mark Taylor, Security Patrol (707) 367-8366

   f) Evan Smith, VP Conservation Ventures (503) 407-0301

FIRE PREVENTION PROCEDURES

General Responsibilities for Logging Contractors, Road Crews and Consultants, herein after referred to as “Contractor”.

All persons working on or traveling through TCF property must strictly adhere to the following Fire Prevention Procedures:

918.3 Roads to be Kept Passable.
Contractors shall keep all logging truck roads in a passable condition at all times for fire truck and emergency vehicle traffic.

918.4 Smoking and Matches

Subject to any law or ordinance prohibiting or otherwise regulating smoking, smoking by persons engaged in timber operations shall be limited to cleared log landing areas. Burning material shall be extinguished in such areas of bare soil before discarding. Contractors shall specify procedures to guide actions of his employees or other persons in his employment consistent with this subsection.

918.5 Lunch and Warming Fires

Subject to any law or ordinance regulating or prohibiting fires, warming fires or other fires used for the comfort or convenience of employees or other persons engaged in timber operations shall be limited to the following condition:

1. There shall be a clearance of 10 feet (3.05 m) or more from the perimeter of such fires and flammable vegetation or other substances conducive to the spread of fire.

2. Warming fire shall be built in a depression in the soil to hold the ash created by such fires.

3. The Contractor shall establish procedures to guide actions of his employees or other persons in their employment regarding the setting, maintenance, or use of such fires that are consistent with (a) and (b) of this subsection.

Under no conditions will warming fires be permitted on TCF property during the declared fire season. The Fire season is determined by CAL FIRE and it generally extends until sufficient rain has fallen to reduce the chance of accidental ignition.

918.6 Posting Procedures

Contractors shall post notices which set forth lists of procedures that they have established consistent with this Fire Plan. Such notices shall be posted in sufficient quantity and location throughout their logging areas so that all employees, or other persons employed by them to work, shall be informed of such procedures. Contractors shall provide for diligent supervision of such procedures throughout their operations.

918.7 Blasting and Welding

Contractors shall provide for a diligent fire watch service at the scene of any blasting or welding operations conducted on their logging areas to prevent and extinguish fires resulting from such operations.

918.8 Inspection for Fire

The Contractor or his/her agent shall conduct a diligent aerial or ground inspection within the first two hours after cessation of felling, yarding, or loading operations each day during the dry period when fire is likely to spread. The person conducting the inspection shall have adequate communication available for prompt reporting of any fire that may be detected.

918.10 Cable Blocks

During the period when burning permits are required, all tail and side blocks on a cable setting shall be located in the center of an area that is either cleared to mineral soil or covered with a fireproof blanket that is at least 15 ft. in diameter. A shovel and an operational full five-gallon back pump or a fire extinguisher bearing a label showing at least a 4A rating must be located within 25 feet of each such block before yarding commences..

Fire Boxes
A sealed fire box shall be present on every active landing during the course of logging operations. It shall contain at least 2 shovels, 2 axes or Pulaski's, a chainsaw serviced with gas and oil and 1 five gallon back pack pump full of water. Fire equipment shall only be used in case of fire.

Heavy Equipment
All tracked or rubber tired equipment over 5,000 lbs GVW shall be equipped with one serviceable shovel and one serviceable chemical fire extinguisher of at least a 2A:10B:C rating (5 lb. capacity) or water stored pressure fire extinguisher with at least a 2A rating (2½ lb. capacity). Equipment shall have and maintain the factory exhaust system or equivalent.

Vehicles
Shall keep a serviceable shovel at least 46 inch total length, an ax or Pulaski, and a fully charged fire extinguisher with at least a 1A:10B:C rating (2½ lb. capacity) in their vehicle and must be equipped with the factory exhaust system or equivalent.

Chainsaws
Chainsaws shall be equipped with the original factory exhaust system or equivalent. A serviceable fire extinguisher must be located within 25 feet of the point of operation.

Firearms
The discharging of firearms is not permitted on TCF property

TCF Responsibilities

~~a)~~ Monitor fire weather daily during periods of extreme fire danger
b) All active operations may be required to be shut down when the relative humidity reaches 20% or lower, or when excessively high air temperatures are present.
c) All logging and road maintenance contractors shall be inspected for fire protection preparedness during the declared fire season. **Failure to comply will cause the job to be shut down until all fire protection measures are in place.**
d) Maintain and have ready fire equipment for immediate mobilization.
e) Use fire equipment only for fire related activities such as fire suppression and planned burning activities.
f) Each passenger vehicle shall be equipped with a fire extinguisher rated 1A:10B:C (2½ lb. capacity), shovel (46 inches in total length) and an ax.
g) TCF shall be a paid subscriber to the Mendocino County Cooperative Aerial Fire Patrol. Aerial flights are scheduled by CAL FIRE.
h) In the event that CAL FIRE announces "very high" fire danger or a "red flag warning" (extreme fire weather conditions), TCF shall determine whether any specific fire prevention measures need to be implemented and if so, shall transmit such measures to contractors for implementation.

INITIAL ACTION INSTRUCTIONS

Any action taken will be done in the safest manner possible. Your personal safety and the safety of other individuals working in the area is the highest priority.

a) Contractor will report the fire to CAL FIRE and TCF personnel as described above.
b) Provide a precise location (general area, ¼ Section, Township and Range) and size of the fire if possible.
c) Describe best access route(s) to the fire. Where possible, open gate(s) or have a TCF employee wait for CAL FIRE/local volunteer fire department at the specified gate, to lead them to the fire.
d) Determine escape routes from the fire and be prepared to evacuate nearby personnel. If no escape route exists evacuate personnel from the area to a safe location, generally a large open area.
e) An appropriately-trained TCF employee responding to a fire on TCF lands, or a fire that is posing an immediate threat to TCF lands may at his or her own discretion assist in coordinating initial fire suppression actions. Take the lead to designate duties and remain in communication with all resources. As soon as CAL FIRE arrives, TCF personnel shall brief them and turn control of the fire over to CAL FIRE personnel.
f) Place available equipment on standby or route to the fire area.
g) Request additional appropriate equipment needs.
h) Direct all water tenders to fill up with water.
i) Place fire locator signs to mark route to the fire.
j) Leave gates on access roads to fire open until the fire is out.
k) Stop all operations that are on or will use the access road to the fire. In extreme fire weather all active logging on the property shall be shut down.

RECOGNIZING FIRE DANGER BUILD-UP

There are many environmental factors affecting the probability of fire ignition and the rate of fire spread, including low relative humidity, high wind speeds, high atmospheric instability, and others. The Burning Index, which indicates severe fuel and atmospheric conditions for logging operations, takes these different factors into account in order to assess the potential for hazardous fire behavior. It is derived from a calculation involving the drying rate of fuels, the humidity, temperature, wind, and the state of curing of the growing plants. It cannot pinpoint the exact conditions in any one particular place. This leaves the Contractor with the responsibility of policing his own area and using good judgment in operating procedures. The Burning Index for coastal Mendocino County is available each day during Fire Season at (707)-459-7404.

OPERATIONAL FIRE SUPPRESSION RULES

Any action taken will be done in the safest manner possible. Your personal safety and the safety of other individuals working in the area is the highest priority. There is no requirement for untrained or unwilling personnel to fight fire on TCF property. The following rules apply to persons who find themselves actively fighting fires.

FIRE SAFETY

a) Personal Safety: The safety of yourself and crew is your highest priority if you find yourself or your crew in an unsafe situation all persons should leave the scene immediately. If you or your crew are directed by anyone including CAL FIRE to do something which you feel is unsafe you may decline to do so. Report any such incidence to the CAL FIRE incident commander and TCF.
b) Working alone on a fire shall not be permitted.
c) Only experienced and capable operators shall be placed on or operate power equipment such as bulldozers, water trucks and chain saws.
d) Hand tools will be carried and used in a safe manner. Protect yourself and the person working next to you by maintaining safe working separation. Watch your footing at all times.
e) Be alert as to what is going on around you (e.g. burning snags, rolling rocks, and logs). Rolling debris comes from above, but don't forget, burning snags do sometimes fall up the hill.
f) Snag fallers must be exceptionally thorough and accurate in their "Timber" call and must allow ample time for an answer before starting their saw for the final cut. Close correlation between hand trail crews and snag fallers is most important.
g) The Fire Boss is responsible for his/her personnel. Missing personnel is cause for alarm and an immediate investigation.
h) Tractors must be provided with lights when working at night.

OPERATION OF TRACTORS

a) Avoid carrying fire outside the lines.
b) Push hot material away from the line and into the fire.
c) Don't bury fire. Buried fire may burn undetected for weeks and break out later when thought to be under control.
d) Work the tractors in pairs on steep terrain so that one can get the other out of "jackpots".

OPERATION OF WATER TRUCKS AND PORTABLE PUMPS

a) Operate pumps at the recommended speed. Exceed this only temporarily when the emergency justifies.
b) When pumping downhill, use only the pressure needed; often times gravity is enough. Excessive pressure will burst a hose and cause dangerous and costly delays.
c) When filling water trucks or pumping directly from streams, utilize a hose with a screened inlet. Keep the intake hose in clean water. Sand and gravel will easily go through the volume pump and will foul the pressure pump.

d) Always keep a grease gun, screwdriver, pliers, and a crescent wrench with the water truck or water pump to facilitate minor pump adjustments. Good service is important with the portable pumps, which in most cases, must be carried to their place of operation.

USE OF HAND TOOLS

a) Keep hand tools sharp and ready for use at all times.
b) All hand tools must be securely handled. Axes and Pulaskis tend to dry out during the summer months. They should be checked regularly and tightened with wedges if necessary.
c) Tools rendered ineffective due to damage or use shall be removed from active use and repaired or replaced as soon as possible.

ENVIRONMENTAL PROTECTION

a) When drafting water, screens will be used to prevent the entrapment of aquatic vertebrates. Drafting sites will be located to minimize damage to the watercourse.
b) When possible, firebreaks shall be placed outside of watercourse and lake protection zones (WLPZs) and other riparian areas.
c) When possible, firebreaks shall avoid unstable areas.
d) Water bars shall be installed on tractor constructed firebreaks as a part of the final "mop-up" operation. Mulching with slash or straw shall be conducted in WLPZ's where necessary to prevent erosion.

