St. Dorothy's Rest

FOREST MANAGEMENT PLAN

California Cooperative Forest Management Plan

(electronic)

(Version 7-5-2012)

Property Name: _____

Property Location Address: _____

Owner Name (s): _____

Plan Author:

Signature:_____

Phone: _____ RPF#: _____

This management plan outlines the conditions and capability of property resources, documents the landowner's objectives and decisions and identifies potential resource improvement projects. It is meant to be a flexible and educational document that considers a planning horizon of at least 5 years but may include objectives that require a much longer time period.

This management plan template meets management plan requirements for grant agreements and other provisions available through CAL FIRE, NRCS, USFS, and the American Tree Farm Association. Signature Pages are provided to document acceptance of this management plan in meeting those requirements.

This management plan is a tool for and belongs to the landowner. Signatures are only required for that entity providing funding as requested by the landowner.

SIGNATURES AND APPROVALS

This Forest Management Plan is provided as a guide to help you accomplish the objectives that you have for your forest. This Forest Management Plan will guide you in achieving the benefits of managing your forest and forest related resources. With this Forest Management Plan, you are eligible to participate in the California Department of Forestry and Fire Protections California Forest Improvement Program (CFIP), US Forest Service's Forest Stewardship Program (USFS), the American Forest Foundation's American Tree Farm System (ATFS) and The Natural Resources Conservation Service (NRCS) programs. This plan will need to be reviewed and approved by representatives for each of the programs that are providing funding.

I have reviewed this plan and approve its content.

_____ _____

Landowner (s) **Date**

USFS Forest Stewardship Program

I certify that this Forest Management Plan meets the requirements of the federal Forest Stewardship Program.

_____ _____

Plan Preparer Date

I certify that this Forest Management Plan meets the requirements of the federal Forest Stewardship Program.

_____ _____

Stewardship Forester Date

Forest Stewardship Tracking Number: _____

NRCS Cost Share Programs including EQIP

I certify that this Forest Management Plan meets the requirements of the USDA-NRCS Programs and/or the Quality Criteria for forest activity plans in Section III of the USDA NRCS Field Office Technical Guide.

_____ _____ _____

Technical Service Provider Date RPF Number

I certify that this Forest Management Plan meets the requirements of the USDA-NRCS Programs and/or the Quality Criteria for forest activity plans in Section III of the USDA NRCS Field Office Technical Guide.

_____ _____

District Conservationist Date

ATFS Program

I certify that this Forest Management Plan meets the requirements of the American Forest Foundation's American Tree Farm System.

_____ _____ _____

ATFS Inspecting Forester Date Number

Certified Tree Farm Number: (e.g. AL 1234) _____ Date of ATFS Certification: _____

CAL FIRE CFIP MANAGEMENT PLAN CERTIFICATION PAGE

California Registered Professional Forester (RPF) Certification: I certify that I, or my supervised designee, personally inspected this California Forest Improvement Program (CFIP) plan area, and that the plan fully complies with the CFIP and Professional Foresters Law, and meets Federal Forest Stewardship Management Plan Standards. I further certify that this plan is based upon the best available site and landowner information, and if followed, will not be detrimental to the productivity of the natural resources associated with this property.

Name (print or type): _____

Signature:_____ Date: _____

Organization or Company: _____

Address: _____

Phone: _____ RPF#:_____

CAL FIRE Unit Certification: I certify that I, or my supervised designee, personally inspected this California Forest Improvement Program (CFIP) plan area, and that the plan fully complies with the CFIP and Professional Foresters Law, and meets Federal Forest Stewardship Management Plan Standards.

Name (print or type): _____

Signature:_____ Date: _____

California Department of Forestry and Fire Protection

Unit: _____

Address: _____

CAL FIRE STATE OR REGION CFIP COORDINATOR: I certify that the plan fully complies with the CFIP and Professional Foresters Law, and meets Federal Forest Stewardship Management Plan Standards.

Name (print or type): _____ RPF#: _____

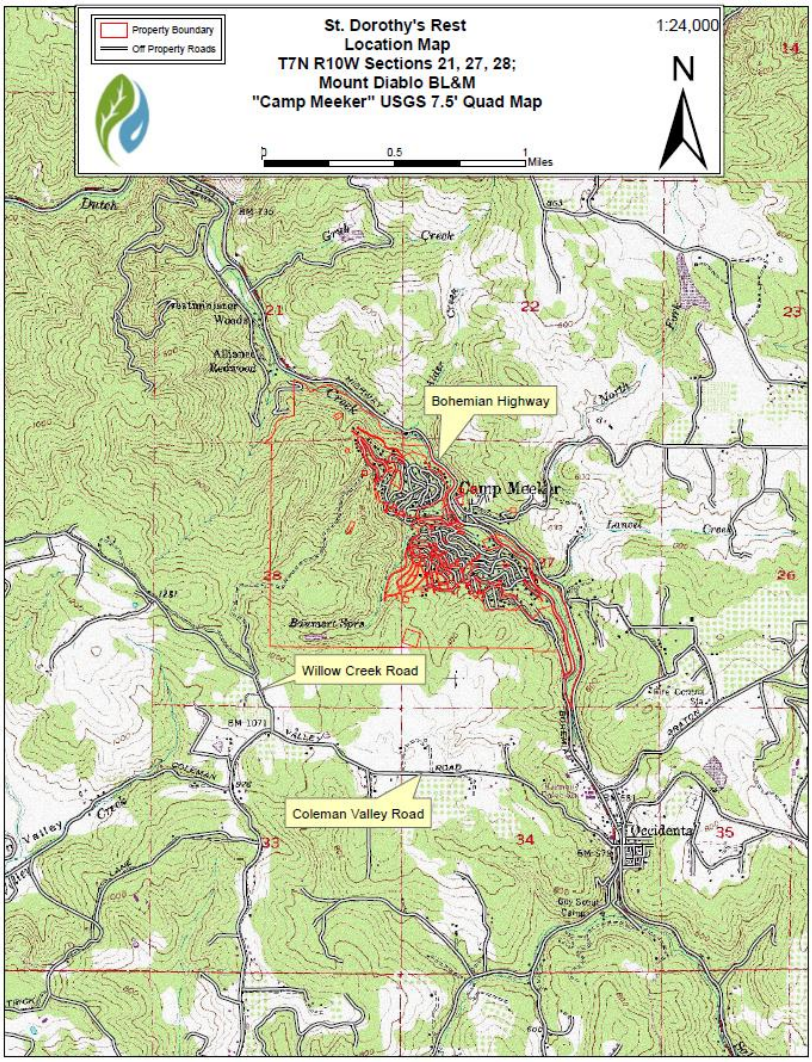
Signature:_____ Date: _____

Contents

1. Introduction & property overview 3
2. Landowner & PROPERTY Information 4
3. Property history and legacy 7
3.1 Property History 7
3.2 Family Legacy 10
4. Management goals & objectives 11
5. Property setting & conditions 12
5.1 Property Infrastructure 12
Annual Road Maintenance and Erosion Control Monitoring 13
5.2 Physiographic Setting 23
5.3 Biological Resources 34
5.4 Air Quality 44
5.5 Archaeology and Cultural Resources 47
6. Proposed vegetation management 48
6.1 Vegetation Types 48
6.2 Summary of Treatment Types Proposed 64
7. climate considerations & assessment of beneficial practices 69
7.1 Introduction to Forest Carbon 69
7.2 Current Forest Structure and Carbon Stocks 69
7.3 Assessment of Potential Carbon Beneficial Practices 70
8. Constraints & Proposed Alternatives 76
8.1 Operational Constraints 76
8.2 Proposed Alternatives 77
8.3 Economic Sustainability 78
9. Planned management activity 79
9.1 Management Activity Schedule and Tracking 79
9.2 CEQA and NEPA Information and List of Required Permits 80
9.3 List of Potential Funding Sources for Project Implementation 81
9.4 List of Additional Professional Assistance 83
10. References 84
11. appendices 85

1. INTRODUCTION & PROPERTY OVERVIEW

St. Dorothy's Rest is a 230-acre forested property in the Dutch Bill Creek watershed of Sonoma County. It borders the western edge of the unincorporated community of Camp Meeker, and is on the western side of Dutch Bill Creek. The property can be found on the Camp Meeker USGS 7.5 Minute Quadrangle map and can be accessed by McCollister Avenue in Camp Meeker, which is a county-maintained road. The property is located within Township 7 North, Range 10 West, Sections 27 and 28.



The property is entirely forested, with tanoak dominating the property, in terms of trees per acre, and redwood covering the most basal area. Many of the drainages contain clusters of redwoods, sprouts from historic timber harvests, many of which have grown into sizeable trees. The other tree species present on the property are Douglas-fir, California bay laurel, madrone, alder, and a small amount of big leaf maple. The terrain is relatively average for the area, with the ridgetops having an average of 20% slope and the creek drainages reaching above 80% slope.

This Forest Management Plan outlines the conditions and capabilities of the Properties' resources, documents the landowners' management objectives, and identifies potential resource improvement projects. The planning horizon for this plan is 10 to 20 years, and will include objectives that extend beyond this time frame. The activities and treatments proposed will assist the owners in creating a healthy, resilient forest. The purpose of this plan is to identify opportunities and related practices, currently in use or recommended for implementation, that meet and further the landowners' goals for their properties. This plan is intended to be a working document to inform and record the landowners' decisions and progress in actively managing their land.

2. LANDOWNER & PROPERTY INFORMATION

Landowner			
Name	Episcopal Bishop of California		
Mailing Address	PO Box 440		
City, State & Zip Code	Camp Meeker, CA 95419	Phone (home)	
E-mail		Phone (cell)	

Landowner's Representative (if applicable)			
Name	Dewey Watson		
Mailing Address			
City, State & Zip Code		Phone (home)	
E-mail	dewey@tw2law.com	Phone (cell)	510-407-6777

Lead Plan Preparer					
Name	Jason Wells, RPF #3014				
Preparer's Affiliation	Sonoma Resource Conservation District				
Plan Sections Prepared	All sections were reviewed and approved by the Lead Plan Preparer				
E-mail	jwells@sonomarcd.org	Phone	707-569-1448 x107	Fax	

Other Contributing Plan Preparer(s)					
Name	Lewis Campbell				
Preparer's Affiliation	Sonoma RCD				
Plan Sections Prepared	Plan Sections Contributed to (List Sections): 1-5				
E-mail	lcampbell@sonomarcd.org	Phone	707-569-1448 x115	Fax	

Management Plan History

Complete this section if there is an existing Forest Management Plan or other plan for the property. Check all that apply. Past plans and current amendments should be attached in Appendix K.

☐ CFIP Forest Management Plan ☐ Fire Management Plan ☐ Forest Stewardship Plan

☐ EQIP Forest Management Plan ☐ Conservation Easement ☐ Other (list)

☐ Conservation Activity Plan (CAP) ☐ Non-Industrial Timber Management Plan (NTMP)

Date of Original Plan Completion	
Revision Date(s)	

Property Facts

Legal Property Description (Township, Range, and Section)	T7N R10W Sections 21, 27, 28			
Nearest City or Town	Occidental			
County	Sonoma			
Assessor's Parcel Numbers (APN)	074-110-003 074-110-004 074-120-001 075-040-005 075-040-007 075-040-011 075-040-012 075-040-015 075-040-017 075-070-003 075-070-005 075-110-009 075-110-024 075-110-026 075-110-039 075-120-017 075-120-046 075-120-047 075-130-001 075-130-004 075-130-005 075-130-006 075-130-007 075-130-008 075-130-011 075-130-012 075-130-013 075-130-014 075-130-015 075-130-016 075-130-024 075-130-025 075-130-026 075-130-027 075-141-005 075-141-006	075-158-002 075-158-003 075-158-005 075-158-007 075-158-008 075-158-009 075-158-010 075-159-001 075-161-002 075-161-003 075-161-004 075-161-005 075-161-006 075-162-001 075-162-002 075-162-004 075-163-002 075-164-001 075-165-001 075-166-002 075-166-003 075-166-004 075-166-005 075-166-006 075-167-001 075-168-002 075-168-003 075-169-002 075-169-003 075-169-004 075-171-001 075-172-001 075-173-001 075-173-003 075-173-004 075-174-001	075-142-001 075-144-003 075-145-001 075-146-003 075-146-010 075-151-002 075-151-003 075-151-004 075-151-005 075-152-001 075-153-001 075-154-001 075-154-002 075-154-003 075-155-006 075-155-007 075-157-002 075-157-006 075-157-007 075-158-001 075-250-010 075-260-001 075-260-004 075-290-001 075-290-014 075-300-002 075-300-003 075-300-005 075-300-007 075-300-008 075-300-012 075-175-002 075-175-003 075-176-002 075-176-003 075-176-004	075-177-001 075-177-002 075-177-005 075-177-006 075-178-002 075-179-001 075-179-002 075-181-003 075-185-010 075-191-003 075-191-005 075-192-003 075-192-011 075-192-019 075-192-020 075-202-006 075-203-005 075-224-002 075-232-004 075-232-021 075-232-022 075-232-023 075-246-002 075-246-003 075-246-004	
Tract and Farm Number (if suitable)				
GPS Coordinates	Latitude	38.422483	Longitude	-122.966628
Total ownership acreage	407.78	Total forested acreage	335	
Does landowner reside on the property?	☐ Yes ☒ No			

Topography *Describe the overall topography of the property, including slope, aspect, and elevation.*	
Elevation Range	500-1,103
Estimated percent of total acreage that is:	
Flat (< 5% slopes)	5%
Gentle (5 - 35% slopes)	20%
Steep (> 35% slopes)	75%

Transportation System	
Vehicle Access (*check the one that most closely describes access over the entire property*)	☐ Excellent (80% accessible) ☒ Good (at least 50%) ☐ Fair (at least 25%) ☐ Poor (less than 10%)
Estimated paved road length	0
Estimated improved road length (rock surfaced roads)	0
Estimated unimproved road length (native surfaced roads)	16,300

Watershed Information			
Water Board Region(s) http://www.waterboards.ca.gov/waterboards_map.shtml		North Coast	
CALWATER 2.2 planning watershed http://frap.fire.ca.gov/data/frapgismaps/frapgismaps-calwater_download		Dutch Bill Creek	
Acres within this watershed		12,624	
303d listing on watershed	☒ Yes ☐ No	TMDL Factors (list)	Aluminum, indicator bacteria, Sedimentation/silt, specific conductivity, temperature

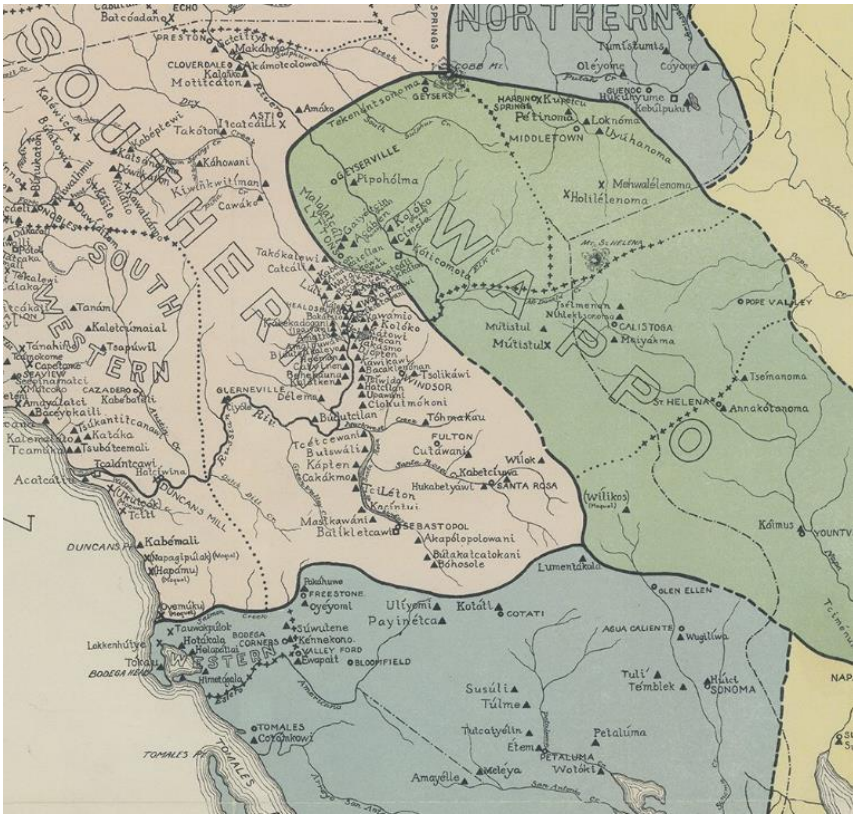
Note: It should be noted that acreage was calculated and represented in this plan using the County's GIS database information. Any discrepancy between county data and on-the-ground acreage typically occurs in the varied and steep terrain of mountain uplands. It is also often compounded where land surveys have not been conducted with modern tools. When using the County parcel data, it is important to understand that this is a graphic representation and land surveys will need to be done before ground altering projects are undertaken near property line.

3. PROPERTY HISTORY AND LEGACY

3.1 Property History

Pre-History:

The Southern Pomo are the dominant Native American group in the project area location. The Pomos created both permanent villages and seasonal encampments, the majority of which were located along shorelines, rivers, and near river mouths. Most permanent villages were in the inland areas – as much as 20 miles back from the coast, according to Bean and Theodoratus (Handbook of North American Indians, Vol 8). The Southern Pomo are renowned for their skilled basketry and are considered expert flint knappers and clamshell bead makers. The Pomo and neighboring peoples developed a relatively stable society composed of small groups linked by geography, lineage, and marriage. They managed the landscape using fire, pruning and weeding, to promote the growth of desirable plants and create conditions favorable for game animals.



The ethno-geography of the Pomo and neighboring Indians, by S.A. Barrett. 1908

"The hunting/gathering Pomos in the Dry Creek area historically used regional plants and game for food, including clams, fish and abalone collected on trips to the coast during summer. But their primary food source was acorns which were gathered, stored, and processed throughout the season. In the 19th and 20th centuries, exploitation of the indigenous peoples in this region occurred first by the Russians, later by the Europeans, and then by American groups. The influx of new settlers to Northern California and the richness of the agriculturally valuable lands long home to the Pomo were key factors in the decimation of the Pomo people. California's Indian population, once estimated at 330,000, dipped down to a mere 15,000 by the early 1900s. In the 1910 census only 1,200 Pomo were recorded." (Dry Creek Rancheria Website, 2018)

Logging:

Figure 1: Meeker Bros Company (Thomas Thompson & Co, 1877)

Logging in the Russian River Watershed and the local area began in the mid-1800s. In 1860 R.B. Lundsford established a lumber camp on the north bank of the Russian River, which became successful and eventually grew to be the town of Guerneville. Initially it took a team of oxen up to two days to haul wood products the 16 mile distance to Santa Rosa. The San Francisco & North Pacific Railroad broke ground on construction of a line which would stretch from Fulton to Guerneville in August of 1875. By May of 1876 the railroad had crossed the Russian River, accessing Hacienda and soon after Korbel. Winter weather and slides slowed the progress of the rail, which eventually reached Guerneville by late February 1877. Harvest methods at the time were typically clearcutting, or high-grading of large diameter redwood trees. These trees were pulled down the hills by "steam donkey" yarders, often through the bottoms of gulches and in the middle of watercourses, to train tracks where they would be hauled to one of the local sawmills. Often these areas would be burned to remove vegetation and slash to allow for easier transportation of logs, which drastically increased the already extensive erosion caused by this form of logging. Many of the gentler ridge top lands in this area were cleared and repeatedly burned to create grazing land for livestock production up until the 1930s.

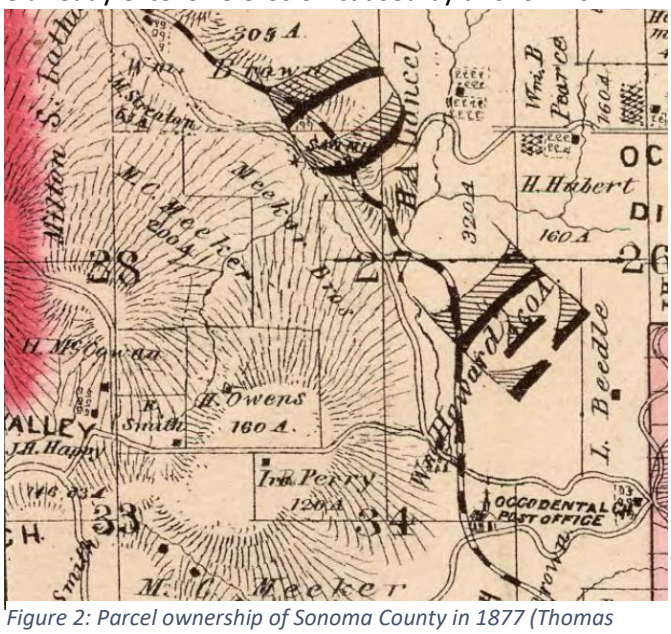


Figure 2: Parcel ownership of Sonoma County in 1877 (Thomas Thompson & Co, 1877)

After World War Two there was an extensive boom in housing production which was fed by lumber from local forests. The majority of the remaining old growth redwood and Douglas-fir in the watershed was harvested at this time. Tractor logging was the primary method of logging during this time; prior to the 1973 Forest Practice Act, these tractors dragged logs through watercourses and most roads were not well drained which further contributed sediment to local watercourses. Beginning in the 1970s, the California Department of Fish and Wildlife (formerly Fish and Game) began conducting

stream clearance projects in these watersheds, removing much of the large woody debris which had been capturing sediment and infilling watercourses. This had a net negative effect on salmonid habitat, as the large wood was responsible for creating pools, gravel riffles, and cover.

Since the advent of the Forest Practices Act, required road upgrades and equipment limitations near streams have significantly improved adverse impacts to watercourses. In the last 20 years the majority of the second entry timber harvesting in the watershed has been under selection silviculture rather than clearcutting.

Property Specific:

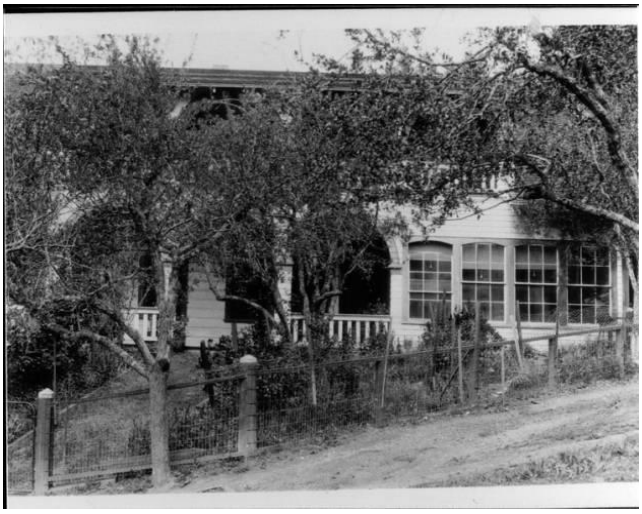


Figure 3: Melvin C. Meeker's house. (Sonoma County Library, 2007)

Melvin C. Meeker, born in New Jersey to William and Sarah Meeker in 1841, owned most of the land around what is now Camp Meeker in the late 1800's. The Meeker Bros (Melvin and brother Amzy P. Meeker) owned about 2,800 acres of timberland, and the Meeker Bros Mill produced about 3,000,000 board feet of timber each year. The North Coast Pacific Railway was built from Sausalito to Duncans Mills around 1874, and ran along Dutch Bill Creek past Camp Meeker (Stindt, 1974). This allowed Meeker to ship lumber to San Francisco (by ferry from Sausalito) and other developing places south of Camp Meeker. Melvin C. Meeker founded Occidental in 1876 and provided the lumber to build the occidental Church ("The Heart of Occidental"). After logging his land, Meeker subdivided Camp Meeker into parcels in 1898, which soon after became vacation homes for people from San Francisco, easily accessed by the railroad.

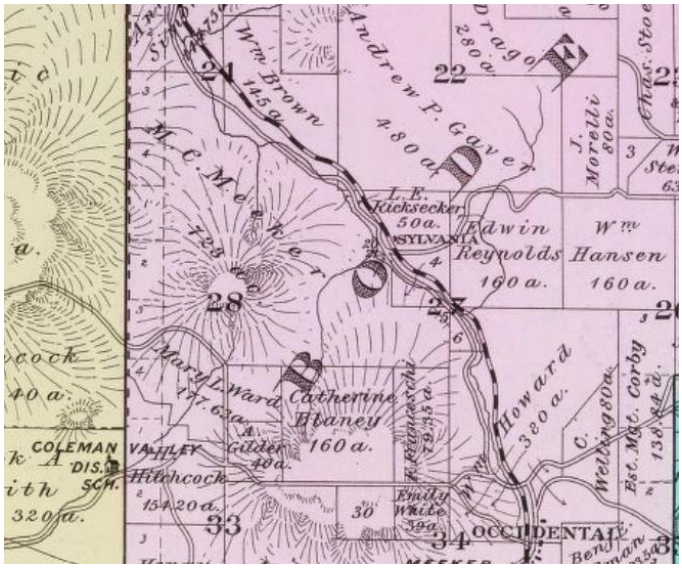


Figure 4: Parcel ownerships of Sonoma County in 1897 (Reynolds and Proctor, 1897)

According to the landowners the largest parcels on the property, for which this management plan is intended, was sold from Melvin Meeker to the Chenoweth family who held the property for decades. The family partially clear cut the property, approximately in the 1970s-80s. The landowners believe that the last fire on the property was in 1924, which would likely fall in line with historic logging slash/burn practices. St.Dorothy's Rest Association/ Episcopal Dioscese of California purchased the property in 2012 during the Chenoweth bankruptcy. The Chenoweth family was given an option to re-acquire 180 acres of the sale, which was exercised in 2017. In the last 20 years, timber harvest has been limited to firewood, and there have been some illegal cannabis operations undertaken by trespassers.

3.2 Family Legacy

The property owners plan to put the property in a conservation easement. This plan is intended to serve as a guidance document for future management on the property and to help in the creation of a conservation easement that meets the intended objectives of the property.

This plan proposes an active approach to forest stewardship to manage the property for the benefit of the community. A potential model to investigate for this purpose is the Arcata Community Forest; a working forest supporting multiple recreational uses with the intended long-term goal of supporting late seral forest conditions.

CAL FIRE's Forest Legacy Program is a competitive grant program meant to support conservation easements of working forests that are at risk for conversion or development, and provide important economic, habitat, watershed, water supply, recreational, scenic, and historical/cultural benefits. Due to the nature of this property, with both development pressure in the area from vineyards and housing, its position as a water supply for Camp Meeker, and its intended use as a community resource, this grant program may be a good opportunity to fund a future conservation easement. For a conservation easement to be created the property will need a sponsoring holder of the easement; an example of such an entity would be Bodega Land Trust or the Sonoma County Agricultural and Open Space District.

4. MANAGEMENT GOALS & OBJECTIVES

The main purpose of the property is to be used as a summer camp and retreat, and to share the property with the general public as a recreation resource. The landowners are interested in managing the property's forest for fire/fuel hazard abatement, recreational access and safety, forest health/ pathogen management with Sudden Oak Death, and future growth of the properties forest focused on enhancing habitat and aesthetic qualities of large trees. Their goals are listed as follows:

Short term (1-2 years):

- Increase access to the property
- Create defensible space around property and access routes
- Assess existing water systems, springs and remove as much piping or spring boxes as reasonable to increase flow to creeks
- Road improvements for access and water quality including removal of any roads which could have a detrimental effect on stream health
- Reduce erosion from both roads and trail systems
- Increase quality of in-stream aquatic habitat by removing abandoned water extraction systems
- Increase recreational potential: trail building, mushroom hunting, mountain bike trail networking
- Reduce/manage invasive weeds such as scotch broom
- Fuels reduction/ management of dead wood
- Manage for aesthetics

Medium term (2-10 years):

- Address forest health: create resilient forest systems capable of enduring biotic and abiotic stresses such as drought, fire, insect and pathogen infestation, and provide growing space for trees of all sizes and ages.
- Manage for increased carbon storage or standing volume in living trees per acre
- Increase forest habitat for specific wildlife, or for wildlife in general
- Reforestation or Afforestation
- Increase non-potable water storage
- Favor certain tree species over others (i.e. increase redwood versus Douglas-fir)
- Increase or decrease tree species diversity as directed by the science

Long term (10+ years):

- Continuation of all the above with goal of creating late seral habitat, which may take a century or more

5. PROPERTY SETTING & CONDITIONS

5.1 Property Infrastructure

PROPERTY IMPROVEMENTS

There is a small abandoned garden on a ridge of the property, with a gate surrounding it and an arched entryway. There is also a partially built log structure nearby. Otherwise, there are no known structures on the main portion of the property (the smaller portions of the property where the office and other buildings are fully developed). There are, however, four or five parcels owned by other landowners that are within the main property boundary. There is a trail system throughout the property that is used by the community of Camp Meeker.

FOREST ROADS

Forest roads on the property were surveyed as part of a larger road assessment conducted by Gold Ridge Resource Conservation District presented to the landowners in early 2022. That plan will be included with this plan in Appendix K. The road assessment made a number of crossing and surface upgrade recommendations, including planned abandonment of two roads on the property.

The primary access road is a gated dirt road that comes off McCollister Avenue, this road is referred to in the road assessment as Willow Creek Access Road (WCA Road). WCA Road travels up to the main ridge of the property and continues on to Willow Creek Road, a county road. There are many old logging skid trails connecting to WCA Road, and one major forest road spur at the intersection with Forest Road (FR) 1. FR1 runs south from WCA Road to the reservoir.

The northern section of the property can be accessed by FR9, which connects to the WCA Road near its connection to McCollister Avenue; this provides access to lower-mid slopes on the northern portion of the property. FR9 is generally wide enough for truck traffic but has either intentionally or through erosion of the local fill slope become impassible to truck traffic near its intersection with the WCA Road. This road is critically important for management of the northern half of the property and should be considered for reconstruction. The road assessment notes a partially eroded stream crossing, called Site 5, on a major crossing of FR9. Site 5 represents a significant threat of further sedimentation to Dutch Bill Creek, which is listed as sediment impaired by the North Coast Regional Water Quality Control Board. A future grant application to remediate Site 5 could provide an opportunity to improve the road alignment for FR9 to that crossing point, after which the road is available for use by 4-wheel drive truck traffic.

Further downhill, to the north of FR9, is FR7 &FR8. From a forestry perspective this road would only be useful as access if improvements were made to connect it to the large open landing area which is currently on Alliance Redwood's property. Truck traffic would not be able to ascend FR7, and if it could it would be putting log trucks into the heart of Camp Meeker, which would complicate operations from a safety standpoint and would be difficult to navigate with a full log load. If FR8 were to be connected to Alliance Redwood, a conversation about building a connecting road between FR8 and FR9 would be worthwhile, for the reason of avoiding traffic in town. Construction of such a road would need to be full-

bench due to side slope steepness, which is more expensive than typical cut and fill. If this were to occur it would be feasible to decommission FR7.

FR10 provides access to the northern ridge top and connects to WCA Road off property. The importance of this road for management becomes much greater if access from off-property is feasible because the road is stable, easily accessible by large truck traffic, and it offers the best opportunity for management from a fuels perspective.

There is another access point to the property off Woodland Avenue in Camp Meeker, which connects through to Hampton Street and Bohemian Highway. This is the only known access point for the southern section of the property, south of Baumert Springs. The roads assessment has described this road as Hampton/Baumert Access (HBA) Road. None of the roads are rocked, and many are in need of significant erosion control, but most are currently passable.

The roads assessment made the recommendation to decommission two roads, FR4 and FR6. These roads are of little utility to the property and, in the case of FR6 especially, they pose a high risk to Baumert Creek. FR4 connects the reservoir to HBA Road by crossing a Class II stream near the southern property boundary. This crossing was identified as having a low potential for future sediment delivery and was rated low priority. There is another crossing on FR4 called Site 6 that has potential for delivery and was recommended for decommissioning involving setting the road grade back to natural slope.

Access is the key to almost all recreation and management activities, including fire suppression. A proper road network is essential for any rural land owner, however improperly constructed and maintained roads are not only costly to keep operational, they are a major source of sediment that ends up in stream channels. Road maintenance must be performed regularly to insure their long term stability and benefit. Road maintenance work includes:

- Installing, replacing and maintaining culverts as needed
- Maintaining waterbars, ditches and rolling dips
- Eliminating road berms
- Clearing bank slumps on roads

Closing secondary (non-rocked) roads in the winter that are susceptible to vehicle damage

Annual Road Maintenance and Erosion Control Monitoring

An annual road maintenance evaluation and monitoring program should be implemented following forest operations. Roads and trails need be shaped and erosion control structures installed and maintained. Roads should be outsloped and perched fill should be reincorporated back into the road surface. Roads with a grade of 8% or less should have rolling dips installed and skid trails and steeper roads should have waterbars installed at a minimum of Forest Practice Regulations. In some places it may be necessary to have erosion control structures at closer spacing. Rolling dips and waterbars should be permanent features and not removed each year. Any road or trail work requiring equipment should be completed before the onset of the rainy season, prior to the first four inches of rain.

Annual road maintenance should include the following:

- Clean out culverts, this includes trash racks, downspouts and any other energy dissipation device.
- Make sure that rolling dips and waterbars are open and properly functioning.
- Clean out inside ditches.

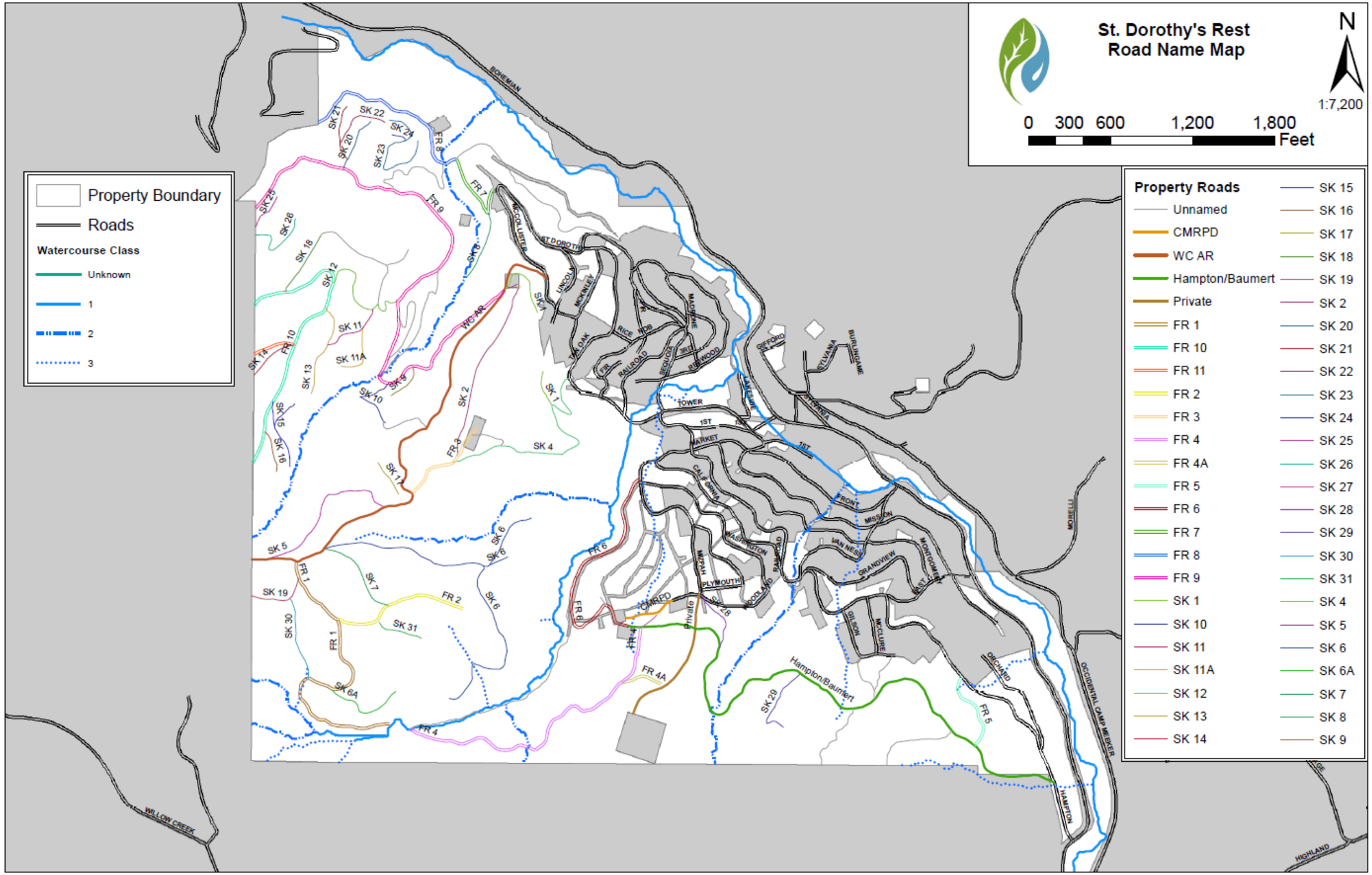
The following table provides an assortment of management practices that are intended to upgrade existing roads and reduce potential sediment delivery to watercourses. Selection of practices must be done on a site-specific basis. NRCS Practice Titles are provided for landowner reference. Contact your local NRCS or RCD field office for technical and/or possible financial assistance. For more information about proper road construction and maintenance, download the *Handbook for Forest, Ranch & Rural Roads* at http://mcrcd.org/.

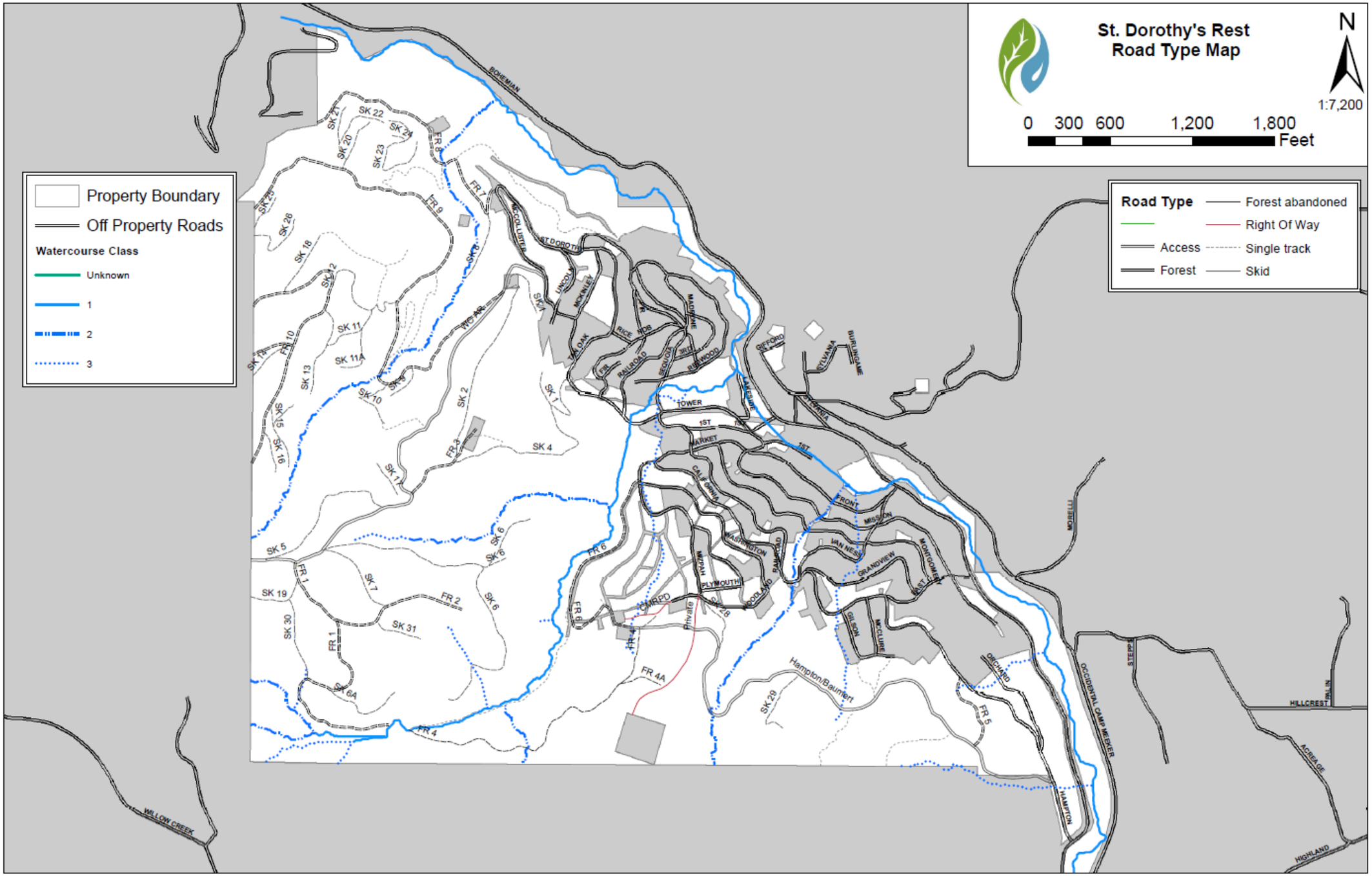
Table 5-2: Road Related Conservation Practices

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Use native surfaced roads as seasonal roads only – avoid use when soils are saturated		☐		
Place rolling dips, water bars, and other drainage features at appropriate spacing to get water off road surface quickly.		☐		
Chemical treatment on unpaved roads to prevent particulate matter emissions from vehicle use, keeping soil on the road.	Dust Control on Unpaved Roads (373)	☐		
Install or replace an undersized or eroded culvert at stream crossings.	Stream Crossing (578)	☐		
Install or replace a bridge so stream flow is not impeded.	Stream Crossing (578)	☐		
Decommission unnecessary or eroding roads, trails, or landings, to allow footprint to return to production. May include recontouring and/or re-vegetating area.	Road/Trail/ Landing Closure and Treatment (654)	☐		
Grade and/or reshape roads to allow for proper surface drainage and decrease	Forest Trails and Landings (655); Access Road (560)	☐		

the risk of compaction and sedimentation.				

Vegetate exposed cut banks or fill slopes to decrease the rate of erosion.	Critical Area Planting (342)	☐		
Other:		☐		


St. Dorothy's Rest
Road Name Map
N
1:7,200
0 300 600 1,200 1,800
Feet
Property Boundary
Roads
Watercourse Class
Unknown
1
2
3
Property Roads
Unnamed
CMRPD
WC AR
Hampton/Baumert
Private
FR 1
FR 10
FR 11
FR 2
FR 3
FR 4
FR 4A
FR 5
FR 6
FR 7
FR 8
FR 9
SK 1
SK 10
SK 11
SK 11A
SK 12
SK 13
SK 14
SK 15
SK 16
SK 17
SK 18
SK 19
SK 2
SK 20
SK 21
SK 22
SK 23
SK 24
SK 25
SK 26
SK 27
SK 28
SK 29
SK 30
SK 31
SK 4
SK 5
SK 6
SK 6A
SK 7
SK 8
SK 9
BOHEMIAN
WILLOW CREEK
HIGHLAND
OCCIDENTAL CAMP MEEKER
HAMPTON
ORCHARD
MORELLI
ST DOROTHY
LINCOLN
MCKINLEY
TAN OAK
RICE
TOB
RAILROAD
SEQUOIA
BURLWOOD
MADRONE
GIFFORD
BETLVANA
BURLINGAME
LAKESIDE
TOWER
1ST
MARKET
CALIFORNIA
FRONT
MISSION
WASHINGTON
RAMSFORD
IVAN NESS
GRANDVIEW
MONTGOMERY
EAST
MCZPAH
PLYMOUTH
WOODLAND
GILSON
MCCLURE
CMRPD
Private
Hampton/Baumert


St. Dorothy's Rest
Road Type Map
N
1:7,200
0 300 600 1,200 1,800
Feet
Property Boundary
Off Property Roads
Watercourse Class
Unknown
1
2
3
Road Type
Forest abandoned
Right Of Way
Access
Single track
Forest
Skid
BOHEMIAN
WILLOW CREEK
HIGHLAND
ACREAGE
HILLCREST
OCCIDENTAL CAMP MEEKER
HAMPTON
ORCHARD
Hampton/Baumert
CAMPPD
Private
SK 1
SK 2
SK 3
SK 4
SK 5
SK 6
SK 7
SK 8
SK 9
SK 10
SK 11
SK 11A
SK 12
SK 13
SK 14
SK 15
SK 16
SK 17
SK 18
SK 19
SK 20
SK 21
SK 22
SK 23
SK 24
SK 25
SK 26
SK 28
SK 29
SK 30
SK 31
SK 6A
FR 1
FR 2
FR 3
FR 4
FR 4A
FR 5
FR 6
FR 7
FR 8
FR 9
FR 10
WC AR
MCCOLLISTER
ST DOROTHY
LINCOLN
MCKINLEY
TAN OAK
RICE
TOB
RAILROAD
SEQUOIA
MADRONE
RED
REDWOOD
GEFORD
LAKEVIEW
SYLVANA
BURLINGAME
TOWER
1ST
MARKET
CALIFORNIA
FRONT
MISSION
VAN NESS
GRANDVIEW
MONTGOMERY
WASHINGTON
MCPAH
PLYMOUTH
WOODLAND
BANCROFT
GILSON
MCCLURE
MORELLI
STEPP
PALIN