TCF CONTACTS

Contact Order	Name	Home Phone #	Cell Phone #
1.	Scott Kelly		(707) 272-4497
2.	Madison Thomson		(707) 357-3919
3.	*Holly Newberger		(707) 357-3391

*Office and administrative support only/Fire dispatcher

TCF FIRE SUPPRESSION ORGANIZATION AND DUTIES

In the event that The Conservation Fund has to maintain fire suppression activities without the aid of CAL FIRE. The following is a list of individual fire suppression roles with their associated duties. In this hierarchical system, with fire fighter as the lowest rank and dispatcher as the highest, individuals report directly to the rank above them. Roles will be distributed between staff and contractors on the basis of experience and physical capacity.

Dispatcher/Fire Operations Manager (Holly Newberger)
Duties and Responsibilities: Maintains radio contact with TCF Fire Boss(es). Arranges for and dispatches equipment, personnel and supplies ordered by the Fire Boss. Maintains the following log/records:

• Daily log of contract equipment and personnel dispatched to each fire including numbers of personnel, supervisor, numbers and type of equipment, hours worked by shift.

• Daily log of all conversations, phone calls with CAL FIRE and others including the time, person talked to, fire command job title/function or other, and substance of the discussion. (Use the Incident Report Form).

Fire Boss (Scott Kelly or designee)
Duties and Responsibilities: Overall organization and supervision of suppression operations on each fire until relieved by CAL FIRE. Develops suppression strategy. Determines and manages manpower, equipment and supplies needs. Maintains personnel roster. Directly supervises crew bosses or fire fighters on small fires. Maintains radio/cellular contact with main office. Maintains contact with Crew Bosses as conditions dictate (intervals not to exceed two hours). Interacts with CAL FIRE hierarchy when present. Completes or directs other TCF personnel to complete the Wildfire Information Report Form. Ensures that the access route to the fire location is adequately signed.

Crew Boss (Scott Kelly or designee)
Duties and Responsibilities: Responsible for direct supervision of fire fighters engaged in suppression operations (e.g. tool complement, fire line location, width and construction; hose lays, mop-up operations). Follows directions and implements strategy developed by the Fire Boss. Monitors fire suppression progress and fire behavior and reports said information to Fire Boss at intervals not to exceed two hours. Coordinates with water truck pump operators. Directs location and construction of tractor firelines. Ensures replacement of worn-out or unusable tools/equipment. Knows the location of, and ensures the safety of each fire fighter on the crew at all times.

Fire Fighters
Duties and Responsibilities: Follows directions of Crew Boss and Fire Boss. Responsible for wearing protective clothing and gear (i.e. long-sleeve shirt, pants, boots, safety glasses, gloves, handkerchief, and hard hat). Wears ear protection and chaps when operating chainsaws; only operates power saws if trained and capable. Uses the proper tool for the specific task at hand. Reports unsafe conditions to Crew Boss. Reports broken or unusable tools to Crew Boss. Paces their work to forestall fatigue. Maintains a supply of personal drinking water. Keeps alert at all times and in contact with other crew members.

TCF EQUIPMENT RESOURCES

McClouds	3
Pulaskis	2
Shovels	4
Backpack pumps	2
Nomex shirts	2
BK radios	2
Fire shelters	2
Pick-ups	2

CONTRACTOR CONTACT LIST

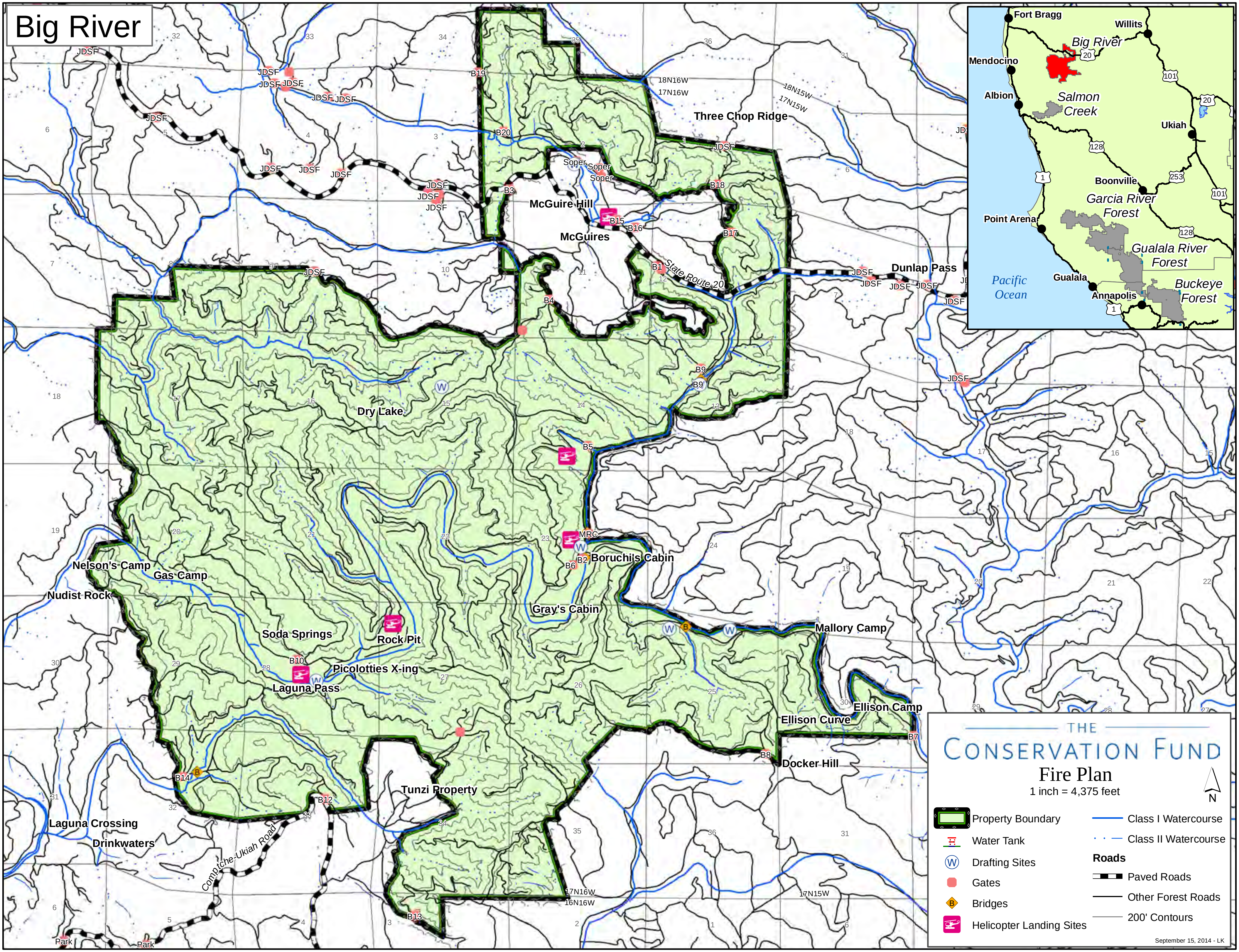
This is a partial list of potential contractors. TCF office will know which contractors are on site and who to contact, additional manpower and equipment may be ordered by the TCF office as deemed necessary by the Fire Boss.

Contractor	LTO#	Contact Persons	Home/mobile
Anderson Logging, Inc. P.O. Box 1266 Fort Bragg, CA 95437 (707)964-2770	A-7124	Mike Anderson Myles Anderson Don Sallinen Mark LeRoy Woods Office	964-0303/489-0837 964-2690/489-5805 961-0305/489-1625 964-0592/272-3706 964-4037
Barnett Logging 31651 Pudding Creek Road Fort Bragg, CA 95437	A-10343	Eddy Barnett	964-2542/357-1285
Bob Baker Trucking P.O. Box 655 Gualala, CA 95445		Bob Baker	884-3318
Christopher Blencowe 116 N Sanderson Way Fort Bragg, CA 95437		Chris Blencowe	964-1409/972-6768
Hautala & Mills Logging 27937 Highway #20 Fort Bragg, CA 95437	A-9276	Richard Hautala Parker Mills	964-2340/489-9556 877-3250/489-4587
Darcie Mahoney 30995 Greenwood Rd. Elk, CA 95432		Darcie Mahoney	877-3435/489-4865
Philbrick, Inc. P.O. Box 1288 Fort Bragg, CA 95437 (707) 964-2277	A-5697	Jerry Philbrick John Starkey	937-5919/489-0923 964-8809/489-2514
William T. Piper Logging P.O. Box 295 Manchester, CA 95459 (707) 882-2561		Bill Piper Robert Piper	489-5150 489-7923
Redwood Resources P.O. Box 1477 Fort Bragg, CA 95437 (707) 961-0347		Jesse Feidler	357-2677

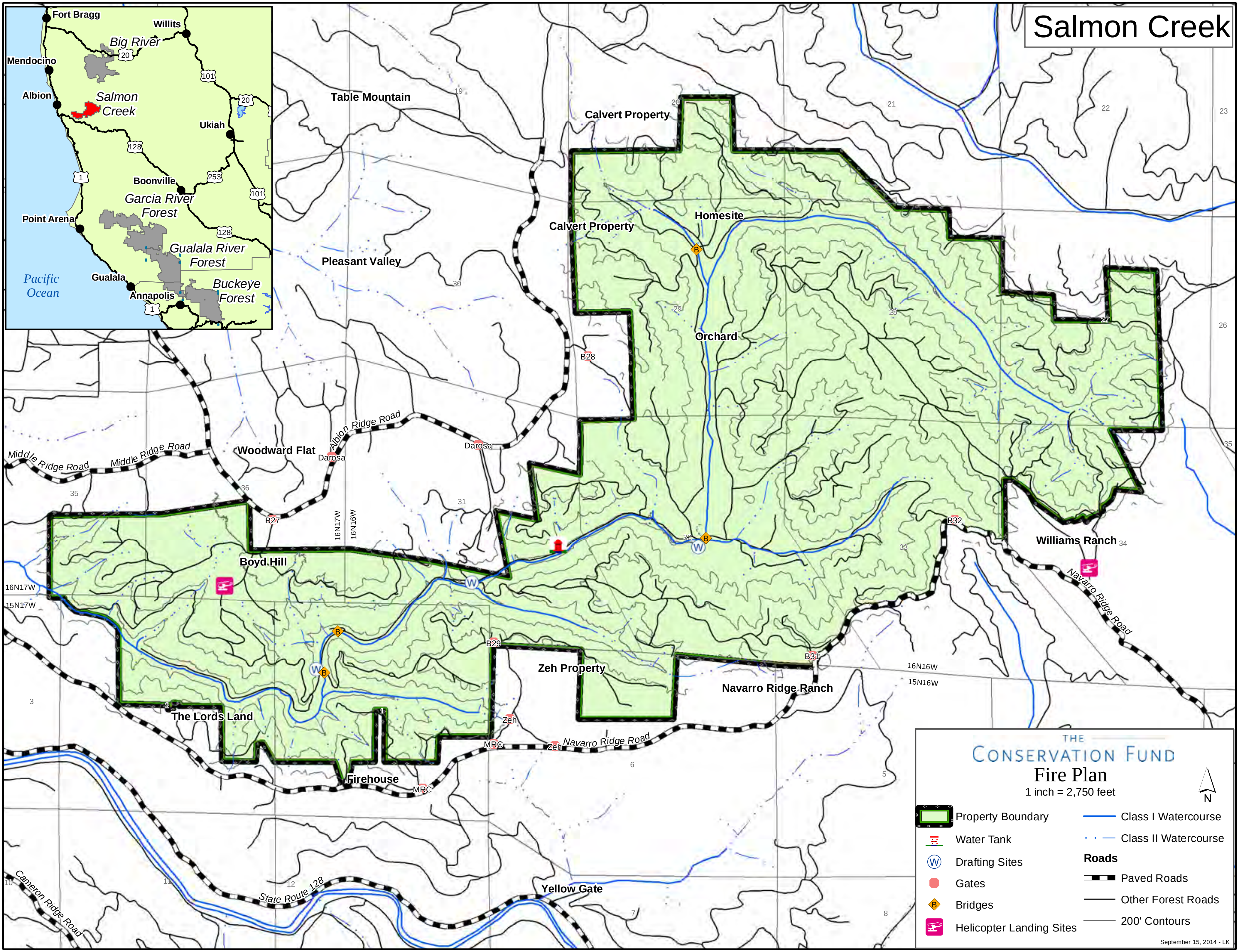
Shuster's Logging Inc. 550 East Valley Street Willits, CA 95490 (707) 459-4131	A-8080	Steve Shuster Randy Yanez	456-9475/272-7120 964-7369/489-0237
Stornetta Excavating P.O. Box 225 Point Arena, CA 95468		Stan Stornetta	884-9628/357-1654
Summit Forestry 16575 Franklin Road Fort Bragg, CA 95437		Lee Susan	964-4566/357-0906
Gary Swanson 31651 Cedar Street (707) 964-3519	C-762	Gary Swanson	964-3519/489-0152
T&S Logging Inc. P.O. Box 31 Philo, CA 95466 (707) 895-3751		Ed Slotte	489-1948
Wylatti Resource Mngmnt. PO Box 575 Covelo, CA 95428	A-851	Brian Hurt	(707) 983-6633 (707) 983-8184 (707) 489-1463

MAPS OF TCF OWNERSHIPS

Helicopter suitable landings
Water drafting sites
Environmentally sensitive areas



Big River
Three Chop Ridge
McGuire Hill
McGuires
State Route 20
Dunlap Pass
Dry Lake
Boruchi's Cabin
Gray's Cabin
Mallory Camp
Nelson's Camp
Gas Camp
Nudist Rock
Soda Springs
Rock Pit
Picolotties X-ing
Laguna Pass
Ellison Camp
Ellison Curve
Docker Hill
Tunzi Property
Laguna Crossing
Drinkwaters
Comptche-Ukiah Road
Fort Bragg
Willits
Mendocino
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Pacific Ocean
Gualala
Gualala River Forest
Annapolis
Buckeye Forest
THE CONSERVATION FUND
Fire Plan
1 inch = 4,375 feet
N
Property Boundary
Water Tank
Drafting Sites
Gates
Bridges
Helicopter Landing Sites
Class I Watercourse
Class II Watercourse
Roads
Paved Roads
Other Forest Roads
200' Contours
September 15, 2014 - LK


Salmon Creek
Fort Bragg
Willits
Big River
Mendocino
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
20
101
128
253
1
Table Mountain
Calvert Property
Calvert Property
Homesite
Pleasant Valley
Orchard
B28
Albion Ridge Road
Darosa
Darosa
Woodward Flat
Middle Ridge Road
Middle Ridge Road
B27
16N17W
16N16W
Boyd Hill
16N17W
15N17W
Williams Ranch
Navarro Ridge Road
B32
B29
B31
Zeh Property
16N16W
15N16W
Navarro Ridge Ranch
The Lords Land
Zeh
MRC
Zeh
Navarro Ridge Road
Firehouse
MRC
Yellow Gate
State Route 128
Cameron Ridge Road
THE CONSERVATION FUND
Fire Plan
1 inch = 2,750 feet
N
Property Boundary
Water Tank
Drafting Sites
Gates
Bridges
Helicopter Landing Sites
Class I Watercourse
Class II Watercourse
Roads
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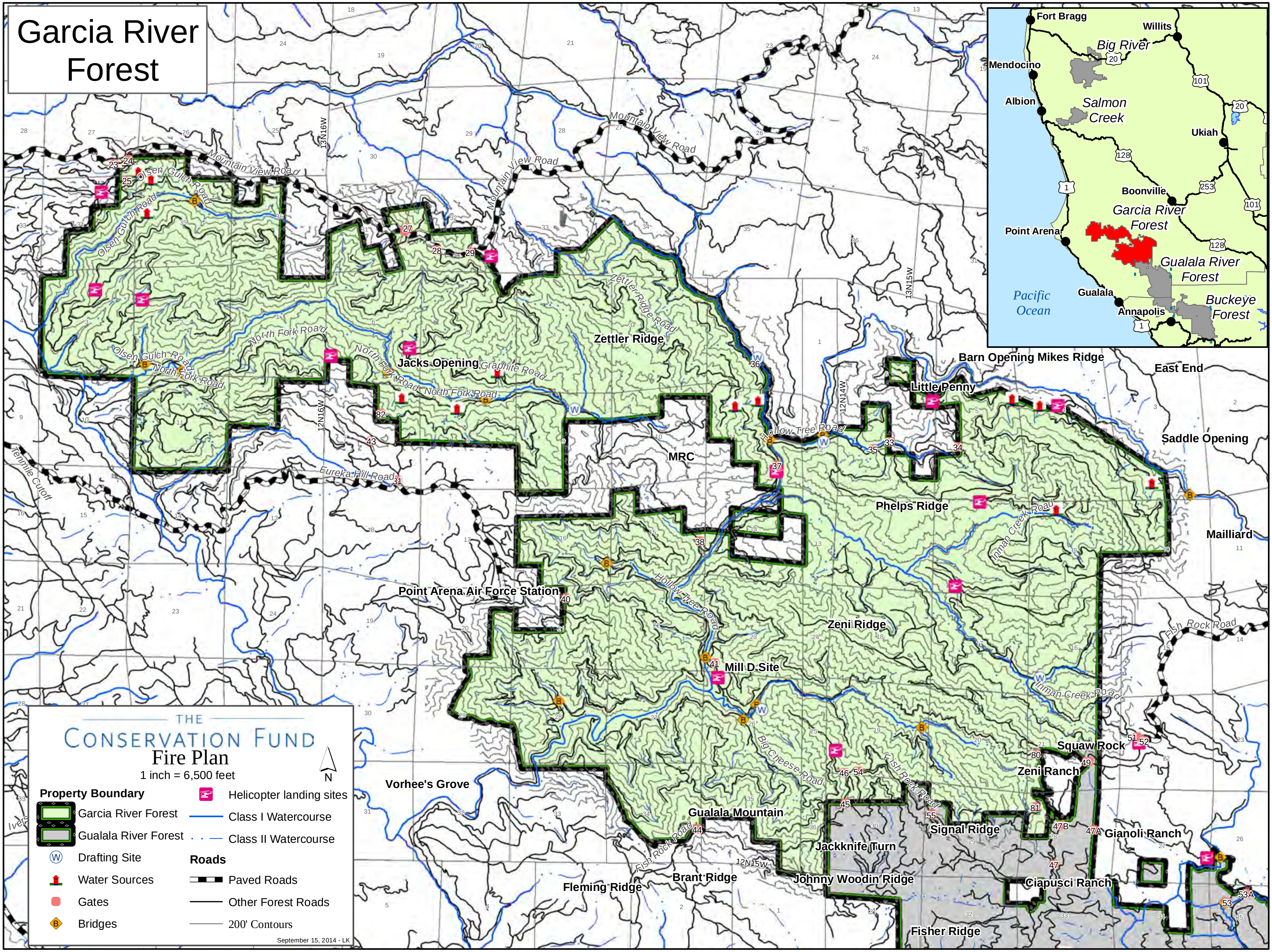
Garcia River Forest
THE CONSERVATION FUND
Fire Plan
1 inch = 6,500 feet
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Property Boundary
Garcia River Forest
Gualala River Forest
Drafting Site
Water Sources
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Helicopter landing sites
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Class II Watercourse
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September 15, 2014 - LK
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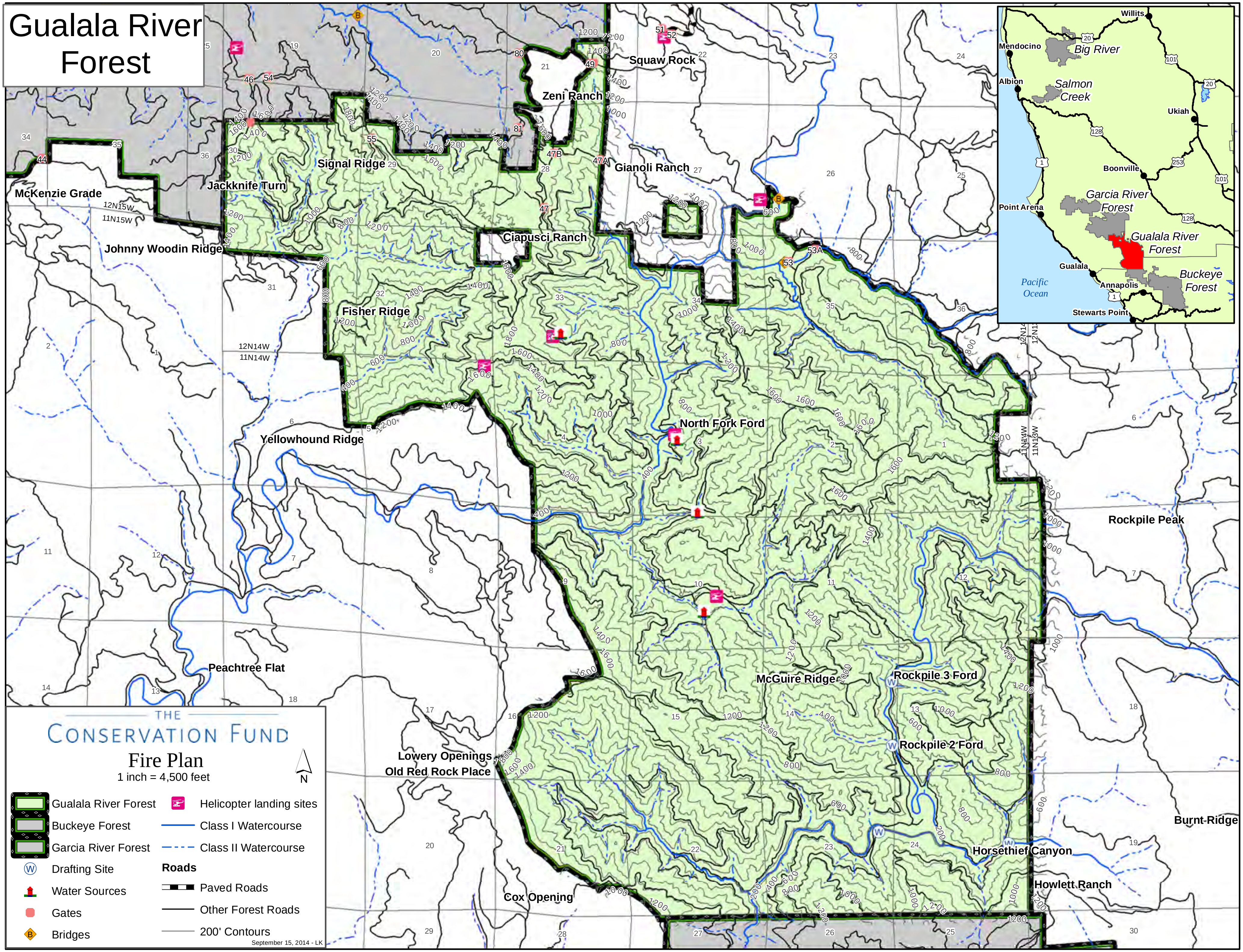
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Gualala River Forest
Pacific Ocean
Gualala
Annapolis
Buckeye Forest
Mountain View Road
Olsen Gulch Road
North Fork Road
Graphite Road
Jacks Opening
Zettler Ridge Road
Zettler Ridge
Barn Opening Mikes Ridge
East End
Little Penny
Hollow Tree Road
Saddle Opening
MRC
Eureka Hill Road
Tennmile Cutoff
Phelps Ridge
Inman Creek Road
Mailliard
Point Arena Air Force Station
Zeni Ridge
Fish Rock Road
Mill D Site
Big Cheese Road
Squaw Rock
Zeni Ranch
Vorhee's Grove
Gualala Mountain
Signal Ridge
Jackknife Turn
Gianoli Ranch
Brant Ridge
Fleming Ridge
Johnny Woodin Ridge
Ciapusci Ranch
Fisher Ridge
13N16W
12N16W
12N14W
13N15W
12N15W