ACCESS AND SECURITY

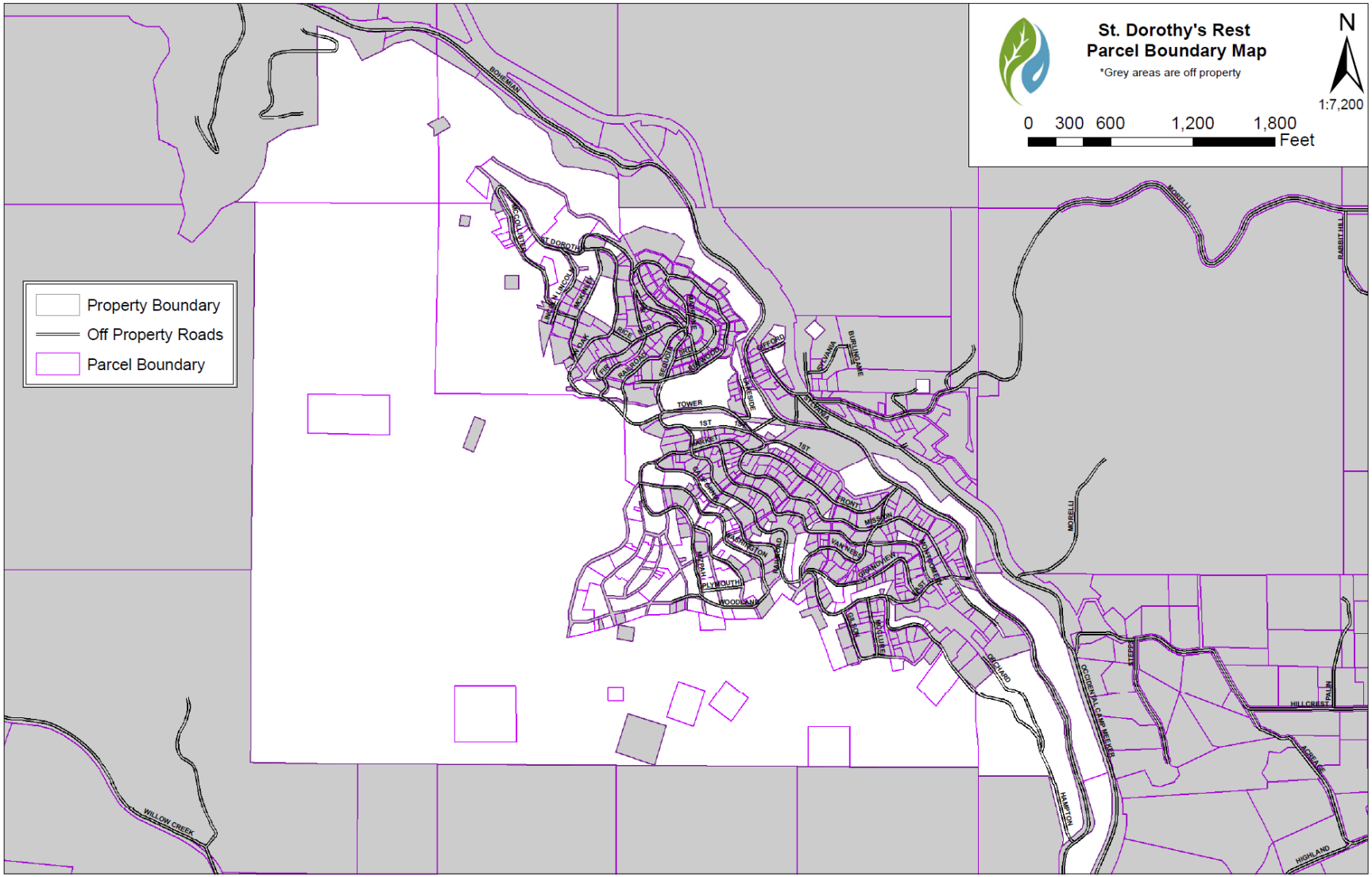
St. Dorothy's Rest property is accessed via a private dirt road that comes off McCollister Avenue in Camp Meeker. The entrance to the property is about a quarter of a mile past the gate at the entrance of this road. There are three other known roads entering the property, but they were not surveyed past the property boundary and the accessibility of these roads is unknown. The property to the west had a recent timber harvest done where they performed group selection silviculture, and remaining flagging from this harvest can be found along the western property boundary.

Trespass on the property is an issue, but the landowners intend the property to be used for the benefit of the general public and neighbors within Camp Meeker. There is a history on the property of unauthorized cannabis crops being grown in and around streams. In general, all encroachments should be gated and posted "Authorize Users Only" or to that affect to control unwanted uses of the property and protect the property owners' rights against trespassers. Exterior gates and fences must be maintained. Gates should be kept closed and locked to prevent unauthorized vehicular traffic, and the property should be regularly patrolled.

In the case of St. Dorothy's Rest some amount of public access is desired. It should be made clear to the public what, if any, areas of the property are available for their use and ideally a system should be put in place to manage liability that the landowner will take on by allowing public access. It may be possible to use the popularity of the property to generate revenue that can help maintain access to recreational activities, more on this will be discussed under the Recreation and Aesthetics section.

The Sonoma County sheriff's department has developed a program to help landowner's who are victims of rural crimes including trespassing, theft of agricultural and forest products, vandalism, etc. and should be contacted if such events occur.

The property boundaries are not currently obvious on the ground. The following maps show the location of the property boundaries.

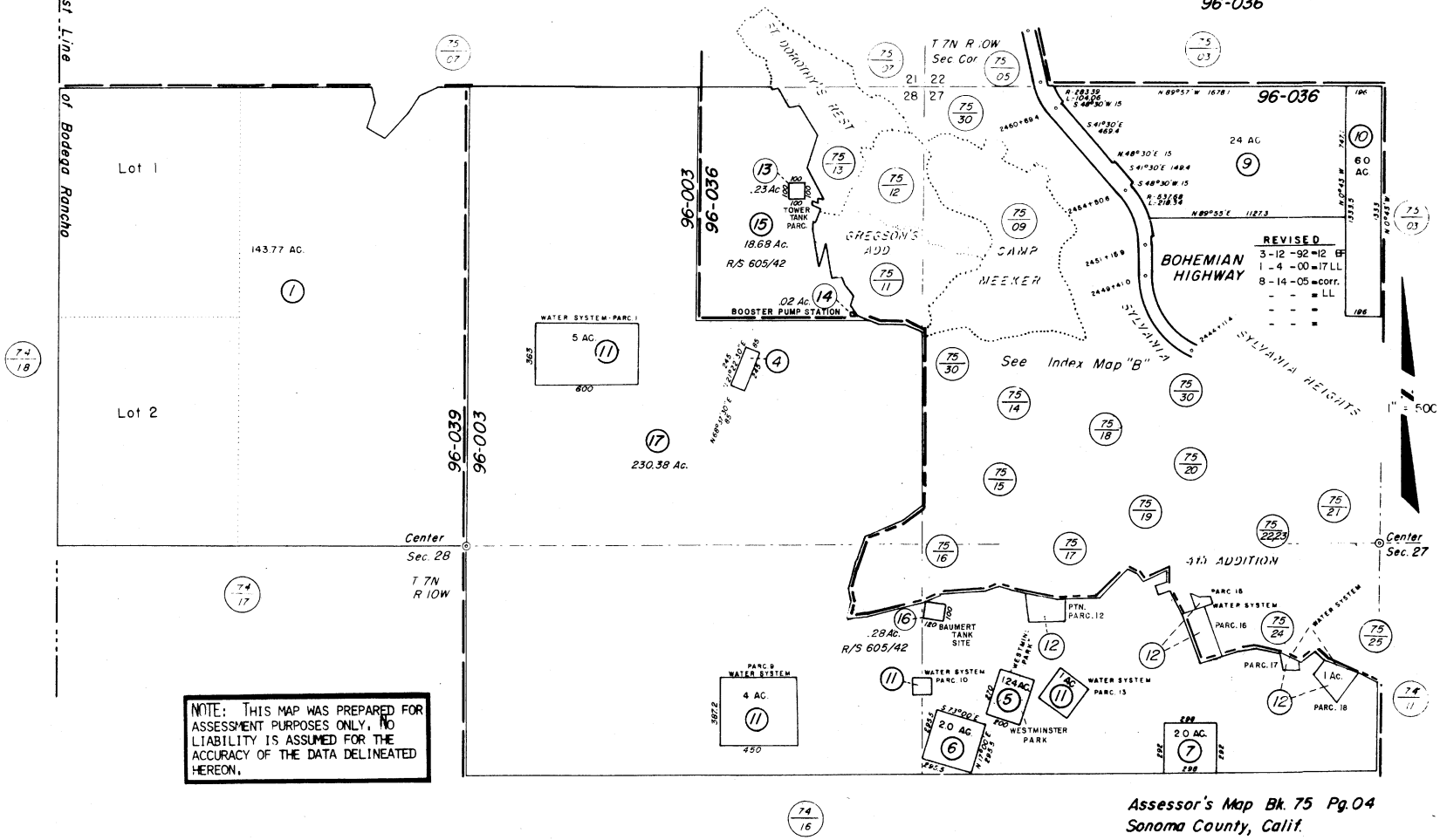

St. Dorothy's Rest
Parcel Boundary Map
*Grey areas are off property
N
1:7,200
0 300 600 1,200 1,800
Feet
Property Boundary
Off Property Roads
Parcel Boundary
BOHEMIAN
MORELLI
RABBIT HILL
TOWER
1ST
FRONT
MISSION
WASHINGTON
PLYMOUTH
WOODBANK
ORCHARD
HAMILTON
HILLCREST
HIGHLAND
WILLOW CREEK

NOTE: Assessor's parcels do not necessarily constitute legal lots. To verify legal parcel status, check with the appropriate city or county community development or planning division.

COUNTY ASSESSOR'S PARCEL MAP

TAX RATE AREA 75-04

96-003
96-039
96-036



NOTE: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA DELINEATED HEREON.

Assessor's Map Bk. 75 Pg. 04
Sonoma County, Calif.

RECREATION AND AESTHETICS

The forest on this property has a wide variety of aesthetic aspects to it, with redwood groves found along creek basins, a mix of conifers and tanoak trees on the hillsides, and even some Monterey pines along some ridges. The creek coming from Baumert Spring, a tributary of Dutch Bill Creek, contains small pools and waterfalls along with other sights including old growth Douglas-fir and many majestic redwoods; There is a well-traveled hiking trail which follows the Baumert creek up to the reservoir starting from Market Street. There is a network of hiking trails and single-track mountain bike trails throughout the property that effectively capture the scenery of the area and provide recreational opportunities.

Recreational use of the property by the public brings with it an increase in potential damages to natural resources; primary damage concerns would include increased soil compaction, erosion, and sedimentation/siltation of creeks along trails from winter use, and vandalism. There are also potentially issues with liability regarding personal injury from those visiting the property that should be addressed.

One way that this could be addressed is an annual use permit with a nominal fee that would include a statement of liability indemnification. A simple fee of $10-20 annually could be asked of the community to help pay for trail maintenance. There are volunteer associations for certain recreational activities that may be able to provide some additional help with maintenance and/or new trail creation. Redwood Trails Alliance is a local organization that recently formed as a merger between the Sonoma County Trails Council and the Redwood Empire Mountain Bike Alliance; they raise funds from their membership and provide volunteers to design and build trail systems for hiking and mountain biking.

Additionally, the property could be developed for a disc golf course, which is a low cost and maintenance outdoor recreational activity. In general, disc golf courses require tee pads and disc baskets with a series of trails connecting the two. The United Flyers of Sonoma County are a local Disc Golf association whose membership occasionally puts on trail and course maintenance volunteer days. As an example, in Humboldt County, there is well-known a private disc golf course called Area 74 which charges participants $75 per year to access the course. The fees pay for maintenance and provide income to the landowner. Potential hazards associated with disc golf would include the potential for hikers to be struck by a disc, which are hard plastic, and there is a high likelihood that trees immediately adjacent to the tees would sustain minor damage from poor drives. The property is more than large enough to locate a disc golf course far from more highly utilized trails to avoid issues with flying discs.

Based on existing conditions it appears that the majority of mountain bike paths are in Unit 1, Unit 2 provides the highest scenic value and hiking trail potential. Were Unit 3 to be developed into a disc golf course, it would be unique in the area as there currently are no redwood forest courses in the county which are often technical and highly sought after.

FIRE MANAGEMENT

Fire is recognized as a natural and critical component of Northern California's forested landscapes. Prior to wildland fire suppression efforts that began in the early 20th century, most of California's forest lands were subject to frequent low-intensity fires brought on by Native Americans. These anthropogenic fires were frequently low to moderate intensity; they removed excess fuel, thinned vegetation, and reduced competition between residual trees. St. Dorothy's Rest falls within the territory of the Southern Pomo; whose territory was bounded on the South and East by the Russian River valley, and north to Pudding Creek, in what is now Fort Bragg, with the coast forming the westerly boundary. A fire history study was performed within that range by Jackson Demonstration State Forest. That study found that the pre-20th century mean fire return interval for the redwood and redwood-Douglas-fir forest types ranged from approximately 6 to 20 years (Brown and Baxter 2003). There has not been a reported fire on the property since records began in the 1940s, in which time there has been a large accumulation of fuel.

Fire suppression, coupled with intermediate logging of larger trees, increased the number of small diameter, shade tolerant trees and reduced canopy height. Areas that historically were open woodland have been encroached by relatively shade-tolerant Douglas-fir trees. This has led to high fuel loadings that may easily carry fire into the canopy and across the landscape. Camp Meeker is the only place in Sonoma County with fire hydrants less than 500 ft apart (Camp Meeker Volunteer Fire Department, 2000).

According to CAL FIRE's Fire and Resource Assessment Program (FRAP), St. Dorothy's Rest is in an area of HIGH fire hazard severity.

Fuel reduction projects and conservation practices will be discussed in Section 7.3, Fuel Reduction.

DEFENSIBLE SPACE

Defensible space in the space immediately around permitted structures on your property is legally required under the Public Resources Code (PRC) and the Sonoma County Fire Code Ordinance (SCFC). Legally; those controlling or maintaining a building or structure within or adjoining a mountainous area, forest-covered land, grass-covered land, or land covered with flammable material, must maintain a 100 foot defensible space around those structures unless limited by their property boundary. General requirements for defensible space in Sonoma County, given in distance from the permitted structure, are as follows.

0-30 feet:

Remove all branches within 10’ of chimney or stovepipe outlet.

- Remove all dead or dying trees, branches, shrubs, or other vegetation adjacent to or overhanging buildings.
-
- Remove or separate live flammable ground cover and shrubs.
- Climbing vines must be removed from trees and structures.
- Spark arrestors requires on all chimneys

30-100 feet:

- Mow dead or dying grass to a maximum 4” in height
- Live flammable ground cover may remain, but overhanging vegetation must be pruned to 6’ minimum.
- Create horizontal and vertical spacing between vegetation. See diagram below.

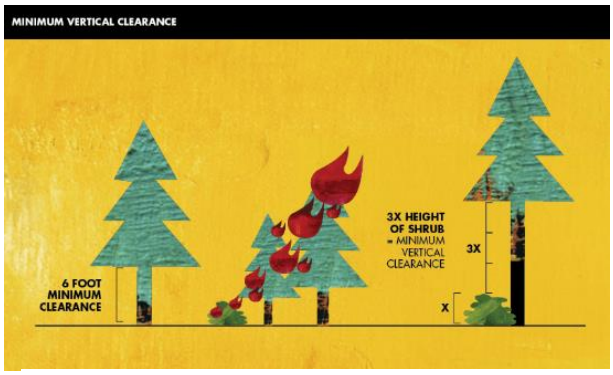


Figure 5-9: Cal Fire Vertical Clearance Guide

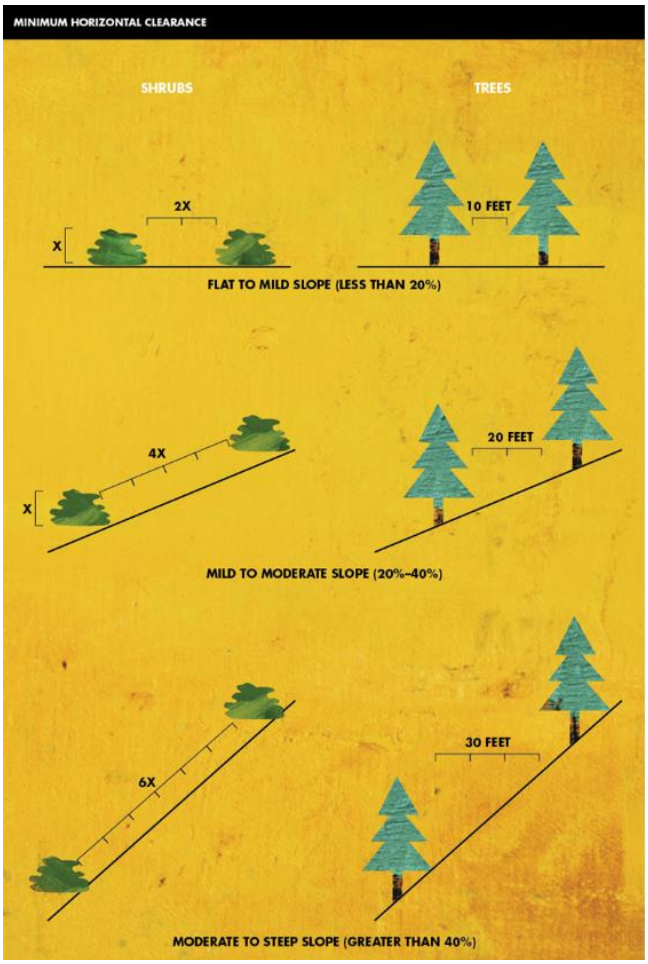
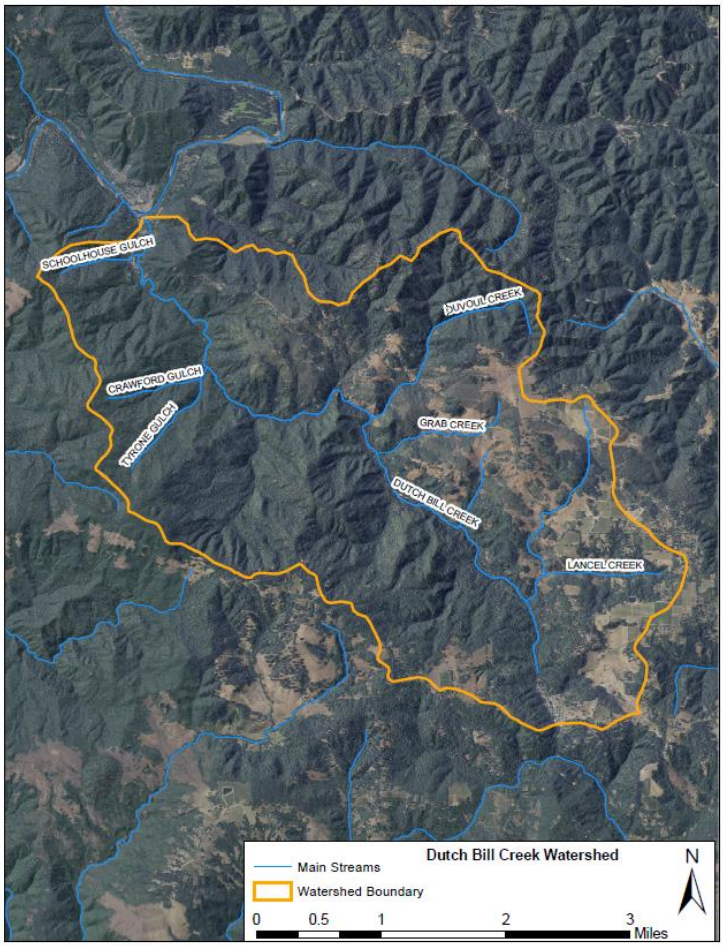


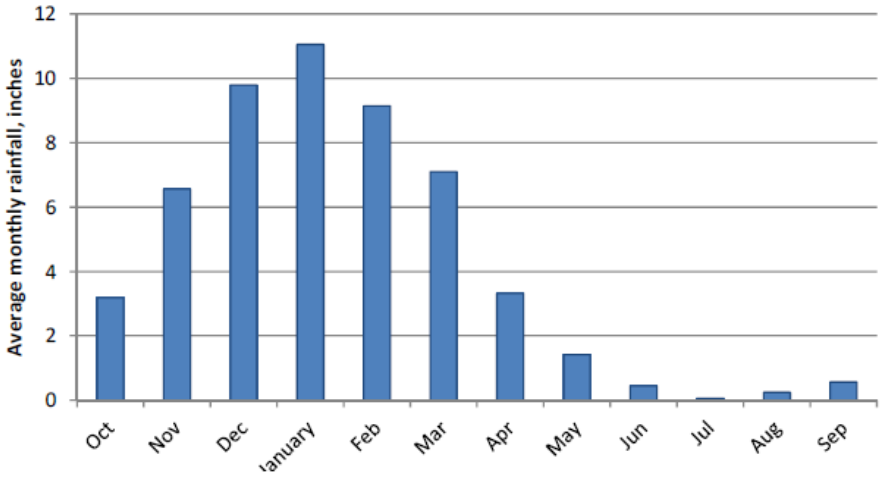
Figure 5-10: Cal Fire Horizontal Clearance Guideline

5.2 Physiographic Setting

DESCRIPTION OF WATERSHED

The Dutchbill Creek watershed covers approximately 20 square miles in western Sonoma County and is a salmonid-bearing tributary of the Russian River, which drains to the Pacific Ocean. The confluence is in Monte Rio, and the Dutchbill Creek headwaters are in Occidental. The watershed has four major tributaries: Alder, Duvoul, Grab and Lancel creeks, and eight other smaller or unnamed tributaries. Dutch Bill Creek is a narrow canyon about seven miles long, and stretches between the towns of Occidental and Monte Rio, with Camp Meeker in the middle. From its highest point at 528 feet, Dutch Bill Creek runs north, winding its way past Camp Meeker and flowing into the Russian River at Monte Rio, about 6.5 miles from the ocean. The watershed's terrain is characterized by steep slopes and the diverse geology of the Franciscan Complex. Slope gradients average 70-80% in many areas of the watershed. The vegetation consists of redwood, Douglas-fir, tanoak, and California bay laurel on most slopes; madrone and Monterey pine on some ridges; and alder and big leaf maple in wetter locations (eg. Inner-gorge areas, swales, and north-facing slopes). The Dutch Bill Creek watershed is almost completely privately owned. The primary land use is unmanaged forestland, but there is also a good portion of managed timber, some viticulture and agriculture, summer camps and conference centers, and concentrated residential areas, including the communities of Camp Meeker and Occidental. Current and historic land-use activities have degraded the natural environment, impaired water quality and aquatic habitat, and increased the rate and amount of sedimentation.