Gualala River Forest
THE CONSERVATION FUND
Fire Plan
1 inch = 4,500 feet
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Gualala River Forest
Buckeye Forest
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Drafting Site
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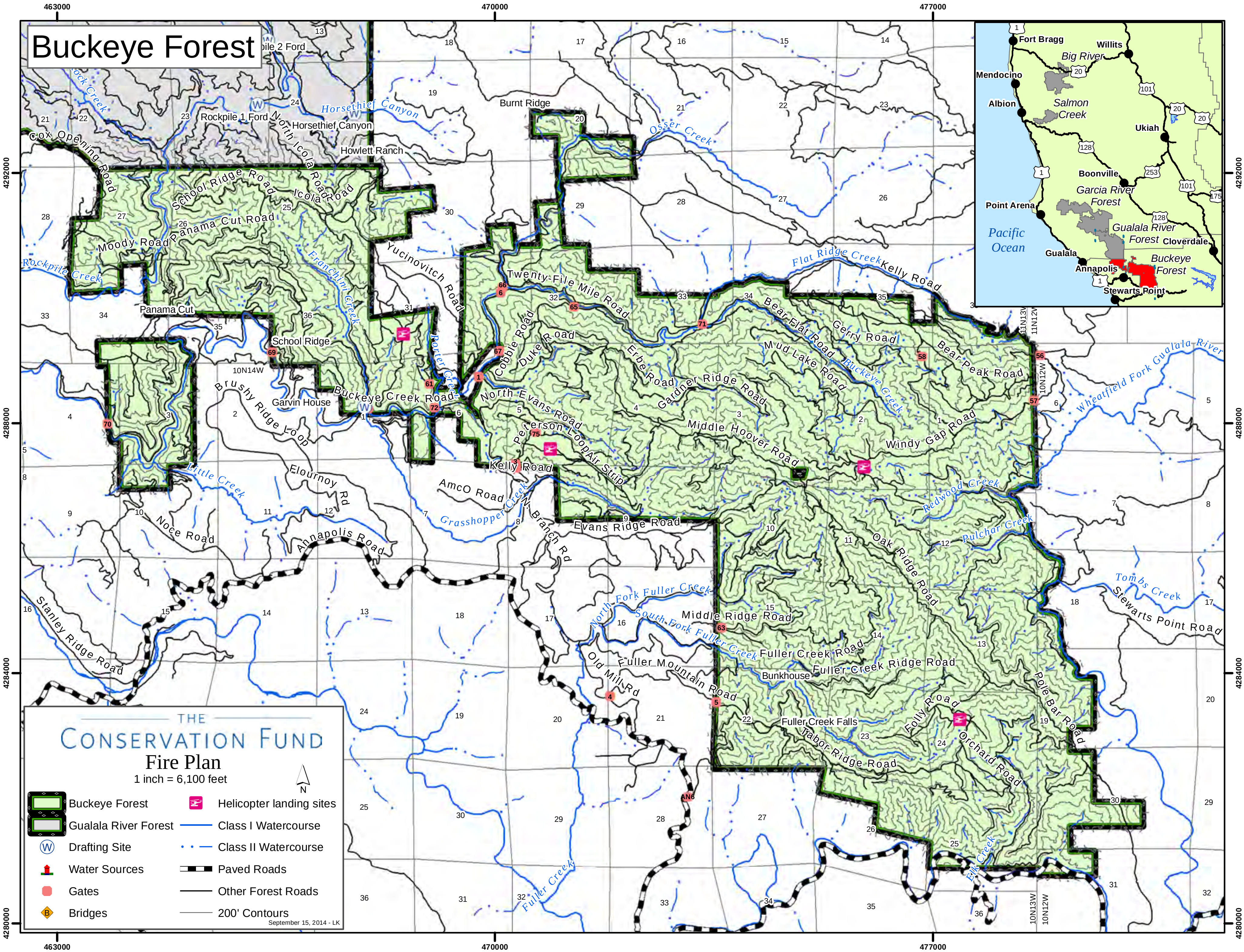
Helicopter landing sites
Class I Watercourse
Class II Watercourse
Roads
Paved Roads
Other Forest Roads
200' Contours
September 15, 2014 - LK
Squaw Rock
Zeni Ranch
Gianoli Ranch
Signal Ridge
Jackknife Turn
McKenzie Grade
Johnny Woodin Ridge
Ciapusci Ranch
Fisher Ridge
North Fork Ford
Yellowhound Ridge
Rockpile Peak
Peachtree Flat
McGuire Ridge
Rockpile 3 Ford
Rockpile 2 Ford
Lowery Openings
Old Red Rock Place
Burnt Ridge
Horsethief Canyon
Howlett Ranch
Cox Opening
12N15W
11N15W
12N14W
11N14W
12N13W
11N13W
Willits
Mendocino
Big River
Albion
Salmon Creek
Ukiah
Boonville
Point Arena
Garcia River Forest
Gualala River Forest
Gualala
Annapolis
Buckeye Forest
Pacific Ocean
Stewarts Point



Buckeye Forest
463000
470000
477000
4292000
4288000
4284000
4280000
Rockpile 2 Ford
Rockpile 1 Ford
Horsethief Canyon
Howlett Ranch
Burnt Ridge
Cox Opening Road
School Ridge Road
Icola Road
North Icola Road
Panama Cut Road
Moody Road
Rockpile Creek
Franchini Creek
Panama Cut
School Ridge
10N14W
Garvin House
Buckeye Creek Road
Brushy Ridge Loop
Little Creek
Flournoy Rd
Noce Road
Annapolis Road
Stanley Ridge Road
Yucinovitch Road
Porter Creek
Twenty-File Mile Road
Osser Creek
Flat Ridge Creek
Kelly Road
Cobble Road
Duke Road
North Evans Road
Peterson Loop
Air Strip
Kelly Road
AmcO Road
Grasshopper Creek
N. Branch Rd
Evans Ridge Road
Erbe Road
Gardner Ridge Road
Middle Hoover Road
Mud Lake Road
Bear Flat Road
Gerry Road
Buckeye Creek
Bear Peak Road
Windy Gap Road
Wheatfield Fork Gualala River
Redwood Creek
Pulchar Creek
Oak Ridge Road
Tombs Creek
Stewarts Point Road
North Fork Fuller Creek
South Fork Fuller Creek
Middle Ridge Road
Fuller Creek Road
Fuller Creek Ridge Road
Fuller Mountain Road
Old Mill Rd
Bunkhouse
Fuller Creek Falls
Tabor Ridge Road
Folly Road
Orchard Road
Pole Bar Road
Fuller Creek
Elk Creek
11N13W
11N12W
10N12W
10N13W
Fort Bragg
Willits
Big River
Mendocino
Albion
Salmon Creek
Ukiah
Boonville
Garcia River Forest
Point Arena
Pacific Ocean
Gualala River Forest
Cloverdale
Gualala
Annapolis
Buckeye Forest
Stewarts Point
THE CONSERVATION FUND
Fire Plan
1 inch = 6,100 feet
N
Buckeye Forest
Gualala River Forest
Drafting Site
Water Sources
Gates
Bridges
Helicopter landing sites
Class I Watercourse
Class II Watercourse
Paved Roads
Other Forest Roads
200' Contours
September 15, 2014 - LK