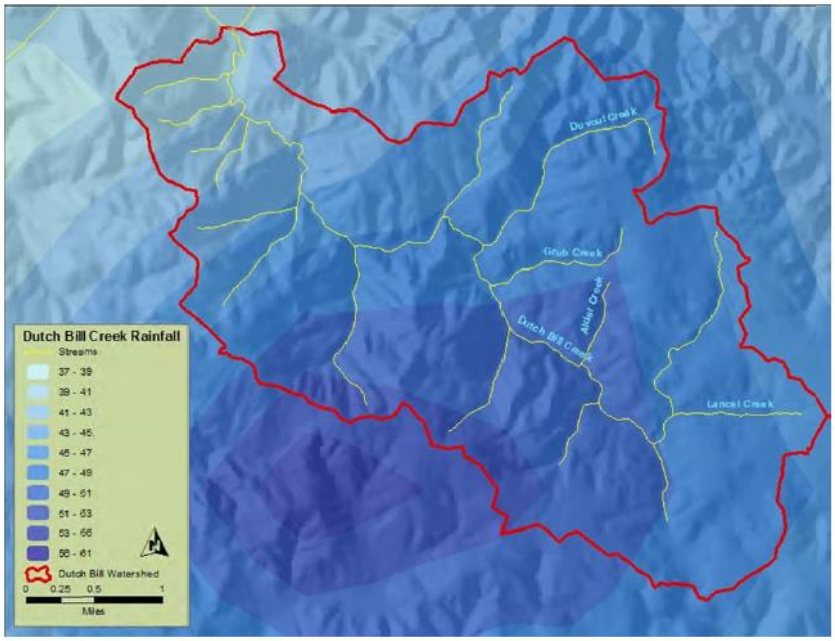


Average Monthly Rainfall Recorded at Occidental, CA 1951-2015

The Dutch Bill Creek watershed has a climate similar to most of coastal California, which is characteristically Mediterranean – with warm and dry summers, and cool and wet winters. Precipitation occurs almost exclusively as rainfall (i.e., snowfall is very rare), and mostly during wet winter months. Rainfall data recorded over a 65-year period at a weather station in Occidental (located in the headwaters of Dutch Bill Creek) show that 89 percent of the average annual rainfall occurs between November and April; less than 2 percent of the average annual rainfall occurs fromJune through September

Computer models indicate that the Dutch Bill Creek watershed receives approximately 56 inches of rainfall in an average year, with up to 61 inches occurring at higher elevations in the watershed and 39 inches occurring in the lower elevations

Long-term records from Occidental indicate that rainfall can be highly variable from one year to the next. Over the 65-year period 1951 through 2015, annual rainfall has varied from as little as 18 inches (1977) to as much as 102 inches (1983), with extended periods of low and of high rainfall throughout the historical record. The four-year drought of 2012-2015 represents one of at least three periods of below-average rainfall for four or more consecutive years. Others include 1959-1962 (four years) and 1987-1992 (six years).



Average Annual Precipitation Over The Dutch Bill Creek Watershed

STREAMS, PONDS, AND WATER QUALITY

One major tributary and two minor ones to Dutchbill Creek flow through the property. The major one is Baumert Springs, which bisects the property almost down the middle but closer to the southern portion. Baumert springs is dammed and forms a pond near the south-western corner of the property. Though water may not flow continuously for the entire length of the minor tributaries, there are isolated pools which remain throughout the year.

Table 5-4: Watercourses Present on the Property

* Buffer widths from Forest Practice Rules for slopes between 30-50%. County Riparian Ordinance may apply further restrictions.

Watercourse Classification	**Channel Length**	**Riparian Buffer Width**	**Notes** (*e.g., species present, seasonality, etc.)*
Class I	17,160	100	Supports fish
Class II	10,910	75	Supports non-fish aquatic vertebrate species
Class III	6,720	30	Capable of transporting sediment to higher classification watercourses

One major and two minor tributaries to Dutchbill Creek flowing through the property. The major tributary is Baumert Springs, which bisects the property almost down the middle but closer to the southern portion. Baumert springs is dammed and forms a pond/reservoir near the south-western corner of the property. Though water may not flow continuously for the entire length of the minor tributaries, there are isolated pools which remain throughout the year.

Class I watercourses include habitat to sustain fish migration and spawning. Barriers to fish migration do not always constitute a transition between Class I and II, as resident populations of fish may exist beyond the barrier, and if the barrier were to be removed migration could be restored. Class II watercourses provide aquatic habitat for non-fish aquatic vertebrate species, such as frogs and salamanders. Indicators of Class II watercourses include: gravel pools, refugia in the channel side-walls, aquatic indicator plants such as giant chain fern *(Woodwardia fimbriata)*, horsetail *(Equisetum spp.)*, or maiden hair fern *(Adiantum capillus-veneris)*, and may have flowing water for the majority of the year. Class III watercourses do not support aquatic life cycles, but show evidence of being capable of sediment transport to Class I and II watercourses under normal high-water flow conditions. These watercourses generally drain the steep headwater areas and side slopes of larger watercourses and run only in response to heavy rainfall.

Roads are the largest source of impacts to water quality on forested properties. To improve water quality, roads should be maintained to get water off the roads as quickly as possible and crossings should be upgraded to limit sedimentation and avoid failure.

Removal of streamside vegetation has the potential to decrease riparian habitat, increase water temperatures and increase sedimentation of watercourses. While there are situations in which thinning and vegetation removal within riparian areas can be beneficial for fire preparedness and reducing competition, these areas are often the most sensitive to disturbance. When removing vegetation near creeks care should be taken to retain larger vegetation, for roots to stabilize stream banks and canopy cover to remain intact for shade.

Another source of sediment from forest related activities comes from large woody slash being deposited in the channel of Class III watercourses. When large wood is in the channel of a watercourse, it scours paths around the obstruction during periods of high flows. While diversified channel morphology is beneficial for habitat in Class I and Class II streams, it is unnecessary in a Class III stream with no aquatic life present and has the potential to deliver sediment downstream. Large slash should be removed to avoid catching and redirecting flows during times of significant rainfall.

Table 5-5: Water Quality Related Conservation Practices in Addition to Road Related Work

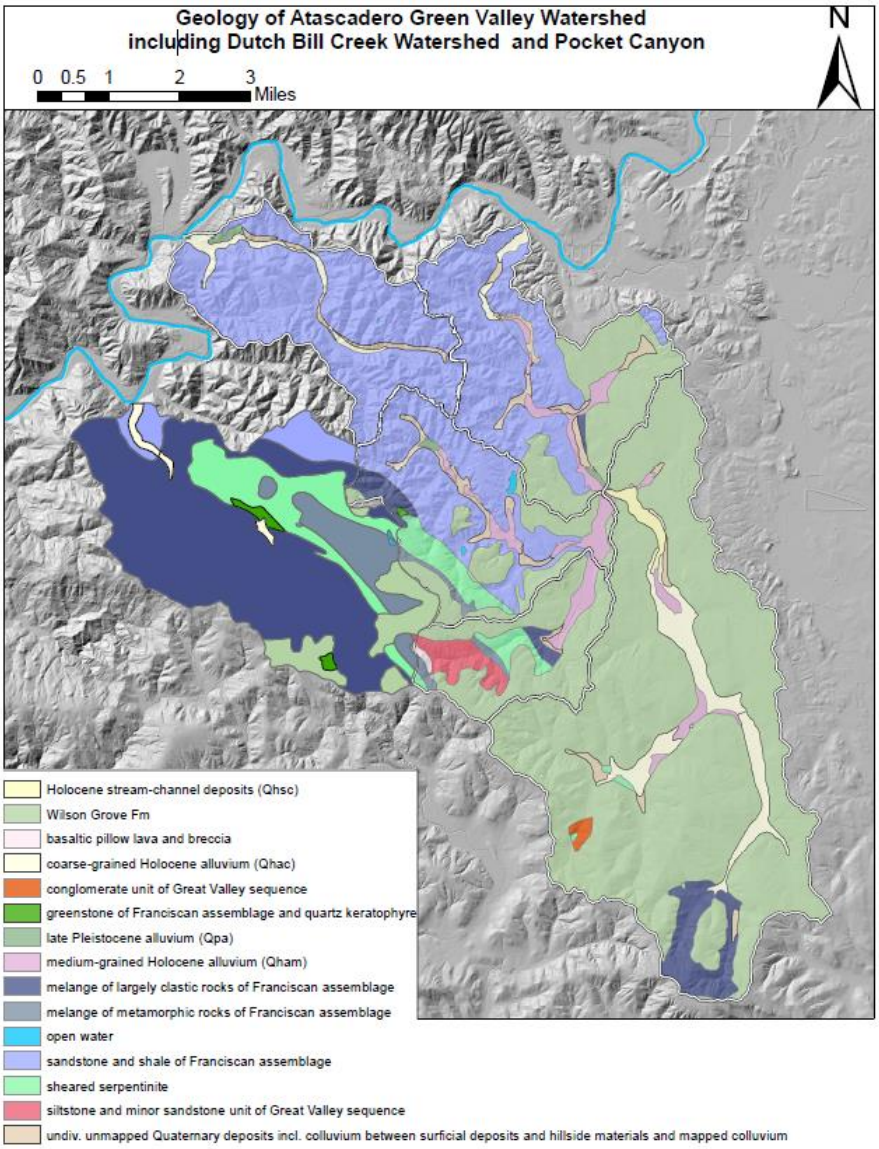
Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Establish permanent vegetation on degraded and exposed areas.	Critical Area Planting (342)	☐		
Enhance and protect existing wetlands on the property to retain permanent vegetative cover.	Wetland Enhancement (659)	☐		
Construct sediment basin on disturbed areas to capture excessive sedimentation delivered to watercourses.	Sediment Basin (350)	☐		
Improve riparian zone to maintain or enhance the beneficial functions of a riparian buffer.	Riparian Herbaceous Cover (390); Riparian Forest Buffer (391); Stream Bank & Shoreline Protection (580)	☐		
Stabilize eroding stream banks	Stream Bank & Shoreline Protection (580)	☐		
Upgrade roads to limit sedimentation	See Table 5-2	☐		
Other:		☐		

SOILS AND GEOLOGY

Geology

The Dutch Bill Creek Watershed is made up solely of the Franciscan Assemblage (Green Valley and Dutch Bill Watershed Update, Gold Ridge RCD)

The Franciscan Assemblage



The Franciscan assemblage is a mélange of various rocks from widely spread sources mixed in a clay matrix. It is the principal geologic formation of western Sonoma County. The Franciscan Complex or Franciscan Assemblage is a late Mesozoic terrane of heterogeneous rocks found throughout the California Coast Ranges. The San Andreas fault (which passes through Tomales and Bodega Bays) defines the western extent of the assemblage. The assemblage is composed of metamorphosed and deformed rocks, associated with an east-dipping subduction zone at the western coast of North America. Although most of the Franciscan is Early/Late Jurassic through Cretaceous in age (150-66 Mya), some Franciscan rocks are as old as early Jurassic (180-190 Mya) age and as young as Miocene (15 Mya). The age distribution represents the temporal and spatial variation of mechanisms that operated within the subduction zone. Franciscan rocks are thought to have formed prior to the creation of the San Andreas Fault when an ancient deep-sea trench existed along the California continental margin. This trench resulted from subduction of the oceanic Farallon tectonic plate beneath continental crust of the North American Plate. As oceanic crust descended beneath the continent, ocean floor basalt and sediments were subducted and then tectonically underplated to the upper plate. This subduction resulted in widespread deformation with the generation of thrust faults and folding, and caused high pressure-low temperature regional metamorphism. In the Miocene, the Farallon-Pacific spreading center reached the Franciscan trench. The relative motion between the Pacific and North American plates caused the initiation of the San Andreas Fault. Transform movement along the San Andreas Fault obscured and displaced the subduction related structures.

The Franciscan Complex is dominated by greywacke sandstones, shales, and conglomerates which have experienced low-grade metamorphism. Other important lithologies include chert, basalt, limestone,

serpentinite, and high-pressure, low-temperature metabasites (blueschists and ecolgites) and meta-limestones. Fossils like radiolaria are found in chert beds of the Franciscan Complex. The chert outcrop forming the so called Knolls' Point, is an example of one type of rock contained in the Franciscan assemblage. On steeper slopes at lower elevations of the 'Knolls" there are numerous exposed Franciscan rocks.

The sedimentary and volcanic Franciscan rocks were formed in a marine environment, as attested by the abundance of foraminifers in the limestone and by radiolarians in the chert. Most of these rocks are probably Late Jurassic and Cretaceous in age (Bailey and others 1964), but some of the chert and associated volcanic rocks are as old as Early Jurassic (Pliensbachian) (Irwin and others 1977; Blome and Irwin 1983). In the northern Coast Ranges, some of the rocks assigned to the coastal belt of the Franciscan assemblage are as young as late Tertiary and are thought to have accreted to North America during post-middle Miocene time (McLaughlin and others, 1982). The age and origin of Franciscan melánge is problematic. Some, possibly much, of the Franciscan has been transported great distances northward along the Pacific margin relative to a stable North America.

After 30 million years of uplift and erosion, the Petaluma Formation formed from sedimentation in a shallow sea (10 Mya). After more uplift, tilting and erosion, the Sonoma Volcanics resulted from erupting lava and ash (3-8 Mya). The Wilson Grove Formation of sands and fossil shells formed in a shallow sea to the west of the volcanos (3-5 Mya). With yet more uplift and erosion, the Russian River cut its path across rising mountains to the sea. Glen Ellen gravel, sand and clay formed in local valleys (1my).

Soils

Hugo Series:

The Hugo series consists of well-drained very gravelly loams that have a gravelly sandy clay loam subsoil. At a depth of 30 to 60 inches the soils are underlain by weathered, fine-grained sandstone and shale. These soils are on mountainous uplands. They are extensive in the northern half of the county. Slopes are 9 to 75 percent. Elevation ranges from 800 to 3,000 feet. Annual rainfall is 25 to 70 inches, annual temperature is 52 to 56 degrees Fahrenheit, and the frost-free season is 260 to 280 days. The vegetation is chiefly Douglas-fir, redwood, and California bay laurel, with an understory of associated hardwood species.

In a typical profile, the surface layer is pale-brown, neutral very gravelly loam about 8 inches thick. Above this is a layer of loose litter of Douglas-fir needles and twigs. The subsoil is pale-brown, medium acid and strongly acid gravelly sandy clay loam and gravelly heavy loam. At a depth of about 48 inches it is mixed, weathered, medium-grained sandstone (graywacke) and soil material. Hugo soils are used mainly for timber. Some areas have been cleared and are used for grazing.

Josephine Series:

The Josephine series consists of well-drained loams that have a clay loam subsoil. At a dept of 24 to over 60 inches they are underlain by weathered, fine-grained sandstone and shale. These soils are on mountainous uplands. They are in the northern half of the county. Slopes are 9 to

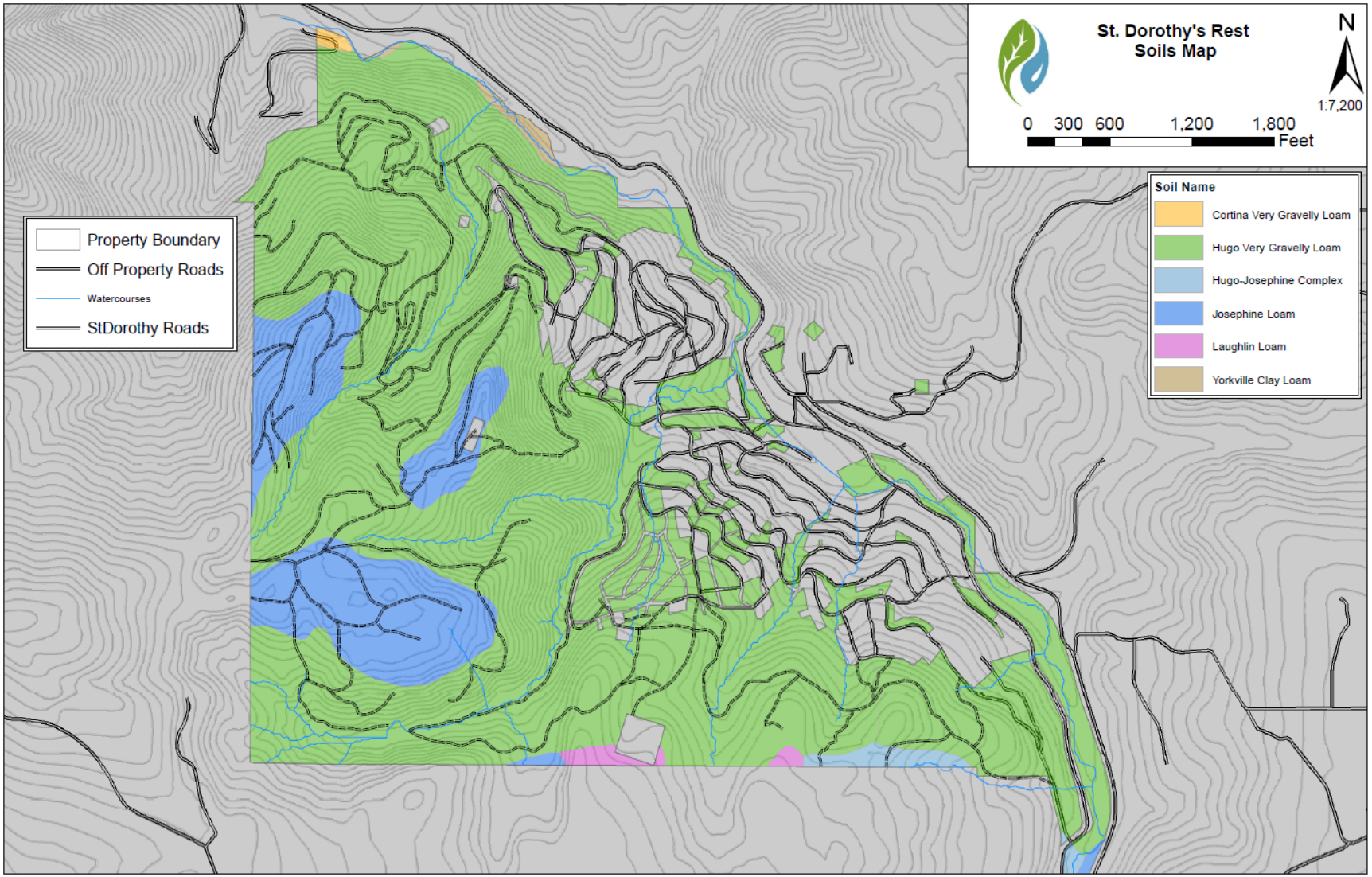
75 percent. Elevation ranges from 600 to 3,000 feet. Annual rainfall is 25 to 70 inches, annual temperature is 52 to 54 degrees Fahrenheit, and the frost-free season is 240 to 260 days. In most place the vegetation is chiefly Douglas-fir, redwood, California laurel, and associated kinds of hardwoods as understory. Some areas have been cleared and have a cover of fern, broom and grasses.

In a typical profile, the surface layer is light-brown, medium acid loam about 13 inches thick. This layer is covered with a thin organic litter of madrone and Douglas-fir. The subsoil is light reddish-brown, medium acid clay loam and, at a depth of 25 inches, is underlain by light reddish-brown, medium acid fine sandy loam. At a depth of about 36 inches, it is fin-grained sandstone and shale. Josephine soils are also used mainly for timber, the cleared areas for grazing.

Laughlin Series:

The Laughlin series consists of well-drained loams that have a sandy clay loam subsoil. At a depth of 14 to 36 inches the soils are underlain by fine-grained sandstone and shale. These soils are on mountainous uplands and ridgetops. They are mainly across the norther half of the county. Slopes are 2 to 75 percent. Elevation ranges from 800 to 3,000 feet. Annual rainfall is 25 to 70 inches, annual temperature is 52 to 56 degrees Fahrenheit, and the frost-free season is also 240 to 260 days. The vegetation is chiefly annual and perennial grasses, forbs and small shrubs, or a combination of oak-grass and manzanita.

In a typical profile, the surface layer is brown, medium acid loam about 4 inches thick. The subsoil is brown, strongly acid sandy clay loam about 18 inches thick. Fractured and weathered sandstone and shale occur at a depth of about 22 inches. Laughlin soils are used mainly for ranch and for grazing by sheep and cattle. A few of the lower slope areas are used for such crops as hay, oats, or oats and vetch.


St. Dorothy's Rest
Soils Map
N
1:7,200
0 300 600 1,200 1,800
Feet
Property Boundary
Off Property Roads
Watercourses
StDorothy Roads
Soil Name
Cortina Very Gravelly Loam
Hugo Very Gravelly Loam
Hugo-Josephine Complex
Josephine Loam
Laughlin Loam
Yorkville Clay Loam

Landslide potential The property is located on relatively unstable soils. See adjacent map. Clip from "Landslides and Relative Slope Stability, Northern Sonoma County" CA Geological Survey. Huffman, Michael E. 1980.

Contact Symbols

Contact between landslide deposits; landslides and more stable ground; or areas of differing slope stability. Dashed line indicates an approximate location.

Landslide Symbols

Landslide: arrows with one barb show general direction of movement.

Possible landslide.

Indicates a generalized area of landslides and unstable soil, undifferentiated in details of size or direction of movement.

Landslide or severe soil creep area too small to be outlined at the map scale.

Data is for the purpose of regional planning and for the assessment of studies that are required for land use and development planning. Geologic and soil reports are required for land development plans and designs.

Zones of increasing natural slope stability

Decreasing hazard

Landslides

(see "Landslide Symbols" below)

Areas of lowest relative slope stability. Failure and downslope movement of rock and soil have occurred, or may have occurred ("possible" landslides).

C

Areas of relatively unstable rock and soil units, on slopes greater than 15%, containing abundant landslides.

B

Areas of relatively stable rock and soil units, on slopes greater than 15%, containing few landslides.

B_f

Locally level areas within hilly terrain; may be underlain or bounded by unstable or potentially unstable rock materials.

A

Areas of greatest relative stability due to low slope inclination - dominantly less than 15%.

Note: Geologic conditions in areas labeled B_f, B, C, and landslides mandate that engineering geology reports must be required prior to tentative tract approval for land use planning and land development within those areas.

Note: Categories are interpretive and apply generally to large areas. Within each area conditions may range in detail through all four stability categories. Hence, an A area may locally contain unmapped landslides, and a landslide area may contain stable slopes of slight inclination.

Table 5-6: Soil Quality Related Conservation Practices

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Reforest areas currently barren or dominated by brush, if ecologically appropriate, to create forest canopy and increase water holding capacity.	Tree/Shrub Establishment (612); Tree/Shrub Site Preparation (490)	☐		
Minimize number of passes by heavy equipment to reduce soil compaction and soil disturbance.		☐		
Do not operate heavy equipment when soil is saturated to reduce potential soil compaction.		☐		
If conducting timber harvests, use cable logging systems on steep slopes.		☐		
Retain low levels of slash for nutrient cycling.		☐		
Place slash or reseed large areas where bare mineral soil is exposed.		☐		
Other:		☐		

5.3 Biological Resources

FISH AND AQUATIC RESOURCES

Fish habitat in the Dutch Bill Creek watershed has been impacted by historical timber harvests, grazing, and other land use practices in the watershed. There were coho salmon detected in Dutch Bill Creek just north (downstream) of Camp Meeker in 2015 (CNDDB list).

Salmonids

Coho salmon over-summer in their natal streams before migrating out to sea the following winter/spring. Water temperature and quantity during the summer and fall low flow periods are two of the most important limiting factors for survival of coho salmon in stream habitats. When water temperatures exceed 68° F (20° C), salmonid fry become stressed and their ability to grow is reduced. In addition, as water temperature increases, the concentration of dissolved oxygen decreases, which adds stress to juvenile salmonids.

Water temperature control in anadromous fish-bearing streams where cooler temperatures are needed can be achieved through controlling sediment from entering streams, ensuring optimal canopy cover, and improving base streamflows from seeping groundwater. Controlling sediment thereby also prevents increases in turbidity levels, which can increase stream temperatures through sediment particle absorption of sunlight. Increasing canopy cover is generally associated with keeping stream temperatures cool by way of reducing the amount of sunlight that reaches the stream. At quantity levels considered healthy, groundwater aquifers can provide base streamflows to streams during low dry season periods. Groundwater is typically cool and seeps to streams during hotter times of the year when most beneficial for anadromous in need of cool temperatures for survival.

When adult salmonids return to freshwater stream habitats to spawn, suitable conditions must be present for them to reproduce successfully. Adequate water depth for migration and complex scour sites for refugia are needed to reach the spawning sites. Typical spawning habitats occur at the transition between a pool and riffle, termed “riffle crest.” Substrate size and the lack of excessive fine sediment are required for a female to dig the redd (nest) prior to depositing the eggs. Thresholds for fine sediment in spawning habitats are measured using embeddedness ratings, and when embeddedness exceeds 50% the site is considered unsuitable for spawning purposes.

Fish and other aquatic wildlife habitat has been degraded by sediment inputs from the legacy impacts of historical land development. Particularly, road networks in the area contribute the largest amount of sediment into streams. Roads, at the time of their building in the area, were not built with consideration of how water moves and its effects on soil. The characteristics of land near old roads include eroded ditches and gullies. Outsloping roads is an appropriate method to remedy this problem when the adjoining area experiences concentrated flows, is recovering from moderate to high burn severity, the road grade is under 10 percent, or the area is susceptible to run-on from adjacent burned areas. Combining outsloping with other treatments, such as rolling dips and armored crossings, is often appropriate (United States Department of Agriculture Forest Service, 2006, December).

Non-Fish Species

The property contains multiple Class II watercourses which provide habitat for non-fish aquatic vertebrate species which potentially includes threatened or endangered species. Within the 3 mile Biological Assessment Area for this plan, CNDDB reported that California red-legged frog have been sighted.

<u>California Giant Salamander</u>

California giant salamanders are year-round residents of north-central California, from southern Santa

Cruz Co.to extreme southern Mendocino and Lake cos. They occur up to 2,160 m (6,500 ft) primarily in humid coastal forests, especially in Douglas fir, redwood, red fir, and montane and valley-foothill riparian habitats. They live in or near streams in damp forests, and California giant salamanders tend to be common where they occur. Aquatic adults and larvae are found in cool, rocky streams and occasionally in lakes and ponds. Terrestrial adults search for prey such as snails, slugs, other invertebrates, small mice, shrews, possibly reptiles, and other amphibians under surface objects and in tunnels underground. Aquatic adults and larvae eat aquatic invertebrates, fish, and other amphibians. Aquatic adults and larvae hide within spaces between rocks in streambeds. Terrestrial adults are found under surface litter and in tunnels underground. Eggs are laid during spring in concealed locations several feet below the surface in cold, slowly flowing water in springs, channels, under streambanks, and beneath rocks and coarse woody debris in stream bottoms. They are usually found in cool, moist, forest habitat and are associated with rocky streams and springs. They are primarily nocturnal, but may be found in the day, and they are more active on rainy nights.

<u>California Red-legged frog</u>

The California red-legged frog inhabits quiet pools of streams, marshes, and occasionally ponds. It occurs along the Coast Ranges from Mendocino County south and in portions of the Sierra Nevada and Cascades ranges, usually below 1200 m (3936 ft). They are a highly aquatic species with typically little movement away from streamside habitats, but can become mobile during rainy periods. Adults feed on aquatic and terrestrial insects, crustaceans, snails, worms, fish, tadpoles, smaller frogs, and small mammals. Their aquatic larvae are mostly herbivorous.

Their breeding period lasts from January to July, peaking in February in the south and March to July in the north. Females lay 750 to 4000 eggs in clusters up to 10 inches across, attached to vegetation 2-6 inches below the water surface. They require permanent or nearly permanent pools for larval development, which takes 11 to 20 weeks, and intermittent streams must retain surface water in pools year-round for frog survival. Individuals have been found considerable distances from breeding sites on rainy nights

A CNDDB search was performed within a 3 mile Biological Assessment Area that can be viewed on the Biological Assessment Map included in the Appendices.

Table 5-7: List of Aquatic Species Found in the Property's Vicinity

Species	Listing Status
Anadromous Fish	
Coho salmon (Oncorhynchus kisutch) central California coast ESU	Federally endangered State listed endangered
Reptiles	
Western pond turtle (Emys marmorata)	CDFW Species of special concern
Amphibians	
California giant salamander *(Dicamptodon ensatus)*	CDFW Species of special concern
California red-legged frog *(Rana draytonii)*	Federal Threatened, CDFW Species of special concern
Foothill yellow-legged frog *(Rana boylii)*	Pacific clade not listed
Crustaceans	
California Freshwater Shrimp *(Syncaris pacifica)*	Endangered

The following table provides an assortment of management practices that are intended improve and protect aquatic habitat, including water quantity and quality. Selection of practices must be done on a site-specific basis. NRCS Practice Titles are provided for landowner reference. Contact your local NRCS or RCD field office for technical and/or possible financial assistance.

Table 5-8: Wildlife Habitat Related Conservation Practices

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Plant native riparian species to improve riparian habitat to retain shade and decrease stream bank erosion.	Riparian Herbaceous Cover (390); Riparian Forest Buffer (391)	☐		
Increase forest vegetation to increase upslope stability.	Tree/Shrub Establishment (612); Tree/Shrub Site Preparation (490)	☐		
Fence riparian areas to keep livestock from browsing riparian	Fencing (382)	☐		

species and eroding stream banks.				
Strategically place large woody debris in stream channels to create fish rearing and spawning habitat.		☐		
Remove fish barriers.		☐		
Other:		☐		

UPLAND WILDLIFE RESOURCES

Table 5-9: California Wildlife Habitat Relationship Types Found on the Property

Habitat Type	Approximate Percentage of Total Property
Redwood	100%

https://www.wildlife.ca.gov/Data/CWHR/Wildlife-Habitats.

Table 5-10: List of Upland Wildlife Species Found in the Property's Vicinity

Species	Listing Status
Mammals	
Pallid bat (*Antrozous pallidus)*	CDFW Species of Special Concern
Sonoma tree vole *(Arborimus pomo)*	CDFW Species of Special Concern
Insects	
obscure bumble bee *(Bombus caliginosus)*	IUCN Vulnerable
western bumble bee *(Bombus occidentalis)*	USFS Sensitive Species

Many upland wildlife species suffer from fractured habitat continuity, and/or degraded habitat from land use practices. The redwood region as a whole suffers from a lack of mature, or old growth, forest characteristics that many terrestrial species have adapted their habits to. Characteristics of these mature stands include large trees within a multilayered canopy with large numbers of snags and downed logs present that contribute to an increased level of stand decadence. According to the California Forest Practice Rules, snags, den trees, nest trees and their recruitment are required elements in the overall habitat needs of more than 160 wildlife species. The property does contain some trees with old growth characteristics, deformities such as broken or multiple tops, which are important for the recruitment of high value wildlife trees. Wolfy trees with large diameter limbs and broken or multiple tops are ideal for nesting and roosting for many species, particularly raptors.

Opportunities to enhance wildlife habitat needs on the property consist primarily of increasing the amount of mature forest on the property with adequate components of hardwoods and standing dead trees (snags), and adequate amounts of large wood debris on the ground. Standing dead timber is an essential feeding and nesting habitat for many wildlife species. Mammals, particularly bats, den in them, raptors perch in them, and woodpeckers feed in them. Large snags are especially valuable. Many cavity nesting birds and mammals are insect eaters and play a significant role in the regulation of forest

insect populations. If enough snags are retained for primary cavity excavators like woodpeckers, then there should be sufficient cavities for secondary cavity nesters such as bats, screech owls, western blue birds, and western gray squirrels who are not capable of excavating and must utilize existing cavities. Increasing the density of snags to at least 3 per acre is recommended. In this area, Douglas-fir tends not to maintain health into old age and could be recruited for snags.

Northern Spotted Owl (Strix occidentalis caurina)

The species is an uncommon permanent resident that utilizes Coniferous Forest and Broadleaf Evergreen Forest habitats. The species frequents old-growth or mixed stands of old-growth and mature tree (occasionally in younger forests with patches of big trees) with high, multistoried canopy dominated by big trees, with some trees having cavities or broken tops, with woody debris and space under the canopy, and perennial sources of water nearby. Breeding takes place in natural tree cavities, on broken tree tops, and on vacant stick nests of other birds. The species hunts nocturnally from perches in trees, primarily taking small to medium sized mammals, but also taking birds and opportunistic prey. In California, the primary food source for northern spotted owl is the dusky-footed wood rat, which makes its nests from downed woody debris and slash.

The main threats to northern spotted owl are habitat fragmentation, displacement from barred owl (Strix varia), effects from previous habitat loss, and continued habitat loss. Conservation efforts for the species should focus on improving habitat by increasing the size and complexity of forest structure in young forests, and maintaining legacy habitat elements within older forests. The critical breeding period for this species is between March 1st and August 31st, forest operations being undertaken using avoidance measures should plan for operations to occur outside this critical period.

Sonoma tree vole (Arborimus pomo)

The Sonoma tree vole (formally the red tree vole) is located throughout Sonoma County. It inhabits young Douglas-fir stands. Nests can be located in Douglas-fir trees in the mid canopy region of the trees. This species is critical to the success of the Northern spotted owl as it is its primary food source. Its primary food source is the needles of young Douglas-fir trees. Tree vole nests look very similar to small woodrats or large bird nests and often times they will take over abandoned nests from other species.

Table 5-11: Wildlife Habitat Related Conservation Practices

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Improve riparian habitat	Riparian Herbaceous Cover (390); Riparian Forest Buffer (391)	☐		
Reforest areas that were historically forest stands	Tree/Shrub Establishment (612); Tree/Shrub Site Preparation (490)	☐		
Remove unnecessary fencing that may inhibit wildlife passage or convert to wildlife friendly fencing.		☐		
Remove and/or girdle conifers and other evergreen tree species encroaching on deciduous oak woodlands.	Forest Stand Improvement (666); Restoration and Management of Rare or Declining Habitats (643); Brush Management (314)	☐		
Radially thin around individual dominant trees to encourage the growth of wolfy characteristics.	Forest Stand Improvement (666)	☐		
Construct nesting or perching structures for wildlife.	Structures for Habitat (649)	☐		
Girdle trees for snag creation and/or invasive tree removal.	Brush Management (314)	☐		
Other:		☐		

RARE, THREATENED, AND ENDANGERED PLANT SPECIES

Use the California Native Plants Society's ("CNPS") Rare and Endangered Plant Inventory list for rare, threatened and endangered plant species found within at least three miles of the property boundary. Lists may be queried by USGS quadrangles. Additionally, the *Rare and Endangered Plant Field Guide for Timber Harvest Plans in Coastal Mendocino County* may be used for forest types found in Mendocino County. The Guide can be downloaded at http://mcrcd.org/. Use Table 5-12 to list the species found in the property's vicinity. Break out species by plant type and list the general habitat(s) in which they are found.

Table 5-12: Rare, Threatened, and Endangered Plant Species Found in the Property's Vicinity

Species	Rare Plant Rank	Habitat
Annual Herb		
Congested-headed hayfield tarplant *(Hemizonia congesta ssp. congesta)*	1B.2	Sometimes roadsides • Valley and foothill grassland
Crystal Springs lessingia *(Lessingia arachnoida)*	1B.2	Serpentinite, often roadsides. • Cismontane woodland • Coastal scrub • Valley and foothill grassland
Two-fork clover *(Trifolium amoenum)*	1B.1	Sometimes serpentinite. • Coastal bluff scrub • Valley and foothill grassland
Saline clover *(Trifolium hydrophilum)*	1B.2	Mesic, alkaline. Vernal pools. • Marshes and swamps • Valley and foothill grassland
Fruticose Lichen (epiphytic)		
Methuselah's beard lichen *(Usnea longissimi)*	4.2	On tree branches; usually on old growth hardwoods and conifers. • Broadleafed upland forest • North Coast coniferous forest
Perennial Evergreen Shrub		
Baker's manzanita *(Arctostaphylos bakeri ssp. Bakeri)*	1B.1	Often serpentite. • Broadleafed uplan forest • chaparral
Vine hill ceanothus *(Ceanothus foliosus var. vineatus)*	1B.1	• chaparral
Perennial Herb		
Sonoma alopecurus *(Alopecurus aequalis var. sonomensis)*	1B.1	• Marshes and swamps (freshwater) • Riparian scrub
Baker's larkspur *(Delphinium bakerii)*	1B.1	Decomposed shale, often mesic • Broadleafed upland forest • Coastal scrub • Valley and foothill grassland
Greene's narrow-leafed daisy (*Erigeron geenei)*	1B.2	• Chaparral (serpentinite or volcanic)

Thin-lobed horkelia *(Horkelia tenuiloba)*	1B.2	mesic openings, sandy. • Broadleafed upland forest, Chaparral, Valley and foothill grassland
Perennial Bulbiferous Herb		
Fragrant fritillary *(Fritillaria liliacea)*	1B.2	Often serpentite • Cismontane woodland • Coastal prairie • Coastal scrub • Valley and foothill grassland
Perennial Rhizomatous Herb		

INVASIVE PLANT SPECIES

Scotch broom (Cytisus scoparius) or French broom (Genista monspessulana)

Scotch and French brooms are upright, woody shrubs that commonly grow to ten feet tall. They have sharply angled branches with simple (single) leaves on young branches and compound (multiple) leaves of three leaflets on older branches. They have yellow to white flowers that bloom between March and June. Management for both broom species is similar, and prevention is the best method of control. These brooms were located on the property during field reconnaissance on a small number of open skid trails, these species are capable of establishing a hardy seed bed that can remain in the soil for decades and capitalizes on disturbance events like fire or logging, which is cause for concern. Areas with large plants will likely need mechanical treatment initially and then a follow-up treatment focusing on early-stage growth as described below.

Eradication methods at early stages are:

- Mechanical – Pulling
- Herbivory – limited to goats due to toxins in the plant
- Chemical – foliar spray with herbicide, contact a qualified licensed applicator for more information
- Fire – young plants may be wilted (top killed) using propane torches or can be knocked back using broadcast fire. Keep in mind that broadcast fire can open the seedbed, potentially making the problem worse without follow up treatment

Himalayan blackberry (Rubus discolor)

Himalayan blackberry (synonym: Armenian blackberry) is a vigorous, sprawling, vine-like evergreen shrub native to western Europe. It produces sweet, edible berry-like fruit and is both a valued cultivated plant as well as a rapidly spreading invasive weed. It is common in the Pacific Northwest and is expanding its range throughout the western United States. It easily spreads vegetatively and by seed.

Himalayan blackberry can be easily distinguished from its California native cousin California blackberry (Rubus ursinus) by examining the canes (or stems) of the plant. Himalayan blackberry will have a deeply ribbed cane, with thick curved prickles. California blackberry will have a smooth cane, with much smaller straight prickles.

Himalayan blackberry rapidly displaces native plant species and produces thickets so dense that the lack of light severely limits understory plant growth. Native vegetation growing beneath Himalayan blackberry becomes highly suppressed from shading and crowding. The dense, prickly thickets also hinder control efforts and impede access for humans, wildlife, and livestock. When growing near waterways, the species may worsen streambank erosion since its relatively shallow roots do not stabilize soils as do other, more desirable native riparian vegetation.

Treatment of Himalayan blackberry requires frequent and persistent treatments. Chemical controls via foliar spray are the usual prescription for Himalayan blackberry, however this is not recommended near watercourses. Himalayan blackberry readily re-sprouts following fire, and typically re-established vigorously post treatment – fire thus should not be depended on as a method of eradication, although it can be used to dispose of vegetative clippings. Prescribed herbivory with goats and sheep can be an effective way to keep new growth of blackberry at bay, however they often will not eat the older canes readily and there are potential erosional and sanitation issues with herbivory near streams.

FOREST INSECTS AND DISEASE

Disease

Diseases affecting redwood are limited. Redwood pocket rot *(Poria sequoiae)* is a large brown pocket rot of the butt and trunks, commonly on old trees.

Diseases which may affect the stem of Douglas-fir in this area include white pocket rot *(Phellinus pini,* or *Fomes pini),* also called red ring rot, a heart rot which is the leading cause of decay. It infects trees through roots and open wounds, fire and lightening scars. This is the most prevalent disease in Douglas-fir and the most damaging wood rot in the western United States. Presence of this disease is identified by the fruiting bodies, or "conks," found throughout the bole of Douglas-fir. The size and spacing of the conks present are directly related to the amount of decay within the wood. The best way to reduce the risk of red ring rot is to avoid damaging trees. However, most old Douglas-fir become infected, reducing the merchantability of trees. The recommended management strategy for addressing red ring rot is through careful thinning. Thinning will reduce inter-tree competition for light, water, and soil nutrients, leading to a stand of wider spaced, more vigorous trees; however, as mentioned before, the disease is spread through open wounds and caution should be taken during any operation to reduce residual stem damage.

Red brown-butt rot *(Phaeolus schweinitzii)* similarly attacks usually just the butt of the tree. Black stain root disease *(Verticicladiella wagnenerii)* has been found on Douglas-fir in Mendocino County, infecting the roots of trees of all ages where it spreads throughout the sapwood of the root system, root crown, and lower bole, causing a visible decline in the tree crown, reducing terminal growth, needle production and eventually causing death. The occurrence of conks with these fungi is common with *Phellinus*,

occasional with the others. Annosus root disease *(Heterobasidion annosum,* formerly *Fomes a.)* is found on most conifers and several hardwoods here including Douglas-fir, coast redwood, madrone, and manzanita. This fungus enters through cut surfaces or through root contact making thinned stands especially vulnerable. Trees weakened by fungus diseases are more susceptible to beetle attack. Common points of infection for these fungi that cause the wood to rot are branch stubs, wounds, and fire scars.

Pine pitch canker *(Fusarium subglutinans)* is a recently introduced lethal fungus seriously affecting pine stands in California, and although it primarily affects Monterey and bishop pine, it is likely that other species may also be susceptible. Presently the disease is found in many coastal areas including Sonoma and Mendocino Counties. Although no evidence of pitch canker has been observed in the immediate area of this property, it is important to watch for initial indicators of the disease not only on site, but in the general area. Indications of the disease in infected trees include color change of needles, leading to flagging of branches and followed by resin flow on branches or down the trunk. Several insects act as vectors including all twig, cone, and bark beetles.

Sudden Oak Death

Another relatively new problem in this area is a water mold called Sudden Oak Death (*Phytophthora ramorum*), which has all the appearances of a classic decline disorder and is exacerbated by stress factors. P.ramorum is hosted by nearly every woody species found on the north coast of California, although some species are affected more than others. The death rate of tan oak, coast live oak and black oak trees has accelerated alarmingly in the affected areas reaching epidemic proportions and exacerbating fire danger. The infection was first detected in the tan oak trees in 1995. Tan oak trees are extremely resilient to most pathogens, which makes their susceptibility even more unusual. An inconsistent symptom of the pathogen is an oozing of liquid, usually on the trunk of the tree. The Phytophthora species enters through the bark and limbs, and thrives in wet conditions. At least two insects and two additional fungus diseases are associated with this oak decline--the western oak bark beetle and the oak ambrosia beetle and *Armillaria* root disease and *Hypoxylon thouarsianum.* These may be contributing stress factors leading to mortality or they may also be causative.

SOD has been seen in the watershed and was found on the property in advanced stages. Signals to watch for are sudden decline and death of tanoak, usually in isolated individual trees, and a brown or black resiny exudation on the lower trunk. Stands of tanoak which are extremely crowded from repetitive resprouting after logging, clearing, or fire are already stressed and may be more susceptible than more open, less dense or more mature stands.

One of the main issues with SOD on the property is that as a result of past high-grade logging, there are significant stands on the property where tanoak makes up the overwhelming majority of basal area, and the disease is spreading rapidly through these stands. As a result there are large gaps in the canopy that are being created, allowing the growth of weedy species, and large quantities of dead wood have been accumulating on the forest floor; a perfect scenario for high intensity high severity fire conditions.

SOD affected tanoak on the property are top killed but the tree is still alive and re-sprouts from the base. These new growth shoots live for a few years and often get to a height of 10-15 feet before again top-kill sets in, critically exacerbating fuel loads. In areas where this is occurring, it may be worth

considering the use of herbicide to kill the individual tree, putting this cycle of death and re-growth to an end.

Beetles/ Insects

In Sonoma and Mendocino County, insect attacks generally occur in scattered small areas. For Douglas-fir, build-up of insect populations to the point where damage is significant is generally associated with trees that have blown down, logging slash, and fire damage, all of which provide a favorable habitat for the insects. Bark beetles cause major damage to California forests, boring tunnels into inner bark and cambium to lay eggs; hatching larvae bore additional galleries as they mature, and the process repeats, sometimes several generations a year. Generally beetles are specific to one particular species of tree, though some may infest several types, and severe infestations weaken and often kill the tree or whole stands of trees, Two bark beetles that attack Douglas-fir are the Douglas-fir beetle *(Dendroctonus pseudotsugae)*, and the Douglas-fir engraver *(Solutes unispinosus)*. Older, stressed Douglas-fir are more successfully attacked by bark beetles. Bark beetle attack symptoms generally include the upper parts of beetle-infested trees fading first from a deep green to light green, then yellow, and finally to red. The top only may be killed or the entire tree. Other less noticeable initial signs of bark beetle attack can include boring dust from entry holes through the bark or pitch tubes exuding from entrance holes. Infested trees with living bark beetles should be cut down and removed, burned or debarked.

Some insects that attack redwood are the flat-headed borer *(Anthraxia aeneogaster)* and the round headed borers *(Callidium sempervirens, C. pallidum, Leptura obliterata, Preonius Californicus).* The redwood bark beetle *(Phloesinus sequoiae)* attacks weakened redwood trees. Maintaining the vigor and health of a stand of forest, though well-timed thinning, with good management and sanitation practices are the best defenses.

Summary

Sanitation is important in maintaining good forest health. Management of slash and damaged trees, especially bishop pine and Douglas-fir, in logging operations and in thinning and release practices will lessen the incidence of many disease and insect vectors. Most diseases spread through wounds, fire scars or cut surfaces, and infected trees are much more prone to insect attack in a weakened or otherwise stressed condition. Entomology and pathology specialists with Cal Fire or the UC Cooperative Extension are usually available to help assess, diagnose, and plan treatment practices for suspected pest or disease problems. A great primary resource for disease identification is “Pests of the Native California Conifers” by David L. Wood, Published by the University of California Press.