APPENDIX F

APPENDIX F: SPECIES-SPECIFIC OLD-GROWTH CHARACTERISTICS

Redwood Old Growth Characteristics

- Trees generally are in the upper 20% diameter class of the species on site
- Deep, plate-like bark patterns, fire resistant
- Flattened or irregular crowns, highly complex structure
- Highly reiterated crowns (multiple sprouting, replicated growth patterns)
- Large limbs, in excess of 6-8 in. diameter
- Crown debris accumulation
- Platforms
- Cavities, partial snag formation
- High presence of complex lichens and moss
- Cat-facing or basal burn cavities

Douglas-fir Old Growth Characteristics

- Trees generally are in the upper 20% diameter class for the species on site
- Bark deeply fissured, thick and fire resistant
- High presence of lichens and moss, where crown soils present, ferns
- Large lateral limbs in excess of 8-10 inches in diameter
- Fattened, irregular crowns with lower limbs with signs of decay and crown thinning
- Conks
- Partial sagging in tops
- Broken out tops
- Crown debris accumulation
- Specific to fir, trees along the margins of vegetation types, which represent the pioneer, tree individuals, which reoccupied the sites following disturbances. These normally will have limbs extending nearly to the ground and at times is wind shaped.

Hardwood Old Growth Characteristics (tanoak, live oak, black oak, madrone, laurel, chinquapin)

- Trees generally are in the upper 20% diameter class for the species on site
- Flattened or irregular crowns, highly complex structure
- Multiple branching crowns with few large well developed main limbs
- Large limbs, in excess of 4-12 inches in diameter
- Crown debris accumulation
- Platforms
- Cavities, partial snag formation
- Crown die-back
- Cat-facing or basal burn cavities

Source: http://www.mrc.com/key-policies/old-growth/

APPENDIX G

APPENDIX G: BUCKEYE FOREST MODELING BASED ON THE 2013 STAND INVENTORY

The following tables and figures were modeled using the Forest Planning and Projection System (FPS) software using data collected in the fall and winter of 2013. The modeling results presented describing acres of silvicultural methods and volume harvested demonstrate that TCF's general approach to achieved sustained yield is valid; they are not, however, presented as a concrete plan of action. TCF foresees the need to deviate from planned silviculture and volume harvested from time to time to account for site specific conditions and inherent stand variability.

Forest-wide Growth and Yield Tables

	Buckeye All Acres MBF Totals						Buckeye Unconstrained MBF Totals					
Period	Pre-Harvest Standing	Harvested	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth	Pre-Harvest Standing	Harvest	Post-Harvest Standing	Growth	Growth / Year	Harvest as a % of Growth
2013	136,533	0	NA	NA	NA	NA	116,379	0	NA	NA	NA	NA
2016-2020	165,259	9,236	197,747	41,724	8,345	**22%**	140,225	8,000	167,843	35,618	7,124	**22%**
2021-2025	197,747	9,998	233,483	45,734	9,147	**22%**	167,843	9,998	196,900	39,055	7,811	**26%**
2026-2030	233,483	12,004	272,333	50,853	10,171	**24%**	196,900	12,004	228,115	43,219	8,644	**28%**
2031-2035	272,333	17,472	310,960	56,099	11,220	**31%**	228,115	13,996	262,001	47,883	9,577	**29%**
2036-2040	310,960	15,084	361,846	65,970	13,194	**23%**	262,001	14,997	303,778	56,773	11,355	**26%**
2041-2045	361,846	16,118	419,496	73,768	14,754	**22%**	303,778	16,008	351,019	63,250	12,650	**25%**
2046-2050	419,496	17,062	475,836	73,403	14,681	**23%**	351,019	16,997	396,753	62,731	12,546	**27%**
2051-2055	475,836	24,554	523,206	71,925	14,385	**34%**	396,753	17,989	440,852	62,087	12,417	**29%**
2056-2060	523,206	19,037	575,853	71,684	14,337	**27%**	440,852	18,986	484,171	62,305	12,461	**30%**
2061-2065	575,853	20,182	628,314	72,643	14,529	**28%**	484,171	19,997	527,140	62,966	12,593	**32%**
2066-2070	628,314	22,026	678,792	72,504	14,501	**30%**	527,140	21,998	567,825	62,683	12,537	**35%**
2071-2075	678,792	24,799	725,958	71,964	14,393	**34%**	567,825	22,999	607,052	62,226	12,445	**37%**
2076-2080	725,958	24,040	773,405	71,488	14,298	**34%**	607,052	23,999	644,864	61,811	12,362	**39%**
2081-2085	773,405	26,079	818,582	71,256	14,251	**37%**	644,864	25,991	680,342	61,470	12,294	**42%**
2086-2090	818,582	27,994	861,394	70,806	14,161	**40%**	680,342	27,994	713,263	60,915	12,183	**46%**
2091-2095	861,394	30,759	900,585	69,949	13,990	**44%**	713,263	29,997	743,398	60,131	12,026	**50%**
2096-2100	900,585	32,251	937,248	68,914	13,783	**47%**	743,398	31,974	770,560	59,137	11,827	**54%**
2101-2105	937,248	34,073	970,841	67,666	13,533	**50%**	770,560	33,992	794,404	57,836	11,567	**59%**
2106-2110	970,841	36,042	1,001,140	66,341	13,268	**54%**	794,404	36,000	814,916	56,511	11,302	**64%**
2111-2115	1,001,140	39,522	1,026,827	65,209	13,042	**61%**	814,916	38,965	831,405	55,454	11,091	**70%**

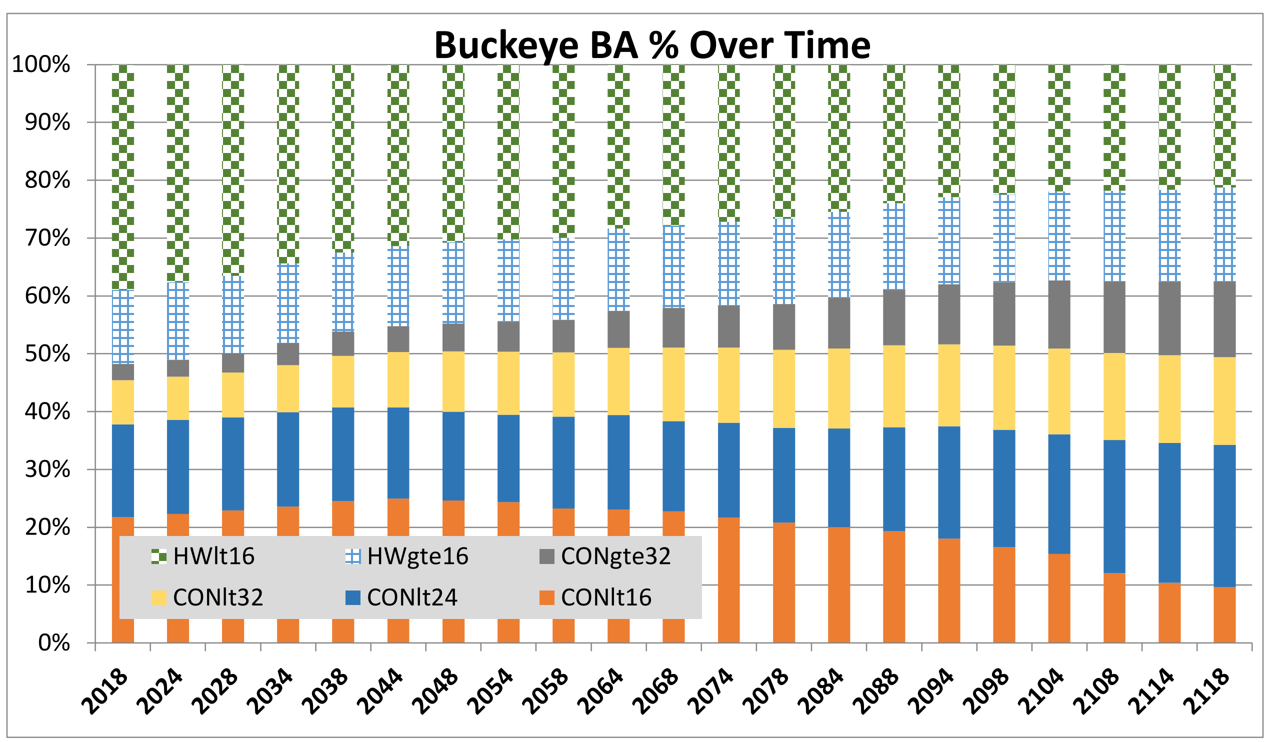
Note: There is an initial 1.5 MMBF total harvest constraint in the first period and this is slowly raised over time. Some other critical starting variables are:

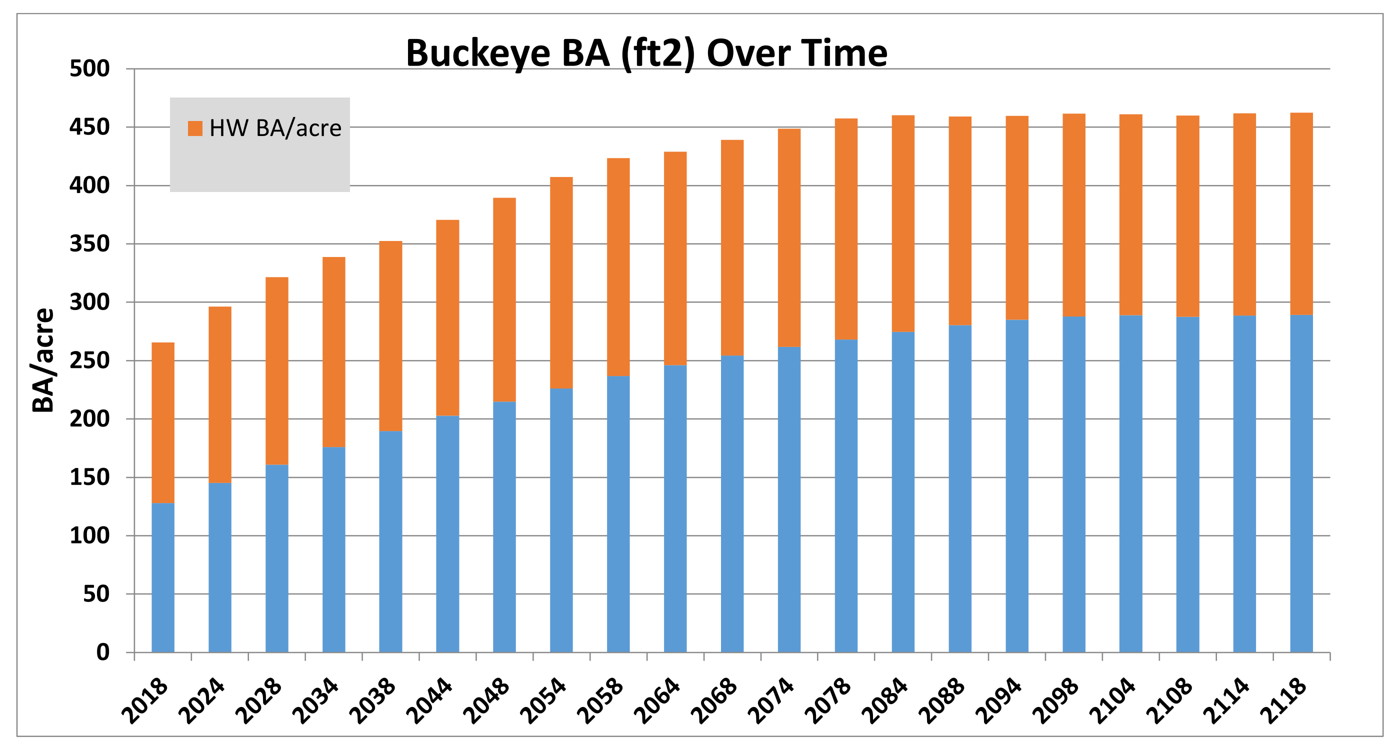
1) percent BA to Cut = 1/3
2) max Percent BF to Remove = 40%
3) min DBH for BA = 4”
4) target BA for good stands = 250, for poor stands = 200
5)min DBH to Cut = 12"
6) grown forward to 2016
7) 113 BA required for selection; 100 BA for transition

Percent Basal Area

Class	2018	2024	2028	2034	2038	2044	2048	2054	2058	2064	2068	2074	2078	2084	2088	2094	2098	2104	2108	2114	2118
CONgte32	86000.34	100774.9	123327	152034.7	170152.2	191892.6	215658.5	246744.7	277978.5	316294.5	350761.2	378909.8	419470.7	468303.4	509765	553938	586155.7	628988	658058.9	680631.2	702658.7
CONlt16	668433.2	765787.2	852358.9	924112.9	1000409	1071616	1110961	1148745	1139869	1147354	1157671	1128359	1103941	1068655	1026725	960726	886222.5	822648	643240.3	555813.2	514700.8
CONlt24	493627.1	558373.4	600252.1	640860.5	661587.8	676368.4	691994	711557.9	779555.7	809667.6	792274.5	851055.9	868128.3	906151.8	956999.9	1032627	1084591	1104931	1224412	1293396	1319499
CONlt32	235770.9	256244.6	288575	319571.2	365099.4	410349.9	471398.9	513384.6	545632.6	578206.6	646670	674929	714837.7	737838.9	753315.9	755603.1	777726.5	789604.6	803417.5	812752.6	812466
HWgte16	393252.1	458538.6	499471.6	536619	558661.7	594933.2	634799	670717.1	694648.5	708356.9	722925.7	751140.3	781877.1	791668.6	795648.4	801369	812010.4	821296.4	835872.6	850063.1	865866.3
HWlt16	1199132	1293096	1359737	1349425	1327215	1347411	1386724	1425750	1468474	1407468	1416015	1412793	1412159	1357975	1276523	1220259	1201467	1171970	1161169	1158516	1139812
Conifer Total	1483832	1681180	1864513	2036579	2197249	2350227	2490013	2620432	2743035	2851523	2947377	3033253	3106378	3180949	3246806	3302894	3334695	3346171	3329129	3342593	3349324
HW Total	1592384	1751634	1859209	1886044	1885877	1942344	2021523	2096467	2163122	2115825	2138941	2163934	2194036	2149644	2072171	2021628	2013477	1993267	1997042	2008579	2005678
Conifer BA/acre	128.0946	145.1311	160.9576	175.8116	189.6817	202.8878	214.9551	226.2138	236.7978	246.1632	254.4379	261.8514	268.164	274.6015	280.2867	285.1286	287.874	288.8646	287.3934	288.5558	289.1368
HW BA/acre	137.4656	151.2132	160.4998	162.8164	162.8019	167.6766	174.5119	180.9816	186.7357	182.6526	184.6482	186.8057	189.4043	185.5721	178.8841	174.5209	173.8173	172.0726	172.3985	173.3944	173.144

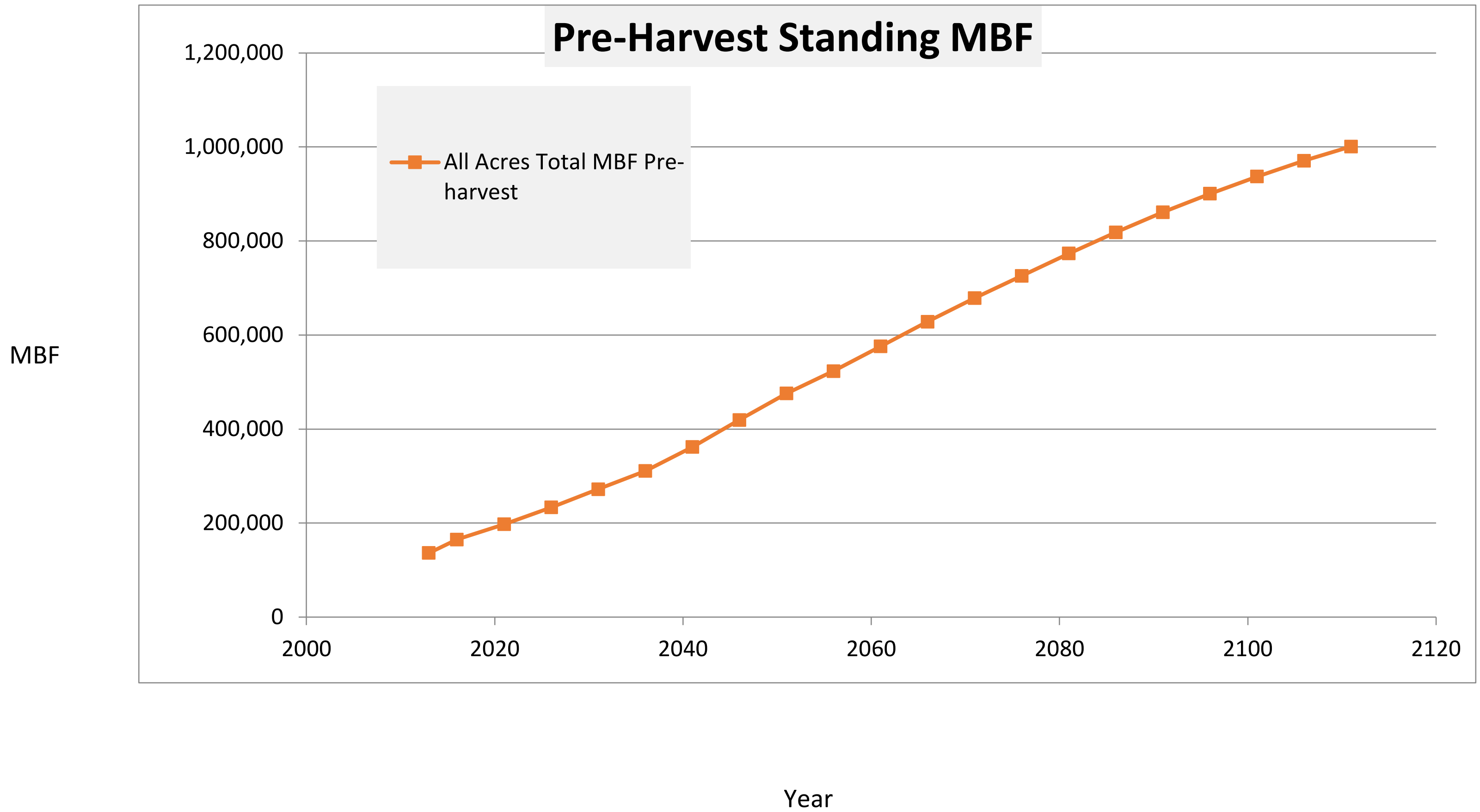
CONgte32 = conifer greater than or equal to 32” dbh
CONlt16 = conifer less than 16” dbh
CONlt24 = conifer less than 24” dbh
CONlt32 = conifer less than 32” dbh
HWgte16 = hardwood greater than or equal to 16” dbh
HWlt16 = hardwood less than 16” dbh