5.4 Air Quality

Slash from hand thinning treatments may be piled and burned to keep surface fuel loading low, but should be limited to areas where slopes do not exceed 35%. Alternatives to burning slash would be 1) lop and scatter slash, and 2) masticate or chip fuels where slopes provide adequate access for equipment. When lopping and scattering slash, woody debris should come into close contact with the ground to increase the rate of decomposition and generally should not exceed 18 inches above ground level. These options would eliminate smoke impacts on air quality.

To reduce emissions if using pile and burn slash treatments, “conservation pile burn” techniques may be used. This includes lighting the pile on the top and back of the pile relative to wind direction to control the spread of flames. By allowing the pile to burn from the top, rather than igniting at the bottom or middle of the pile, the heat column will consume most of the smoky emissions from the fire. To ensure complete combustion of the piled materials, move unburned edges into the center of the pile. Conservation burning is promoted by Sonoma Biochar Initiative and the Sonoma Ecology Center; however, there is no scientific literature on the effectiveness of this technique to reduce greenhouse gas emissions.

When burning piles or broadcast burning, all measures required by the Northern Sonoma County Air Pollution Control District (NSCAPCD) must be followed. A burn permit is required year-round for any outdoor burning and must be renewed each year. The smoke management plan is valid for five years. A full list of requirements and restrictions for NSCAPCD’s Open Outdoor Burning Program can be found in Appendix E. The general provisions on restrictions for open burn permits is located below.

NORTHERN SONOMA COUNTY AIR POLLUTION CONTROL DISTRICT

2-100 GENERAL PROVISIONS

2-101 Restrictions & Descriptions
This regulation prohibits the use of open outdoor fires within the North Coast Air Basin with certain exemptions as outlined in 2-102.

101.1 Restrictions
No person shall ignite or cause to be ignited or suffer, allow or maintain any open outdoor fire for the disposal of rubber, petroleum or plastic wastes, demolition debris, tires, tarpaper, wood waste, asphalt shingles, linoleum, cloth, household garbage or other combustible refuse; or for metal salvage or burning of motor vehicle bodies.

2-102 Exemptions

102.1 Fires used only for the cooking of food for human consumption or fires used for recreational purposes.

102.2 Fires set by or permitted by any public officer when such fire is necessary for any of the following purposes: (41801 H & S Code)

102.2.01 The prevention of an imminent fire hazard, as defined in 2-207.

102.2.02 The instruction of public employees in the methods of fighting fires.

102.2.03 The instruction of employees in methods of fighting fire, when such fire is set pursuant to permit, on property used for industrial purposes.

102.2.04 The setting of backfires necessary to save life, or valuable property pursuant to Section 4426 of the Public Resources Code.

102.2.05 The abatement of fire hazards pursuant to Section 13055 H & S Code. (Any public agency authorized to engage in fire protection activities, including but not limited to a fire protection district, city, city and county, or county fire department, the California Department of Forestry and Fire Protection, and the United States Forest Service, may use fire to abate a fire hazard.)

102.2.06 Disease or pest prevention, where there is an immediate need for, and no reasonable alternative to, burning.

102.3 Fires used for the disposal of non-industrial wood waste from trees, vines, and brush at any approved disposal site in the North Coast Air Basin subject to the requirements and limitations of 2-101.1 and 2-400 (41804.5 H & S Code).

102.4 Fires set in accordance with Section 2-300 of this regulation, and subject to the restrictions and limitations of 2-101.1 and 2-400 (41804.5 H & S Code).

102.5 Fires conducted in a mechanized burner subject to permit conditions specified by the District such that no air contaminant is discharged into the atmosphere for a period or periods aggregating more than 30 minutes in any eight-hour period which is:

102.5.01 As dark or darker in shade as that designated as No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines, or

102.5.02 Of such opacity as to obscure an observer's view to a degree equal to 102.5.01.

5.5 Archaeology and Cultural Resources

There are no known archaeological resources on the property. The RPF preparing this document did not observe any archaeological artifacts or features during field reconnaissance, although there are historic resources of potential significance throughout the area and the village of Camp Meeker.

In order for grant funds or public works to occur on the property a cultural resources review will need to be conducted, which generally involves tribal notification, an inquiry to the Northwest Information Center at Sonoma State University to determine if there are known local sites, a pre-survey report, archaeological survey, and any subsequent documentation of findings. Items that are likely to be found on site include midden, or ancient refuse deposits, shells, stone tools including mortars/pestles (metate/mano), bedrock mortars, sharpened obsidian or chert points, and/or worked stone flakes and cores.

Forest practices that may cause significant degradation of cultural and historic resources include, but are not limited to: road and landing construction, fire break construction, log skidding, timber felling, prescribed fire, quarry development, and heavy equipment operation in general. One of the major reasons that prescribed fire can have a negative impact on cultural resource sites is that when archaeologists date neolithic artifacts they depend on radiocarbon dating the patina of stones, which builds over time on the surface of a cracked stone exposed to oxygen. They can estimate the length of time that a stone's face has been exposed to the atmosphere, which is very helpful when looking at neolithic scattered tools and stone flakes. This patina can be destroyed if exposed to high heat for long durations, so prescribed fire is considered a ground disturbing event.

In general, archaeological sites are found in the same areas that historic sites are found because people throughout time have generally needed the same things from encampments: access to water, food, and shelter. Encampments are generally located near water on flat locations such as mid-slope benches near watercourse confluences, or on ridgetop saddles with high access to water.

The property has multiple potential historic resources, which are generally defined as any cultural resource that is listed in or eligible for listing in the California Register of Historical Resources, or any object, building, structure, site, area, place, record or manuscript which a lead agency [archaeologist] determines to be of *historical significance*. Generally, this *could* be applied to any historic artifact or site in excess of 50 years old, if it is determined that it provides important information about historic events or people, or has important design values (important structures, buildings, or objects). When working with CAL FIRE, it is their archaeologists who determine if records are significant, although an archaeologically trained resource professional could conduct the survey.

Prior to utilizing government cost share programs like CFIP, EQIP, or VMP, or grant-funded operations on site; a confidential archaeological addendum will need to be prepared by a qualified Archaeologist or their designee, and an archaeological records request to the Northwest Information Center will need to be filed. If the property owner chooses to work under an EQIP contract, NRCS currently will provide this service at no cost to the landowner. If the landowner chooses to enter into a CFIP contract, or file a Timber Harvest Plan, this work can be conducted by a Registered Professional Forester as long as they have a valid Archaeological Surveyor Certificate through CAL FIRE.

6. PROPOSED VEGETATION MANAGEMENT

6.1 Vegetation Types

Summary of overall forest inventory:

The property was surveyed by SRCD in the Summer of 2020. Twenty-three, 1/10th acre plots, were measured for species, number of trees, and diameters. The plots focused on the parcels acquired in 2017 rather than including information within the village of Camp Meeker. Results from the inventory show a coarse picture of the forest structure on the property as a whole. Analysis of the inventory did not show a great disparity in trees per acre or basal area between units on the property, which was surprising and likely is a result of plots being placed in a systematic evenly spaced random distribution based on the entire acquisition property, rather than a stratified random sampling based on anticipated subpopulations of known size; which would have had more plots allocated in riparian areas where large trees are known to be based on field observations and height distribution models verified by LiDAR imaging.

The following tables show the summary of forest conditions across the property.

Trees Per Acre		
Species	Live	Dead
Redwood	70.0	0.9
Douglas-fir	76.1	0.0
Tanoak	424.8	84.3
Madrone	13.9	7.4
CA Bay	133.0	9.1
Bigleaf Maple	0.4	0.0
Alder	13.0	0.0
White Oak	0.0	0.0
Live Oak	0.0	0.0
Black Oak	0.0	0.0
Pine Spp	0.9	0.0
Other Softwood	0.0	0.0
Other Hardwood	69.6	8.7
SUM	801.7	110.4
	912.2	

Basal Area (ft^2/ acre)		
Species	Live	Dead
Redwood	120.4	0.8
Douglas-fir	38.7	0.0
Tanoak	44.5	24.4
Madrone	5.3	1.6
CA Bay	17.3	0.2
Bigleaf Maple	0.8	0.0
Alder	0.1	0.0
White Oak	0.0	0.0
Live Oak	0.0	0.0
Black Oak	0.0	0.0
Pine Spp	2.3	0.0
Other Softwood	0.0	0.0
Other Hardwood	0.4	0.1
SUM	229.8	27.1
	256.8	

Size Breakdown (Live)		
Trees Per Acre		
DBH	Live	Dead
1	500.0	30.4
2	73.9	30.4
3	47.8	21.7
4	27.8	7.0
6	33.9	3.5
8	19.1	3.9
10	17.0	3.5
12	15.2	4.3
14	12.2	0.9
16	15.7	1.3
18	10.0	1.3
20	7.0	0.0
22	3.5	1.3
24	3.0	0.4
26	1.7	0.0
28	3.0	0.4
30	1.7	0.0
32	3.9	0.0
34	0.9	0.0
36	1.7	0.0
38	0.4	0.0
40	1.3	0.0
42	0.0	0.0
44	0.0	0.0
46	0.0	0.0
48+	0.9	0.0
SUM	802	110

Above Ground Bole Volume Per Acre (ft^3)			Pounds of Carbon/Acre	
Species	Live	Dead	Live	Dead
Redwood	4374.7	0.3	62907.5	3.8
Douglas-fir	1484.8	0.0	19925.7	0.0
Tanoak	1911.7	866.5	22482.1	10190.3
Madrone	239.6	39.6	2817.3	465.3
CA Bay	683.5	6.5	8037.7	76.7
Bigleaf Maple	32.6	0.0	383.5	0.0
Alder	0.0	0.0	0.0	0.0
White Oak	0.0	0.0	0.0	0.0
Live Oak	0.0	0.0	0.0	0.0
Black Oak	0.0	0.0	0.0	0.0
Pine Spp	75.2	0.0	884.6	0.0
OtherHardwood	0.0	0.0	0.0	0.0
OtherSoftwood	0.0	0.0	0.0	0.0
SUM	8726.8	912.9	116553.7	10736.0
	9639.7		127289.7	

Species	Trees Per Acre	Basal Area (ft^2/ acre)	Merchantable Volume/Acre (BF)
Redwood	70	120	22719
Douglas-fir	76	39	7937

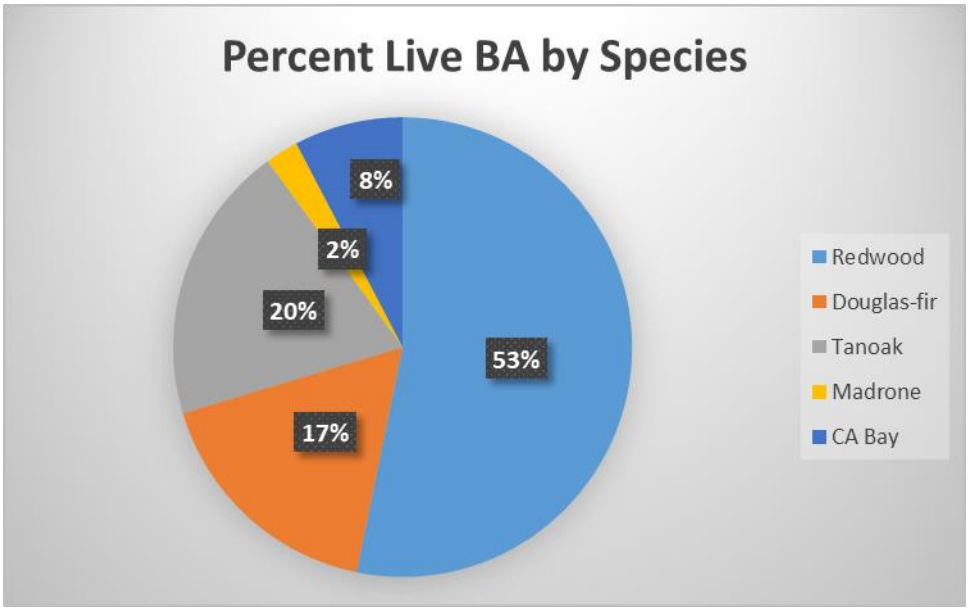


Figure 1 Percent Live Basal Area by Species

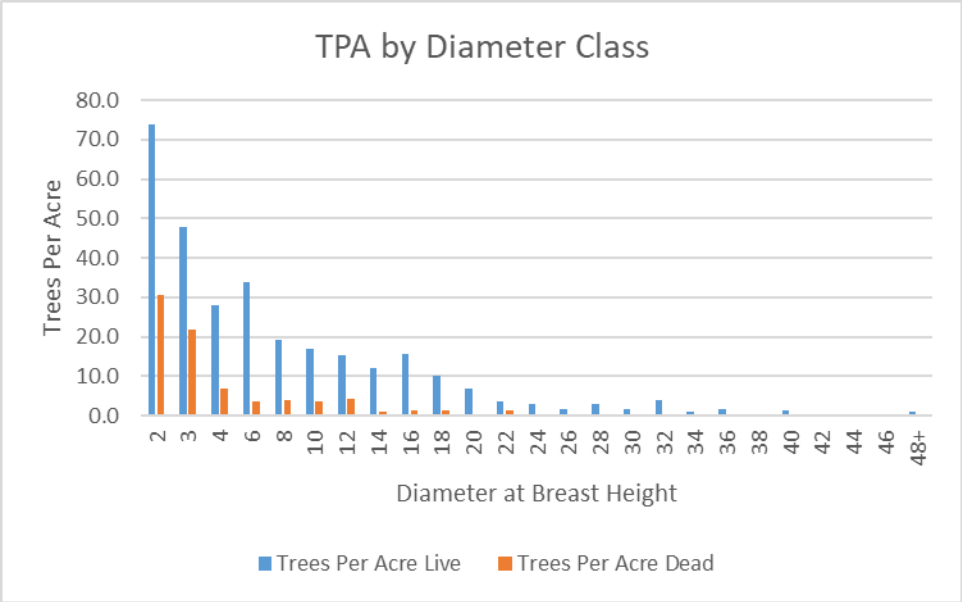
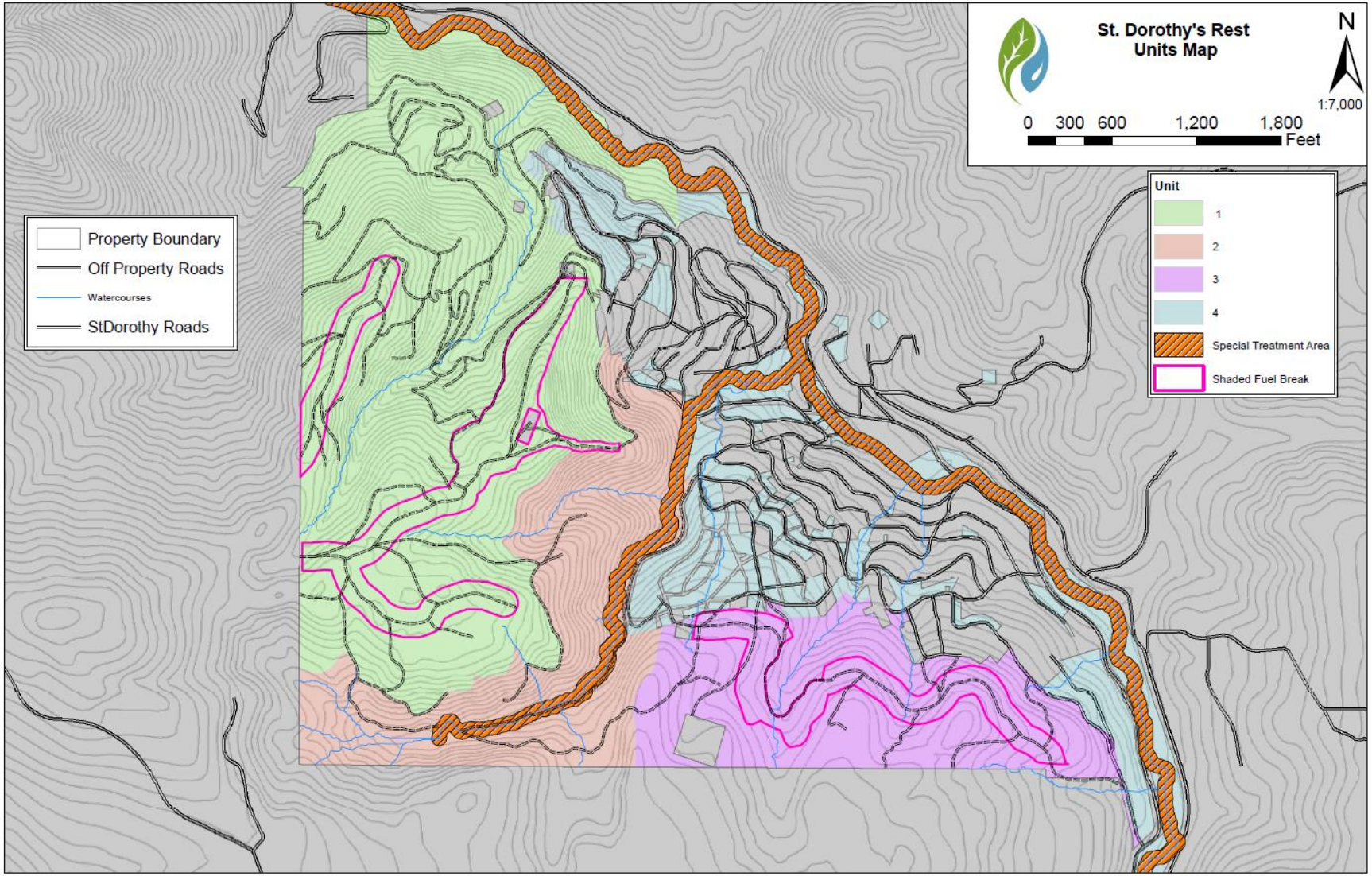
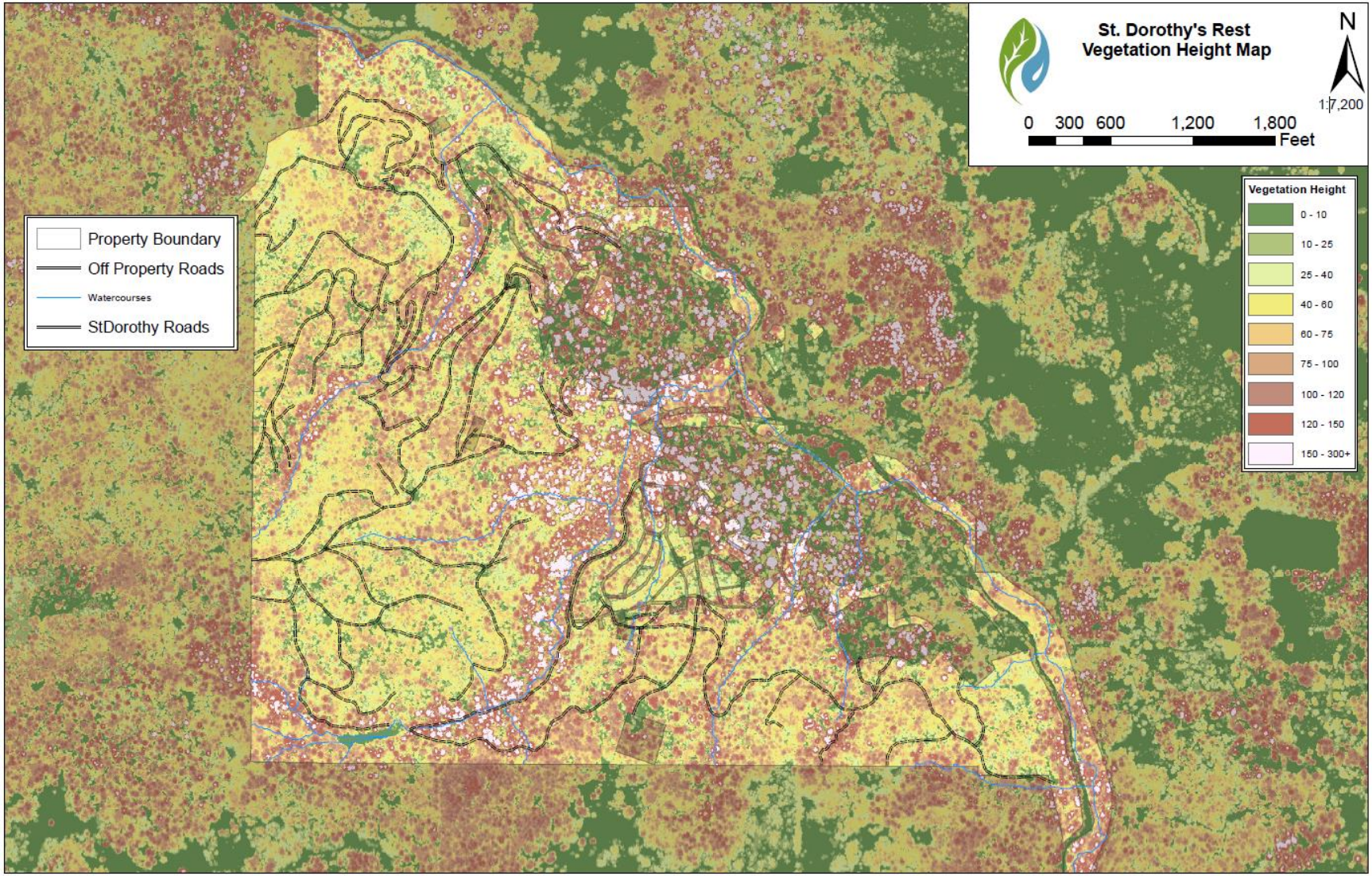
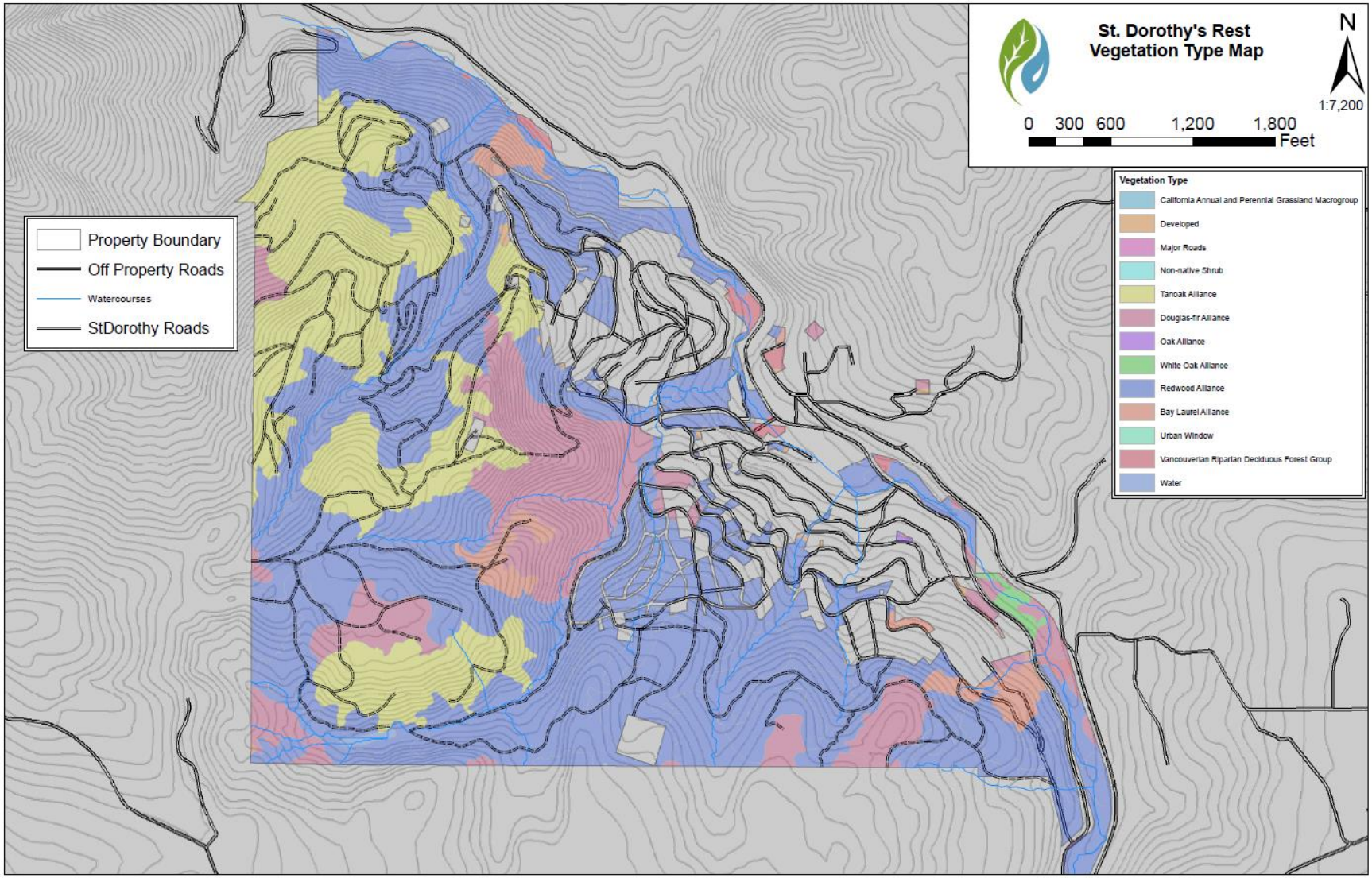