Forest-wide Harvested Acres by Year

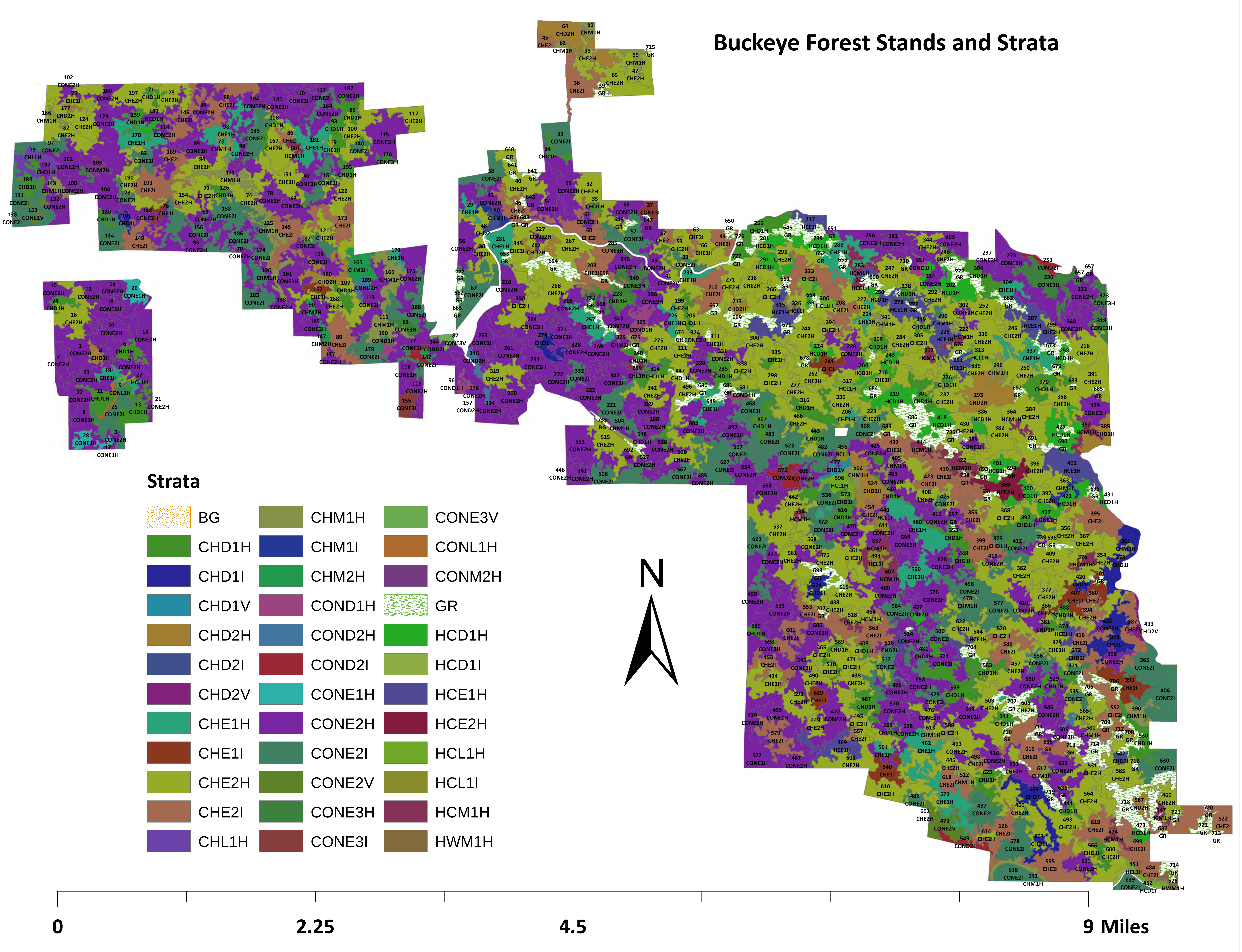
Period	Buckeye MBF/acre Results: Pre-Harvest Standing (All Acres)	Pre-Harvest Standing (Unconstrained Acres)	Harvest (All Harvested Acres)	Harvest (Unconstrained Acres)	Post-Harvest Standing (All Acres)	Post-Harvest Standing (Unconstrained Acres	Harvest/Year (All Acres)	Harvest/Year (Unconstrained Acres)
2013	7.6	7.6	NA	NA	NA	NA	0	0
2016-2020	9.2	9.2	4.8	5.8	12.9	11.0	1,847	1,600
2021-2025	11.0	11.0	6.7	6.7	15.2	12.9	2,000	2,000
2026-2030	13.0	12.9	7.5	7.5	17.8	14.9	2,401	2,401
2031-2035	15.1	14.9	5.8	9.2	20.3	17.1	3,494	2,799
2036-2040	17.3	17.1	8.6	8.7	23.6	19.8	3,017	2,999
2041-2045	20.1	19.8	9.9	10.1	27.4	22.9	3,224	3,202
2046-2050	23.3	22.9	10.3	10.5	31.1	25.9	3,412	3,399
2051-2055	26.5	25.9	8.0	11.8	34.2	28.8	4,911	3,598
2056-2060	29.1	28.8	11.8	11.9	37.6	31.6	3,807	3,797
2061-2065	32.0	31.6	11.9	12.2	41.0	34.4	4,036	3,999
2066-2070	34.9	34.4	12.3	12.4	44.3	37.1	4,405	4,400
2071-2075	37.7	37.1	7.5	13.1	47.4	39.6	4,960	4,600
2076-2080	40.4	39.6	16.4	16.6	50.5	42.1	4,808	4,800
2081-2085	43.0	42.1	17.3	18.5	53.4	44.4	5,216	5,198
2086-2090	45.5	44.4	18.3	18.3	56.2	46.6	5,599	5,599
2091-2095	47.9	46.6	8.9	15.5	58.8	48.5	6,152	5,999
2096-2100	50.1	48.5	15.3	15.5	61.2	50.3	6,450	6,395
2101-2105	52.1	50.3	14.3	15.0	63.4	51.9	6,815	6,798
2106-2110	54.0	51.9	18.7	18.8	65.4	53.2	7,208	7,200
2111-2115	55.7	53.2	12.7	25.0	67.0	54.3	7,904	7,793



Pre-Harvest Standing MBF
All Acres Total MBF Pre-harvest
MBF
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2000
2020
2040
2060
2080
2100
2120
Year

	Buckeye Silvicultural Acres by Period									
Year	**WLPZ1**	**WLPZ2**	**standard**	**transition**	**VR40**	**VR60**	**CommThin**	**ConRelease**	**Rehab**	**Sum**
2016-2020	10	533	1,274	63	46	0	0	0	0	**1,926**
2021-2025	0	0	1,490	4	8	0	0	0	0	**1,501**
2026-2030	0	0	1,589	0	1	0	0	0	0	**1,590**
2031-2035	353	1,127	1,445	0	28	44	0	0	0	**2,997**
2036-2040	22	22	1,529	160	28	0	0	0	0	**1,761**
2041-2045	29	16	1,589	0	0	0	0	0	0	**1,634**
2046-2050	9	15	1,626	0	0	0	0	0	0	**1,650**
2051-2055	383	1,152	1,523	0	0	0	0	0	0	**3,059**
2056-2060	6	11	1,596	0	0	0	0	0	0	**1,613**
2061-2065	35	30	1,637	0	0	0	0	0	0	**1,702**
2066-2070	0	9	1,780	0	0	0	0	0	0	**1,789**
2071-2075	401	1,153	1,756	0	0	0	0	0	0	**3,310**
2076-2080	3	11	1,450	0	0	0	0	0	0	**1,465**
2081-2085	56	48	1,404	0	0	0	0	0	0	**1,508**
2086-2090	0	0	1,533	0	0	0	0	0	0	**1,533**
2091-2095	424	1,119	1,931	0	0	0	0	0	0	**3,474**
2096-2100	0	45	2,065	0	0	0	0	0	0	**2,111**
2101-2105	63	54	2,272	0	0	0	0	0	0	**2,389**
2106-2110	0	8	1,919	0	0	0	0	0	0	**1,928**
2111-2115	435	1,128	1,556	0	0	0	0	0	0	**3,118**

WLPZ1 = prescription of around Class I and Large Class II stream courses
WLPZ2 = prescription around standard Class II stream courses
Standard = single tree selection
VR40 = 40 acre variable retention
VR60 = 60 acre variable retention
CommThin = commercial thinning
ConRelease = conifer release


Buckeye Forest Stands and Strata
Strata
BG
CHD1H
CHD1I
CHD1V
CHD2H
CHD2I
CHD2V
CHE1H
CHE1I
CHE2H
CHE2I
CHL1H
CHM1H
CHM1I
CHM2H
COND1H
COND2H
COND2I
CONE1H
CONE2H
CONE2I
CONE2V
CONE3H
CONE3I
CONE3V
CONL1H
CONM2H
GR
HCD1H
HCD1I
HCE1H
HCE2H
HCL1H
HCL1I
HCM1H
HWM1H
N
0
2.25
4.5
9 Miles

Buckeye Forest Stand Volume by Species Group Summary

Strata	Total Acres in Strata	Weighted Average BF/acre							
		DF	RW	SP	TO	OH	Hardwoods	Conifers	Totals
CHD1H	904	3,937	1,556	231	439	1,851	2,289	5,724	8,014
CHD1I	201	4,564	228	0	777	692	1,469	4,791	6,260
CHD1V	13	7,804	0	0	0	944	944	7,804	8,747
CHD2H	296	6,883	656	0	268	2,102	2,370	7,539	9,909
CHD2I	29	2,663	2,973	516	4,390	316	4,706	6,152	10,857
CHD2V	10	1,084	0	0	0	2,253	2,253	1,084	3,337
CHE1H	585	2,547	2,920	478	1,129	1,341	2,470	5,945	8,415
CHE1I	157	4,945	50	331	861	431	1,291	5,326	6,617
CHE2H	5,198	3,893	2,984	333	1,903	1,512	3,415	7,210	10,625
CHE2I	1,708	2,540	2,949	636	2,822	1,259	4,081	6,126	10,207
CHL1H	35	759	2,407	860	66	855	922	4,026	4,947
CHM1H	328	1,853	4,146	65	1,437	584	2,021	6,063	8,084
CHM1I	21	1,426	1,475	0	0	708	708	2,901	3,609
CHM2H	50	2,539	4,070	355	1,287	407	1,694	6,965	8,659
COND1H	54	3,306	6,952	193	1,900	1,289	3,190	10,451	13,640
COND2H	27	662	7,839	712	0	252	252	9,213	9,465
COND2I	57	6,006	8,081	2,417	332	0	332	16,505	16,837
CONE1H	34	5,021	2,907	0	1,020	0	1,020	7,928	8,947
CONE2H	5,052	4,709	4,534	605	2,487	831	3,319	9,848	13,167
CONE2I	1,872	8,183	3,735	436	1,473	922	2,395	12,354	14,748
CONE2V	62	3,270	2,301	0	5,544	462	6,006	5,571	11,577
CONE3H	165	9,122	3,283	243	3,258	273	3,532	12,648	16,180
CONE3I	33	12,955	0	0	4,835	0	4,835	12,955	17,791
CONE3V	9	8,545	5,671	0	5,367	0	5,367	14,216	19,583
CONL1H	5	661	359	0	0	0	0	1,020	1,020
CONM2H	9	987	9,616	0	0	475	475	10,603	11,078
HCD1H	363	1,178	468	0	0	3,475	3,475	1,646	5,121
HCD1I	9	3,631	0	0	0	2,576	2,576	3,631	6,208
HCE1H	332	2,323	0	419	272	2,700	2,972	2,742	5,714
HCE2H	48	7,022	8,124	0	745	2,827	3,572	15,146	18,718
HCL1H	91	80	0	0	0	1,164	1,164	80	1,244
HCL1I	38	91	0	0	0	0	0	91	91
HCM1H	178	1,112	260	0	177	1,205	1,381	1,371	2,752
HWM1H	7	0	0	0	0	1,051	1,051	0	1,051