Figure 2 TPA by Diameter class without the 1 inch size class represented for clarity


St. Dorothy's Rest
Units Map
N
1:7,000
0 300 600 1,200 1,800
Feet
Property Boundary
Off Property Roads
Watercourses
StDorothy Roads
Unit
1
2
3
4
Special Treatment Area
Shaded Fuel Break


St. Dorothy's Rest
Vegetation Height Map
N
1:7,200
0 300 600 1,200 1,800
Feet
Property Boundary
Off Property Roads
Watercourses
StDorothy Roads
Vegetation Height
0 - 10
10 - 25
25 - 40
40 - 60
60 - 75
75 - 100
100 - 120
120 - 150
150 - 300+


St. Dorothy's Rest
Vegetation Type Map
N
1:7,200
0 300 600 1,200 1,800
Feet
Property Boundary
Off Property Roads
Watercourses
StDorothy Roads
Vegetation Type
California Annual and Perennial Grassland Macrogroup
Developed
Major Roads
Non-native Shrub
Tanoak Alliance
Douglas-fir Alliance
Oak Alliance
White Oak Alliance
Redwood Alliance
Bay Laurel Alliance
Urban Window
Vancouverian Riparian Deciduous Forest Group
Water

The landowner's main objective for the forest is to protect forest health and encourage large diameter tree growth; thereby the management objectives will be to limit forest pathogen spread, reduce fuel loads and connectivity, and favor individual tree growth in large thrifty trees. The forest composition is typical of redwood forests in the southern extend of their range including redwood, Douglas-fir, tanoak, madrone, and California bay laurel. The forest inventory also identified big leaf maple and California nutmeg near riparian areas, and a minor component of pine what were likely planted at some point. The forest structure on the property is largely made up of younger redwood resulting from the most recent timber harvest on the property. There are interspersed old growth Douglas-fir (and to a much lesser extent, redwood) throughout the property, with larger concentrations of such older trees being located near watercourses and more extreme steep slopes. From a limited number of samples, it appears as though the site productivity of the property may be relatively high with conifer tree heights averaging around 100 feet and the average age of the stand being 45 years old. That would put the site index at 150, meaning at 100 years old a Douglas-fir would be 150 feet tall, which would be high Site Quality III (on a 1-5 scale) nearly Site Quality II for purposes of the Forest Practice Rules.

Management of the property will focus on achieving the above stated goals regarding improved forest health and growth. Much of the work that will need to be done for fuel hazard reduction will be in non/pre-commercial activities, such as thinning of non-commercial woody trees and vegetation, or thinning of tree species that will have commercial value in the future but are currently too small to sell. Activities in this category are typically the most difficult to achieve because they require substantial up-front costs with little to no opportunity for future monetary gain to offset the present costs. There are incentives (cost-share) programs available to help landowners with these costs, they are further discussed in Section 9.4. of this Forest Management Plan.

Currently the vast majority of stems on the property are in the 1 inch or less size class, meaning they are at least 4.5 feet tall but do not have diameters in excess of 1 inch at that height. These stems are overwhelmingly tanoak and California bay laurel, which are hardwood species with the ability to coppice (basal sprout) when the tops die. There is evidence of Sudden Oak Death on the property which accounts for a large percentage of the dead standing inventory on the property. Often times when tankoak trees die from Sudden Oak Death it is only the top of the tree that is killed, and they re-sprout from the base, only to die back again in a few years. Roughly 80% of the standing dead basal area and over 80% of the standing dead mass on the property is represented by dead tanoak. While our inventory did not calculate surface fuel loads, field observations confirm that much of this dead standing inventory has and/or will make it to the ground in the near future and will be readily available fuel in the event of a wildfire.

More than half of the basal area on the property is Redwood and more than half of that basal area is made up of trees over 30 inches in diameter at breast height. Redwood volume on the property comes out to 22.7MBF and of that 16MBF are in trees larger than 30 inches DBH. Douglas-fir occupies a similar trees per acre countt as redwood, but represents a third of the basal area and volume that redwood provides.

The diameter of the tree of mean basal area, meaning the size of tree most representative of the area occupied by trees in the forest, is 10.6 inches DBH; this is ofen called the quadratic mean diameter (QMD). In order to raise the average size of tree on the property, trees under the QMD size must be

removed or otherwise treated, however removing all trees under the QMD would create a vulnerable condition in the forest by removing all the advanced regeneration that is meant to replace larger trees when they die. Instead, silvicultural prescriptions to meet the landowner's ojective of creating a healthy late seral forest type should consider the size and spacing requirements of trees throughout the entire spectrum of sizes and species.

As trees grow they require more space and photosynthetic leaf area to support their increasingly large living mass and remain healthy. When trees compete over growing space it results in mortality among less advantaged trees. It's also important to note that when trees compete for resources their individual growth rates are affected and they are left more susceptible to mortality from outside factors like drought, fire, and pathogens. This relationship in the forest between tree size and number is generally shown on Figure 2 above and is colloquially referred to as a "reverse-J curve". When designing silvicultural prescriptions to manage uneven-aged forests it is important to keep this relationship in mind; to plan for future growth (from residual trees or new recruits) to occupy the growing space left behind from the removal of trees, and to manage competition among individuals within the forest.

Conifer trees on the North Coast can grow to be a substantial size. Old growth redwood, for instance, typically measure 5 feet in diameter or more in Sonoma County; old growth redwoods in Humboldt and Del Norte Counties often measure 20 feet or more in diameter. These trees often require substantial amounts of space and may only number a dozen per acre. In order to meet the objective of managing the forest at St.Dorothy's Rest for late-seral or old growth characteristics, commercially sized trees will need to be managed as they die from competition, although a commercial harvest may not be necessary for some time given the relatively small size of the stand QMD.

As previously mentioned, the majority of work that will be proposed in this forest management plan will focus on pre-commercial forest improvement activities, but it is important to note that as trees increase in size the cost to implement these proposed treatments increases. At a certain point it becomes economically infeasible to treat larger trees with practices like pile burning and chipping, financially imprudent because the cost to treat these trees could be offset by their sale, and generally becomes unethical because the growth represented by these trees could be utilized in ways that benefit society; logs produced locally offset logs that must be imported from industrial forests in other states and countries. **It is strongly recommended that this plan be updated with a more robust forest inventory and growth analysis to consider commercial harvest as a means to responsibly achieve the landowner's long term goal of developing a late seral forest.**

Management Units:

Unit 1: 112 Acres

This unit is the largest on the property, encompassing the area north of Baumert Creek to the Alliance Redwood property. The unit consists of mostly young redwood and tanoak with patchy old-growth Douglas-fir. Slopes are variable with a fairly wide ridge top area near the WCA Road, but mostly with side slopes averaging 40% and in some cases exceeding 80%. Access is fairly good between the WCA road and FR9, however FR9 requires reconstruction prior to being useful for management purposes.

Treatment of SOD

This unit is plagued by Sudden Oak Death. There are significant stands of near pure tanoak which have become infected and mortality is starting to create large gaps in the forest canopy. Fuel loading in these areas is excessive with untreated remains of dead toppled tanoak scattered through these stands In addition to being a fire hazard, these falling trees are blocking access routes and, were these areas to be opened to public access, would represent a significant falling hazard. Management of this problem will be exceptionally difficult because there is at present very little value to any of these tanoak trees. Even if there were a reliable market for firewood, it would be unethical to transport this material due to concerns of spreading the pathogen, and much of the dead material has started to rot and is very poor firewood.

Ultimately the goal for these stands should be to enhance conditions in such a way that prescribed fire could be applied to manage new fuels. Unfortunately the current fuel condition would lead to unacceptable outcomes if fire were to burn through the stand because mortality among residual trees would be very high and such an operation would likely be very dangerous. Even if the initial prescribed fire event were successful, the fuel loading in these stands is often high enough that flare ups would be expected to occur for months after the initial burn.

In order to reduce the existing fire hazard, the fuels need to be modified in some way. Fuels could be masticated (pulverized) using a forestry mulcher, which would break down large fuels into smaller particles. This would reduce flame lengths and fire line intensity, and it would increase decomposition rates of the wood because of increased surface area connection with the soil. The tradeoff to this would be an increase in fine fuels that are readily ignitable by embers, and the fact that the woody material is still on site and can burn. Some of the highest damage to trees occurs when fire is prolonged in an area, especially around their root systems, and mulch-like conditions can have a tendency to burn slowly with significant heat.

Another option may be to use equipment, such as an excavator or log loader with a grapple attachment, to shovel log material to an appropriate landing for pile burning. Shovel logging is a type of log yarding procedure in which logs are slowly moved up or down a logging unit by an excavator that lifts and stacks piles of logs in successive order, swinging them closer to the road on every pass. There is so much material on the ground that it would be inappropriate and inefficient to create multiple small piles. Instead, an industrial sized (20+ feet) burn pile could be created near roads where they could be monitored with a water truck and safely burned during the winter. Using this method, it would be possible to sell firewood to locals in Camp Meeker for a nominal fee, and allow them to access the wood on a supervised wood cutting day. This way transportation and processing would be on the individual, and staff could be present to help with directions and safety for residents accessing the wood. Such a sale would trigger the forest practice rules, which may actually provide a somewhat streamlined permitting process for CEQA (archaeological surveying requirements in particular) if this activity were to take place under grant funding. Generally, equipment is limited to gentle slopes (under 40%), however with shovel logging it is possible to operate on steeper slopes because there is no dragging of material, and the machine is generally picking up one log at a time. Additionally, new techniques for tethering equipment with a cable winch are being utilized that increase the slopes at which an operation can take place. With equipment on site, it will also be possible to use the equipment to walk over slash and brush that don't make it to burn piles; this will help fire conditions by creating more contact that fuels have with the ground, increasing decomposition rates and reducing available oxygen for fire (similar to mastication treatments).

Figure 3: SOD killed tanoak in Unit 1

A few downsides to shovel logging are that generally the material that this method works with are whole logs or whole small trees. With Sudden Oak Death, many of these trees are broken into many bits and it may be inefficient work. Additionally, because shovel logging works by picking up logs and swinging them around via a boom-mounted machine, it requires quite a bit of open space and is typically used on clear-cuts for this reason.

An alternative to shovel logging while still utilizing equipment on steep slopes could be to utilize a caterpillar tractor with a cable winch to drag larger logs and deck them by roadways for firewood. This would be inefficient but may be more practical than the final alternative of utilizing exclusively hand crews, who would not be able to transport the material outside a few feet. Regardless, if this method were utilized hand crews would still be necessary to treat the majority of smaller stems and branches throughout the unit.

It's possible that some mix of mastication, machine piling, and hand-crew work will ultimately be the best fit for treating these SOD areas. Local prescriptions will need to be determined by examining local conditions within a treatment unit.

Planting

The next priority in these areas will be to occupy new growing space that is opened by Sudden Oak Death. Tree planting will be an important step to making sure that these opened areas are not occupied by invasive brush or other undesireable species. Tree planting would best be timed to occur after an initial prescribed burn, if possible, because this prescribed burn would act as site preparation. Site preparation is the act of removing competing nearby vegetation and preparing the soil for tree planting. If a prescribed burn isn't able to happen, this can be done by hand crews who may then need to scalp or grub the soil around where the planting will occur, and there may be need for select herbicide application depending on how bad the competing vegetation is. Site preparation is important because it allows the trees time to grow higher than competing vegetation, at which point they will no longer be at risk of being overtopped and killed by weeds.

Planting is typically done in the winter when soils are moist and pliable. Conifer seedlings are typically 1-year old contanerized stock, which means that orders for new trees need to be put in a year in advance, which means that timing is critical and you will have to make the decision to plant well before you know if it is a good year to do so. Generally trees should be planted utilizing seed stock that is local and from a similar elevation, the local seed zone for Camp Meeker is 095.

What to plant will be at the discretion of the landowner. It is important to note that historically redwood would have been the species occupying the most space in these forests prior to high-grade logging, and of local species it has the highest commercial value, however tanoak is a significant habitat tree and food source for many animals, so some consideration as to other trees that could help fill this niche is deserved. California hazelnut is a local shrub species found on the property whose nut is edible and used by wildlife, and it is a species which generally occupies the understory of redwood forests. California nutmeg is a local tree species which is also found on the property, generally located near watercourses this species often occupies the mid-lower portion of the canopy but can in extraordinary circumstances grow to be in excess of 100 feet tall. Coast live oak is a hardwood species that was not seen in much of the forest inventory, but is located nearby in excess, and is relatively well suited to moderate light conditions; it also produces a seed that is highly desired by wildlife species.

Commercial Harvest

While these conifer stands are still quite young, and with many of them experiencing relief from hardwood competition provided by SOD, there could still be a residual growth and individual tree habit benefit provided by thinning out some of the more dense clumps of redwood. At current inventory levels it's likely that a harvest would need to be overly heavy to pay for itself. At a property-wide level there are 22.7MBF of redwood, with approximately 16MBF of that volume coming from trees over 30" DBH. In order to have an economical harvest operation there should be a minimum of 5MBF harvested per acre with at least 200MBF harvested total. Per tree volumes increase exponentially in relation to diameter and height, so of the approximately 6.7MBF per acre represented by redwood under 30"DBH, the majority of that volume will be in larger trees, with almost no volume in trees under 12"DBH. Because of the economics of harvest, at present, commercial sale of timber on the property is only

recommended in association with a grant such as CAL FIRE's Forest Health Grant Program wherein the sale of timber can be utilized as a matching fund for the grant. As these forests mature, there will be a need to manage the overstory, at which time a Nonindustrial Timber Management Plan can be developed to analyze an appropriate yield schedule based on the cabability of the forest.

Unit 2: 87.4 Acres

Unit 2 is the area within the viewshed of Baumert creek, which hosts one of the more active hiking trails from Market Street to the reservoir. Slopes in general in this unit are extreme, often in excess of 80% or 36 degrees. Vehicular access is very poor and the only road serving any portion of the unit is FR6, which is currently not driveable for the majority of its length and has been recommended for decommissioning. The forest in this unit is mostly sparse but very large trees, with gaps between trees having been created by a combination of past logging practices and Sudden Oak Death. The highest and best use of this unit will be for recreation, aesthetics, water quality, and wildlife habitat. Management of this unit will mostly be for public safety of those using the trail, maintaining the reservoir, and improving water quality conditions in Baumert Creek. Vegetation treatments in this unit are low priority outside of hazard tree abatement due to the presence of old growth structure, poor access and slopes, and emphasis on aesthetics placed on the unit. Some amount of prescribed fire may occur in the unit if part of a larger operation off of Unit 1, but it is unlikely that such activities will occur on the south end of Baumert Creek unless work is done in collaboration with adjacent landowners. Planting some areas of Unit 2 could be a beneficial practice from a carbon standpoint, but given the slopes and access issues this is unlikely to be feasible at any reasonable cost and without fuels treatments this may be a futile effort. Instead, a better way to ensure regeneration of a new cohort of trees would likely be to conduct broadcast prescribed fire in the manner previously described and follow up those treatments with a targeted application of herbicide to suppress the re-growth of Sudden Oak Death affected tanoak in favor of natural regeneration supplied by seed from existing overstory trees like Douglas-fir and redwood.

Unit 3: 59 Acres Acres

Unit 3 is the southernmost unit on the property, it is accessed by the Hampton/ Baumert Access Road, which splits the unit in half. Slopes in this unit are moderate, averaging 40%, and access is very good. The unit has a relatively mature forest structure, likely due to the presence of multiple creeks running through the unit with steep side slopes that may have limited harvest availability when the unit was last harvested in the 1970s. This unit is likely one of the best suited to casual recreation due to proximity its to public roads and good access. This unit does have sudden oak death, but it appears to be at an earlier, or less prolific stage than Unit 1. The forest is still somewhat patchy, with heavy amounts of evergreen hucklberry in some areas that have completely taken over the available growing space. Commercial sized timber in the stand ranges in size from smaller, dense Douglas-fir stands, which average approximately 16-20 inches DBH, to larger 2nd growth redwood that might average closer to 20-30 inches DBH. One very large redwood was found to be approximately 66 inches DBH with a height of 187 feet; the tree was too large to be cored for accurate age estimates, while it lacked any old-growth physical morphology it is likely that this tree was present as a small tree during the original harvests around Camp Meeker. *P.pini* conk was found to be on older Douglas-fir trees, and younger trees (40-

50yrs) were starting to show early signs of the disease. While this isn't a major concern for the life of the tree, it will generally slow growth and will reduce or destroy the long term value of infected timber.

Forest Health Improvements:

Treatments in this unit should focus on sanitation thinnings/removal of sudden oak death infected trees, thinning out young conifer stands to improve growth, and targeting diseased and damaged trees for removal. This unit would also benefit from significant brush treatments, clearing out some of the heavier thickets of re-sprouting tanoak and evergreen huckleberry. Treatment of trees under 10" DBH could be paid for in part by participating in government cost-share programs such as NRCS's EQIP or CAL FIRE's CFIP. However the stand is at an age to where the thinning prescription to improve growth rates and individual tree conditions are going to be targeting trees that are larger than 10"DBH. Ideally a prescription would target roughly half of smaller trees between 10-18" DBH and maybe ¼ of trees between 18-30" DBH for sale while targeting trees and brush under 10"DBH for mastication, chipping, or pile burning to reduce its potential fire hazard and clear the area for planting more desireable forest species. The current stand volume is not large enough to pay for such an operation alone, but CAL FIRE currently offers the Forest Health Grant utilizing California Climate Investments funds which allow the sale of timber to be used as match funds for the grant. With such a grant, treatment of mid-level canopy trees could be used to help offset the cost of other operations. The unit would be a good fit for an exemption to the typical harvest requirement to have a Timber Harvest Plan; the unit would benefit by applying a 1038.3 Forest Fire Prevention Exemption which allows the sale of small diameter timber (under 30" stump diameter) on projects up to 300 acres as long as the QMD of trees above 8"DBH increases (see explaination above, under general forest inventory discussion). This exemption could clear CEQA permitting for the purposes of the grant for the use of heavy equipment, which is very desireable for funders.

Figure 4: Property boundary between St. Dorothy (left) and Occidental Arts & Ecology Center (right) shows OAEC has conducted treatment of sub-10"DBH material

SOD, tanoak brush, and follow-up:

Many of the brushy tanoak and other hardwoods in the unit will continue to re-sprout if treatments are left to simply cutting down the standing stems. Once the tree re-sprouts, follow up treatments will be necessary. Those treatments could be hand thinning, grazing/browsing by goats or other animals, prescribed broadcast fire, or initial use of herbicide. Of all these treatments, herbicide is the most

practical, effective, and cost efficient, but there are concerns throughout much of Sonoma County regarding their use. My recommendation would be to consult a qualified pesticide applicator familiar with forestry uses of herbicide to discuss options regarding foliar spray versus cambium injection treatments, and how such treatments may or may not include some level of herbicide drift that could affect other desireable trees. Without using herbicide, re-treatment will absolutely be necessary, and it can be difficult to find future funding to help pay for continual grazing or prescribed fire without some kind of revenue generating plan in place.

Potential revenue sources:

This unit in particular has high value for recreation. The sliver between Hampton and Baumert/Hampton Access Road could be utilized as a small park and picnic area with use fees collected for parking. The entire unit would be a good location for a disc golf course, which could generate revenue from annual fees or from fees collected in monthly tournaments. Logging the area would allow the construction or reconstruction of landings, which could turn into parking areas. Parking is currently limited in Camp Meeker, so this could be a way to generate revenue for those who wish to utilize the area. Logging obviously can also generate revenue once the forest grows to a point where harvest can sustainably be done while meeting the goals of the landowner. This unit has very solid road systems which lead directly to Hampton road, away from town.

Unit 4: 7.4 Acres

This unit makes up all of the small parcel ownerships throughout Camp Meeker. Management of these units will almost entirely be made up of defensible space work around structures and home hardening improvements.

Shaded Fuel Break 50.4 Acres*:

*** Acres overlap with underlying unit**

Shaded Fuel Breaks (SFB) are a type of silvicultural treatment intended to disrupt the horizontal and vertical continuity of woody fuels in a wildland setting. These treatments create a space with relatively light fuel loads wherein wildland firefighters can stage an attack on an advancing fire, or where prescribed fire practitioners can safely begin treatments. They differ from traditional fuel breaks in that they retain a sparse overstory to help suppress the growth of weeds and undesired woody fuels that will take advantage of bare mineral soil and available light. Shaded fuel breaks are intentional features on the landscape that require maintenance by repeated mechanical, chemical, or fire treatments.

Shaded fuel breaks are becoming a popular treatment in Sonoma County. A common theme among many shaded fuel break projects happening throughout the county is that they generally only treat

understory trees and brush; while beneficial for reducing fire line intensity and reducing convective heat required for crown-crown ignition, a true shaded fuel break (especially in conifer systems) should manage to discontinue fuels within the canopy. One of the additional benefits for this particular prescription in redwood forests is that it may help to dry surface fuels earlier in the year by allowing sunlight to reach the forest floor; while counter-intuitive, this could be a very helpful strategy if prescribed fire is intended for the treatment area because often in redwood ecosystems it is difficult to sustain prescribed fire until the Fall season, which may complicate potential firing operations if current fire season trends continue. Additionally, having significant spacing between conifer canopies makes air-dropped fire retardant much more effective, and it creates a much safer environment for firefighters to stage as opposed to an area with connected canopy. With additional light on the forest surface comes additional new growth, so maintenance will be critical.