Forest Stratification System
Guide to Strata Codes

Category	Class Names	Class Breaks
Percent Conifer Canopy Cover	CON: more than 75% Conifer Crown Cover CH: between 50% and 75% Conifer Crown Cover CH: between 25% and 50% Conifer Crown Cover HW: less than 25% Conifer Crown Cover	25% conifer crown cover bins. The LiDAR-derived crown segmentation was assigned a conifer or hardwood call based on the crown shape.
Percent Canopy Cover ofer 25ft	O (Open): less than or equal to 20% cover L (Low): between 20% and 40% cover M (Medium): between 40% and 60% cover D (Dense): between 60% and 80% cover E (Extremely Dense): over 80% cover	20% canopy cover bins where % cover is defined as the cover of crown elements above 25ft tall.
Mean Tree Height	1, 2, 3, 4, 5, 6, 7	25ft height bins of mean tree height
Tree Height Variablility (Coefficient of Variation of Tree Height)	H (Homogeneous) I (Intermediate) V (Variable)	Homogeneous stands are any stand with CV < .23, Intermediate: .2 3 <= CV < .33, and Variable: CV >= .34

APPENDIX H

Memorandum of Understanding – Buckeye Forest Public Access

THIS MEMORANDUM OF UNDERSTANDING ("MOU") is entered into as of March 2, 2017 ("Effective Date"), by and between Sustainable Conservation, Inc., (a Maryland corporation doing business in California as "Buckeye Forest" and a supporting organization of The Conservation Fund existing under sections 501(c)(3) and 509(a)(3) of the U.S. Internal Revenue Code) (hereinafter "SCI"), the Sonoma County Agricultural Preservation and Open Space District, a public agency formed pursuant to the provisions of Public Resources Code sections 5500 *et seq.* ("District"), and the California State Coastal Conservancy ("Conservancy"), (collectively, "the Parties").

Background

A. In connection with its purchase of the Buckeye Forest ("Forest"), SCI sold that certain conservation easement recorded in the Office of the Sonoma County Recorder on May 31, 2013 as Instrument No. 2013056475 ("Easement") to the District.

B. The Conservancy provided a $10 million dollar grant to SCI for the fee purchase of the Forest (Conservancy Grant Agreement No. 12-099, "Grant"). "Compatible public access" is among the acquisition purposes of the Grant. The Grant requires SCI to submit recommendations for public access to the Conservancy within two years of Grant authorization, and the Easement requires SCI to develop a Recreational Use Plan within 2 years of the recordation of the Easement. (Additional Grant Condition 6; Easement Section 5.2.6(b).) The Easement also requires SCI to "at a minimum . . . make the [Forest] available for guided public tours no less than 6 times a year." (Easement Section 5.2.6(a)). In addition, the Easement states that "legal access to the [Forest] ... is limited and may preclude or strictly limit public access" and that "[n]othing [in the Easement requires SCI] to perfect legal access beyond that which has been established at the time of the grant of this Easement." (Easement Section 5.2.6(c).)

C. The Parties agree that unsupervised daytime public access to the Forest is preferable to guided tours and that guided tours may be impractical at this time. In light of the foregoing, and because successful implementation of unsupervised daytime public access to the Forest will render guided tours unnecessary, the Parties agree it is in their mutual interest to delay implementation of guided tours in accordance with the provisions of this MOU so that available resources can instead be directed towards the development of unsupervised daytime public access to the Forest that is safe, feasible and consistent with applicable property rights.

D. Separately, the Sonoma County Regional Parks Department ("County") owns and operates the Soda Springs Reserve ("Reserve") which is adjacent to the Forest. The public accesses the Reserve over Kelly Road pursuant to a license agreement between the County and Kelly Road, LLC ("License"). The License expires on July 31, 2022, unless renewed by the County and Kelly Road, LLC. Over the last year, the Parties and County have discussed and evaluated the possibility of providing public access to the Forest through the Reserve.

Thus, the Parties agree as follows:

Agreement

1. Evaluation of Public Access Solutions. Within 60 days of the Effective Date of this MOU, SCI will retain appropriate engineering services and pay the costs of title review and survey costs to evaluate a public access solution through the Reserve that is consistent with the County's License and other rights currently held by SCI. SCI will provide copies of all reports received from the consultants retained by SCI for these engineering and survey services to the District and Conservancy. Final engineering and survey reports shall be prepared and delivered to all Parties within 120 days of the Effective Date of this MOU. The Parties shall thereafter meet and confer regarding the viability of the public access solution(s) that can be identified based on all available information. For purposes of this MOU, a "Public Access Solution" is one in which the obligations of each Party whose participation or contribution will be required to implement the Public Access Solution have been specified and agreed to by each Party in writing.

a. *Public Access Solution Identified.* If a Public Access Solution satisfactory to the Parties is identified, SCI will, within 60 days of District's written request therefor, develop a Recreational Use Plan in accordance with Section 5.2.6(b) of the Easement describing the Public Access Solution, including a description of the type of access, access points and routes, and any restrictions, as well as a timeline for implementation and any phasing the Parties may have agreed to in developing the Public Access Solution, and submit such plan to the District for its review and approval. The Parties agree that SCI's failure to comply with this Paragraph 1(a) of this MOU will be considered a violation of Section 5.2.6(b) of the Easement. If implementation of a Public Access Solution is dependent upon the acquisition of additional property rights, the Parties will discuss the feasibility of acquiring such rights, provided, however, that no Party shall be obligated by this MOU to contribute funds to the acquisition thereof. In the event the Parties agree to pursue acquisition of additional property rights, they shall meet as often as may be necessary to advance the acquisition process until this MOU expires.

b. *Public Access Solution Not Identified.* If a Public Access Solution has not been identified within 365 days of the Effective Date of this MOU or is identified but not fully implemented within three (3) years of the Effective Date of this MOU, regardless of the cause(s) of the failure to implement the Public Access Solution, SCI will, within 60 days of the District's written request therefor, develop and submit to the District for its review and approval a Recreational Use Plan providing for guided tours in accordance with Sections 5.2.6 (a) and 5.2.6(b) of the Easement. The Recreational Use Plan shall describe the number and schedule of tours to be provided by SCI, access points and routes, any specific themes and/or key destinations, modes of advertisement, and process for annual reporting. The Parties agree that SCI's failure to comply with this Paragraph 1(b) of this MOU will be considered a violation of Section 5.2.6(b) of the Easement.

c. *Implementation of Public Access.* SCI will commence to offer the public access opportunities set forth in the Recreational Use Plan developed pursuant to Paragraph 1(a) or Paragraph 1(b), as the case may be, not later than 60 days following the District's written notice of approval of the applicable Recreational Use Plan, provided however that guided tours shall only be required to occur between May and October of each year. The Parties agree that SCI's failure to comply with this Paragraph 1(c) of this MOU will be considered a violation of Section 5.2.6(a) of the Easement.

2. Affirmation of Easement and Grant; Non-waiver. Nothing in this MOU shall be deemed or construed to amend, modify, expand or limit the terms and conditions of the Easement and Grant, which shall remain in full force and effect notwithstanding this MOU, nor shall this MOU be deemed or construed to be a waiver or forfeiture of any party's right to enforce any of the terms and conditions of the Easement or Grant in the future. The Parties reserve all of their respective rights and remedies under the Easement and the Grant with respect to the subject of this MOU.

3. Right to Request Easement Amendment. In the event that a Public Access Solution is identified and implemented via this MOU, SCI and the District agree to amend the Easement in accordance with Section 20 thereof so as to make clear that the implemented Public Access Solution fulfills SCI's obligations pursuant to Section 5.2.6(a) of the Easement. Such amendment is subject to Conservancy approval in accordance with Section 31 of the Easement.

4. Term. This MOU shall remain in effect for four (4) years. Unless the Parties mutually agree in writing to an extension, this MOU will expire at that time without the need for written confirmation of such termination.

5. No Admissions. This MOU does not constitute an admission by any party of liability or an admission that any cause of action exists in favor of any party as to any matter referred to in this MOU.

6. Integration. This writing is intended both as the final expression of the agreement between the parties hereto with respect to the included terms and as a complete and exclusive statement of the terms of the agreement, pursuant to California Code of Civil Procedure Section 1856. Each party acknowledges that, in entering into this MOU, it has not relied on any representation or undertaking, whether oral or in writing, other than those which are expressly set forth in this MOU. No modification of this MOU shall be effective unless and until such modification is evidenced by a writing signed by both Parties.

7. Governing Law. This MOU shall be governed by and construed in accordance with the laws of the State of California.

8. Counterparts. This MOU may be executed in any number of counterparts, and each of these executed counterparts shall have the same force and effect as an original instrument and as if all of the Parties to the aggregate counterparts had signed the same instrument.

9. Successors and Assigns. The Parties intend that this MOU shall benefit and burden, as the case may be, their respective successors, assigns, heirs, executors, administrators, agents, officers, employees, and all other persons claiming by or through them pursuant to the common and statutory law of the State of California.

10. Authority. Each of the signatories to this MOU warrants that he or she has been duly authorized by the party on whose behalf he or she is signing to execute this MOU on said party's behalf and to bind said party to this MOU.

11. Informed Consent. Each party acknowledges that it has been given the opportunity to read this entire document, and it has been given an opportunity to review it with their attorney.

By executing below, each party agrees to be bound by this MOU.

SUSTAINABLE CONSERVATION, INC.

By: ____________________
Name: Elizabeth Engle
Title: Assistant Secretary

Date: 2/3/17

SONOMA COUNTY AGRICULTURAL PRESERVATION AND OPEN SPACE DISTRICT

By: William J. Keene
Name: William J. Keene
Title: General Manager

Date: 3/2/2017

STATE OF CALIFORNIA
COASTAL CONSERVANCY

By: ____________________
Name: Sam Schuchat
Title: Executive Officer

Date: 2/23/17