In the specific case of the St.Dorothy forest, there are significant areas within the shaded fuel break area that currently have large gaps in the canopy due to sudden oak death. Immediate treatments will be more focused on reducing dead and downed fuels in these strategic areas. Shaded fuel breaks typically involve shade; in areas where there are significant canopy gaps a new cohort of trees will need to be grown and carefully managed to get to the point where they can provide this shade. Long term objectives in theses areas will involve the heaviest treatments of fuel management including mastication and prescribed fire, both pile and broadcast, prior to planting treatments and pruning/limbing of young trees once they are large enough to do so.

Areas witin Units 1-3 that would be of high value for conducting prescribed fire or managing a wildfire are highlighted for shaded fuel break treatments. In general these areas are located on or near ridgetops with decent vehicular access and on slopes that are conducive for operations. Prescriptions in these areas will focus on fuels management over forest regeneration, wildlife habitat, and other forest health concerns. They have generally been planned to avoid watercourses, although there are a few watercourses that cross shaded fuel break areas in Unit 3. These crossing areas are a minor concern for water quality because they quickly transition through the treatment, that is to say they cross perpendicular to the treatment rather than running alongside it, and additionally these treatments are intended to retain canopy and root structure of larger trees.

Mechanical Prescription:

In areas with contiguous conifer or otherwise non-SOD areas: Focus on tree spacing, remove all but the largest trees to achieve a spacing of roughly 1 tree, or clump of trees for redwood and hardwoods, per 30-40 feet. This generally will involve treatments targeting trees under 20”DBH. Clumps can be thinned as well, removing 2/3rd of the stems in the clump and prioritizing the largest stems for retention. Prune trees to a minimum canopy height of 10 feet if necessary.

In SOD affected areas: Treat standing and downed dead trees by either chipping/masticating or pile burning. Mastication with a front-end drum machine is likely the best treatment due to the variability of sizes in the targeted dead material (which can get quite large), but this treatment will be limited to relatively flat areas with good access such as the area around FR2. When mastication isn’t an option, create burn piles with equipment wherever possible. Keep stems over 10” out of burn piles if possible, instead retain those near access roads for firewood.

Retain the largest live trees, target trees/shrubs under 6” DBH for removal if they lead to the canopy of residual trees, otherwise attempt to recruit them into the overstory and prune/limb them once they are large enough to do so. Consider herbicide for persistent vegetative sprouting and work with a qualified applicator to treat areas.

All areas: Remove all snags as feasible. All treated material should be either piled and burned, chipped, or masticated.

Special Treatment Area (STA) – 36.8 Acres*:

*** Acres overlap with underlying unit**

Special Treatment Ares (STA) is the designation given to areas which fall within the Sonoma County zoning designation Riparian Corridor Combining Zone (RC). Native vegetation cannot be removed from the STA without first obtaining a permit from the county, unless activities are exempt from the regulation or activities are operating under a valid timber harvest plan issued by the California Department of Forestry and Fire Protection (CALFIRE). One of the exemptions to this permit requirement are activities for fire mitigation that fall under California Statute (PRC§4291 – See Defensible Space section of this plan) or County firesafe regulations as long as no redwood trees are removed. For more information on management within the RC zone see the following link from Permit Sonoma: https://permitsonoma.org/policiesandprocedures/8-2-3guidelinesforfirefuelmanagementinripariancorridors

6.2 Summary of Treatment Types Proposed

Treatments proposed at this time:

Fuel Reduction Treatments

Fuel reduction prescriptions consist of targeting dead standing and downed woody vegetation. Treatment will consist of chipping/mastication or pile burning, lop-and-scatter treatments are only to be used where no other options exist due to access and topography.

Hand crew thinning will be limited to treating trees under 16” DBH, with tops and branches removed and further treated as described above (note that this may leave standing dead vegetation in place and will leave large trunks on the ground in place). When implementing pile burning with hand crews, piles created throughout the stand will remain fairly small (4 feet dimensions, typically) with no large woody material (>10” diameter), will be covered, and burned in the winter. This is less desirable than yarding material to a landing and burning larger piles.

Mastication treatments may treat trees up to the capability of the equipment. Where feasible given access and slopes, large wood may be yarded to roads for firewood. Whole tree yarding can allow for stems to be sorted by diameter, with small (<16” diameter) material being burned and large material being split for firewood.

Live trees undergoing fuel reduction treatments will be pruned to a height of 8 feet. Trees under 6”DBH that cannot be pruned to a minimum crown height of 8 feet without reducing the live crown ratio below 30% will be thinned out heavily with a target goal of one stem per 16 feet.

Within areas designated as a shaded fuel break, fuel reduction treatments will be prioritized with some additional cost toward higher intensity treatment being acceptable. For example: within a shaded fuel break, per acre costs to masticate large (>16”) diameter logs may be acceptable where in other areas of the unit treatments will focus on smaller diameter material to save time and retain downed wood for habitat.

Pre-commercial Thinning/Release

This treatment will mostly be done to improve spacing and growth rates on small pole and sapling sized trees in the stand. Thinning will follow the D+10 rule wherein retention of small trees will be based on retaining high quality vigorous trees, and where spacing conflicts arise between two similarly thrifty and sized trees, treatment shall ensure that at least one of the trees is granted clear growing space for at least D+10 feet (where D equals the number of inches in diameter of the tree, represented as feet). For example, a 6-inch DBH tree would receive 16 feet of clear growing space. Trees that have recently coppice sprouted following some disturbance may be treated by removing all but 2-3 of the thriftiest stems per clump. SOD affected tanoak trees should be considered for herbicide treatment to limit the cycle of coppicing and death.

Reforestation and/or Afforestation

In response to Sudden Oak Death, some areas on the property require planting. Planting is the preferred method for establishing redwood because of how poor its natural seed viability is. Planting is also the preferred method if trying to introduce a species that is not immediately local or has large seeds, such as California nutmeg or coast live oak. Prior to planting, site preparation is necessary, and will include woody residue treatment of dead and downed fuels in the area. There may be need for additional overstory treatment to provide light to seedlings.

Prescribed Broadcast Fire

Prescribed fire may be utilized as a follow-up tool to further treat areas within shaded fuel breaks, and in certain cases it may be used as a first entry tool when treating areas that initially have relatively low fuel loads or are too steep to send in hand crews. It is recommended that broadcast prescribed fire not be utilized until shaded fuel break treatments have been completed so that there are safe areas to conduct and contain the burn operation.

<u>Overview of Treatments to Dead Woody Material:</u>

Mastication: Mastication is the reduction of vegetative materials into smaller pieces by grinding or chewing up by way of a mechanical device. Masticating heads can be fitted onto a skid-steer or a boom-mounted excavator or loader. Using this technique, vegetation is ground up into a fibrous material that will decompose much faster than if the material were to remain intact. Mastication equipment is typically limited to slopes <40 percent, due to the limitations of the machines, and safety. As slopes increase in steepness, as with any equipment use, the chance for erosional damage increases due to continued movement of tracked vehicles; however, mastication has the erosional benefit of leaving a

mulch-like material on site that acts as an energy dissipater, slowing the movement of water and helping to keep soils from moving. Mastication is typically the cheapest method to mechanically treat fuels on a per-acre basis.

Lop-and-Scatter: Lop-and-scatter is a vegetation management technique in which woody material is reduced to smaller pieces by individually cutting via chainsaw or loppers. Lop-and scatter can take place on any slope where it is feasible to hike. It works by reducing the size of woody material and placing the material with as much contact to the ground as possible; this increases the rate at which the vegetative material decomposes on the forest floor. Lop-and-scatter is effective, but can be more unsightly than mastication or chipping, it falls in between mastication and chipping on a per-acre cost.

Chipping: Chipping is the reduction of vegetative material into fine pieces by a rotating blade. Chippers can be either trailer mounted or track mounted. Vegetation is fed into a hopper, and is blown out the other size once processed. Chipping is the most expensive treatment of fuels, on an acre basis, and is limited only by vegetation size, usually around 24", and the distance vegetation must be moved to the feeder. Chipping is similar to mastication, but has the added benefits of being more aesthetically pleasing, and material can be placed as an effective mulch after processing.

Pile Burning: Pile burning is a method of eliminating vegetative material by incineration. Material is cut down and piled in relatively open areas with decent access by vehicles. The piles are fully or partially covered with tarps or plastic to cure, typically for one year, until they are dry. The piles are burned after a few solid rains have saturated the surrounding vegetation, and typically on days where rain is expected. Pile burning requires authorization by the Air Resources District, and may require a smoke management plan, see Section 5.4 Air Quality.

It may be difficult locating suitable areas for piles, depending on the steepness of the terrain. Piles can be placed on or adjacent to skid trails, where vegetation has been removed or pruned to eliminate fuel connectivity. Consult the section of this management plan on Defensible Space for information pertaining to fuel connectivity for more information.

Broadcast Burning: Broadcast burning is a method of eliminating vegetative material by incineration. Material is burned in place, utilizing drip torches or flame torches, with the fire line carefully monitored by a burn boss and crew. Broadcast burning, often called prescribed burning, is conducted during times of the year when fuel moisture is higher, such as the spring or winter.

NRCS Practices

Forest Stand Improvement 666 –
The manipulation of species composition, stand structure, or stand density by cutting or killing selected trees or understory vegetation to achieve desired forest conditions or obtain ecosystem services. Associated goals related to this practice are: to improve and sustain forest health and productivity, reduce damage from pests and moisture stress, initiate forest stand regeneration, reduce fire risk and hazard and facilitate prescribed burning, restore or maintain natural plant communities, improve wildlife and pollinator habitat, alter quantity, quality, and timing of water yield, or increase or maintain carbon storage.

Woody Residue Treatment 384 –

Treating woody plant residues created during forestry, agroforestry, and horticultural activities to achieve management objectives. Associated goals related to this practice are: reducing hazardous fuels and wildfire risk to humans and livestock, reduce the risk of harmful insects and disease, protect/maintain air quality by reducing the risk of wildfire, improve access to forage for grazing and browsing animals, improve the soil organic matter and maintain or improve soil health and soil quality, improve site for natural or artificial regeneration, enhance aesthetics.

Tree/Shrub Site Preparation – 490

This practice involves the clearance of above ground vegetation or woody debris that inhibit successful planting and establishment of young trees. This practice is typical of burned over sites where natural seed sources have been lost and the site is captured by undesirable plant communities.

Tree/Shrub Establishment – 612

This practice involved the planting of tree species after the site has been prepared for tree growth and establishment. Available planting scenarios involve bare root or plug conifer planting spaced to 300-400 trees per acre, or "conservation planting" which typically establishes a lower number of trees per acre, and can also be used to establish hardwood species.

Commercial Timber Harvest

Commercial harvest of timber can be a contentious issue in Sonoma County. Due in large part to historic practices that have modified the landscape, often to deleterious effect, and the prevalent opinion that timber sales are inherently profit motivated; the public in Sonoma County are often angered to learn about timber harvesting in the area. Recognizing that past practices have modified the landscape, often re-setting forests from a successional standpoint, it is safe to say that left to their own devices forests may arrive at a future compositional structure that differs from what we may expect or hope for; and the time frame in which it takes to do so is often outside what society should find acceptable due to the benefits that healthy forests can have on wildlife, scenic values, and carbon sequestration, which may be lost without management. It is a biological fact that individuals within a closed system compete for resources and that there is a biological carrying capacity to which any unit of area can support. As trees grow larger they require more space to grow and thrive. "Thinning" for forest health at a certain point involves the treatment of larger trees that would be acceptable as saw logs. Without a point of sale, thinning projects must rely on expensive treatments like chipping or pile burning that only become more difficult as the size of material increases. Chipping saw logs also brings with it a societal cost in that the growth represented in that log could have been utilized as a building material, sequestering the carbon within boards and providing a housing benefit until its usefulness had been exhausted; instead, building materials are imported from forests outside the state or even the country.

Although this property has significant restraints from an access and operational standpoint on the viability of a timber harvest, it's important to note that some grants (e.g. CAL FIRE Forest Health Grant) allow the net sale of timber to be used as a matching fund. Sales of timber on a project that would not be commercially viable can still be used to make grant proposals more appealing than proposals that include

no match at all. Selling marginal timber as part of a grant program can provide some revenue on projects that otherwise would be at full cost to the program, as long as all net revenue from the project is promised to the grant funder, and timber sales have the additional benefit of providing a mechanism by which to haul woody material from treatments off site; eliminating excessive fuel loading that can be caused by mechanical treatments.

Types of Permits

In order to achieve the stated goal of creating late seral conditions from a young even-aged stand, it is important to consider the use of timber harvest as a necessary tool to achieve the desired future condition for the forest. Prior to the sale of woody products, including chip and firewood, a Timber Harvest Plan (THP) or equivalent permit is required; CAL FIRE is the agency that regulates timber harvest in the state of California. THPs are functional equivalent documents to an Environmental Impact Report (EIR) under CEQA, they also serve as an operational document for use by the operator and any regulatory agency with authority over the project. THPs generally cost between $40-60k and are good for 5 years from signing with the ability to appeal for their extension an additional 2 years.

A Non-industrial Timber Management Plan (NTMP) is a type of timber harvest plan that does not expire. NTMPs serve all of the functions of a THP while additionally including a growth/yield analysis that sets the rate at which timber may be harvested to meet the goals of the landowner. NTMPs are available to small, non-industrial forest landowners who own and manage less than 2,500 acres and they can be created over multiple ownerships, if that be necessary for the management of the properties. For larger properties, there are Working Forest Management Plans that act as NTMPs for ownerships up to 10,000 acres. NTMPs can cost $50-80k, plus there are requirements for surveys and monitoring before harvest can take place in any given year that might cost $5-10k.

There are also exemption documents that can be filed with CAL FIRE that exempt the plan preparer from having to conduct the full THP process. These exemptions are ministerial permits, meaning they are a set of pre-defined prescriptions meeting an intended purpose that cannot be modified to fit conditions on the ground. Most all exemptions require work avoid sensitive areas including watercourse buffers and they limit or do not allow road work to take place under them. That said they can be useful tools to achieve limited goals without having to go through the full EIR process.

Applicable exemptions are:

1038(b) Dead Dying and Diseased Exemption. Harvesting dead trees, Dying Trees, or Diseased Trees of any size, fuelwood or split products in amounts less than ten (10) percent of the average volume per acre, or the removal of Slash and Woody Debris that is not located within a WLPZ.

1038(c) 150 foot Defensible Space Exemption allowing sale of timber within 150 feet of approved and legally permitted structures.

1038.3 Forest Fire Prevention Exemption allows for harvest areas up to 300 acres, allows limited road building and reconstruction, and allows for harvest of trees up to 30 inches at stump diameter (diameter at 8 inches above the ground) so long as the Quadratic Mean Diameter of trees above 8”DBH increases following harvest.

7. CLIMATE CONSIDERATIONS & ASSESSMENT OF BENEFICIAL PRACTICES

7.1 Introduction to Forest Carbon

Forest grow and store large quantities of carbon dioxide, a greenhouse gas and the most abundant driver of global climate change. Young, rapidly growing forest can sequester a remarkable amount of carbon dioxide, while older forests stores carbon over generations. The California Forest Carbon Plan (CFCP Draft, 2017) identifies forestland as the largest land-based carbon sink in the state, but recent trends and long-term evidence suggest that certain forests may become a source of overall net greenhouse gas (GHG) emissions if actions are not taken to manage forests in a way to enhance their potential to sequester carbon. Climate change impacts California's forests with more frequent and severe wildfires, pests, disease, increased temperatures, and changes water availability. These effects may decrease forest growth, and thus decrease rates of carbon sequestration, as well as result in forests lost to wide-spread tree mortality, increasing rates of GHG emissions.

Due to past forest management, particularly fire suppression, many forests are currently unhealthy, with unnaturally dense stands making them more susceptible to drought, disease, insect pests, and uncharacteristically large, severe wildfires (CFCP Draft 2017). These events result in massive amounts of dead trees that are no longer removing carbon from the atmosphere and will continue to emit greenhouse gasses for decades as they decay. The vegetation that replaces the trees that have died will not compensate for the carbon loss for decades.

In the face of climate change, as temperatures increase and extended droughts are likely to be more common, researchers found that forests actively managed for resilience were better able to sustain their current carbon sequestration rates under significantly hotter and drier conditions than unmanaged stands (CFCP Draft 2017). As a result, how forests are managed has a significant effect on the atmosphere. Forest stand treatments should be aimed at reducing current stocking of small-diameter, fire sensitive trees to fewer, larger diameter trees, creating forest more resistant to stand replacing disturbances, creating a resilient carbon storage pool.

7.2 Current Forest Structure and Carbon Stocks

Use Table 7-1 to show the property's current carbon stocks on forestland by forest type or management unit as of the current inventory year. Inventory data should be included in Appendix B. Use inventory to calculate above ground biomass and estimated carbon pools. Note if estimated carbon pools are above and below ground or above ground only. To do this, use growth and yield models (such as FVS or FORSEE).

Table 7-1. Current estimated live, dead, and total carbon stores for forestland on the property.

Above Ground Bole Volume Per Acre (ft^3)			Pounds of Carbon/Acre	
Species	Live	Dead	Live	Dead
Redwood	4374.7	0.3	62907.5	3.8
Douglas-fir	1484.8	0.0	19925.7	0.0
Tanoak	1911.7	866.5	22482.1	10190.3
Madrone	239.6	39.6	2817.3	465.3
CA Bay	683.5	6.5	8037.7	76.7
Bigleaf Maple	32.6	0.0	383.5	0.0
Alder	0.0	0.0	0.0	0.0
White Oak	0.0	0.0	0.0	0.0
Live Oak	0.0	0.0	0.0	0.0
Black Oak	0.0	0.0	0.0	0.0
Pine Spp	75.2	0.0	884.6	0.0
OtherHardwood	0.0	0.0	0.0	0.0
OtherSoftwood	0.0	0.0	0.0	0.0
SUM	8726.8	912.9	116553.7	10736.0
	9639.7		127289.7	

7.3 Assessment of Potential Carbon Beneficial Practices

This assessment includes the following forest health related greenhouse gas (GHG) reducing activities (check all that apply):

- ☒ Reforestation
- ☐ Pest Management
- ☒ Fuels Reduction
- ☒ Forest Conservation
- ☐ Biomass Utilization

It is noted that forest carbon pools always decrease immediately after vegetation treatment activities (e.g., thinning, prescribed burning, and harvesting) and modeling suggests they remain lower decades beyond treatment date (Clark et al. 2011; North et al. 2009). This is due to the reduction in total biomass present on the landscape when stocking is reduced. If the vegetation removed during thinning and fuel reduction treatments could be utilized, either as lumber or biomass energy production, the emissions associated with these activities can be reduced. Additionally, all vegetation treatment activities create carbon emissions, but emissions can be reduced and future carbon stocks increased by reducing surface fuels, small and intermediate sized trees, and fire-sensitive species on the landscape (North et al. 2009). The goal of vegetation treatments in terms of GHG benefit would be to move carbon stocks from many

small, fire-vulnerable trees into large, disturbance-resilient trees. By leaving crowded stands unmanaged, the existing carbon stocks are highly vulnerable to catastrophic loss from large-scale disturbances, such as high-intensity fire and outbreaks of insects or disease.

For the purpose of this assessment, net GHG benefit will be calculated using the California Air Resources Board (ARB) quantification methodologies, found online at: https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/quantification.htm.

REFORESTATION

The reestablishment of forests after large-scale disturbances, such as high-intensity wildfire, will offer important ecosystem services for a variety of important natural and social reasons. Best management practices suggest reforestation activities establish a diverse, native forest, which will result in stable carbon sequestration rates and storage, restore watershed functions, and result in a resilient forest. Replanting a disturbed site with trees to create a future forested stand sequesters much more carbon than a brush field, which is often the result of leaving the site to natural succession. The net GHG benefit of reforestation can be calculated as follows:

Net GHG Benefit = Δ in standing live and dead tree carbon stocks in the treatment boundary – carbon in shrubs and herbaceous understory removed from treatment boundary – mobile combustion emissions from site preparation

It is important when planting seedlings to plant species that will thrive in the planting location. The seed used to grow seedlings for reforestation should be from the local area or tree seed zone[1] that is compatible in terms of latitude and elevation.

Identify and discuss areas within the property that are understocked and desired for regeneration practices with specifications for natural seedling recruitment, site preparation, planting, and/or follow-up treatments (e.g., grubbing to reduce competition). To promote nutrient cycling, reduce GHG emissions from pile burning, and minimize soil disturbance, mastication should be considered for site preparation as opposed to tractor piling, where possible. Tractor piling includes the skidding or raking of woody material into piles to burn. Mastication shreds woody debris in place, creating a layer of shredded material that helps protect the top soil horizons by providing a mat for the masticator to drive on. If tractor piling is necessary for the site, limit skid trails to the extent possible to minimize soil disturbance, compaction, and subsequent diminished site productivity. Describe the area to be improved, including practice specifications for fire protection, thinning, pruning, and future regeneration.

The following table provides an assortment of management practices that are intended to sequester carbon and reduce GHG emissions that result from leaving areas unmanaged after a large-scale disturbance. Implementation of all practices is not necessary or required. Selection of

[1] California forest tree seed zones were established to aid in the planting of trees from seed that is adapted to the planting site conditions (e.g., climate, elevation, latitude and longitude) to increase the likelihood of survival.

practices must be done on a site-specific basis. An assortment of practices to suit the property's circumstance should be selected. NRCS Practice Titles are provided for landowner reference. Contact the local NRCS or RCD field office for technical and/or possible financial assistance.

Table 7-2: Reforestation Related Conservation and Carbon Beneficial Practices

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Plant Conifer and/or Hardwood Seedlings	Tree/Shrub Establishment (612)	☐		
Prepare area for planting (e.g., reduce existing vegetation that will compete with planted seedlings)	Tree/Shrub Site Preparation (490)	☐		
Restore riparian plant communities by planting native woody species	Riparian Forest Buffer (391)	☐		
Maintenance treatments: Grubbing of competing vegetation		☐		
Pre-commercial thinning to required future stand density	Forest Stand Improvement (666)	☐		
Other:		☐		

FUEL REDUCTION

As temperatures are projected to increase and precipitation to subsequently decrease throughout the next century due to climate change, wildfires are expected to increase in severity compared to historic conditions (Mallek et al. 2013). Additionally, the length of fire season will likely increase (Westerling et al. 2006). With the estimated increase in area burned over by wildfires and no change in present management, wildfire GHG emissions, including combustion and subsequent decay of residual dead woody material, are estimated to increase, as well. Moreover, the CFCP Draft (2017) states that recent observations suggest that a portion of high severity burn areas may not regrow as forestland, and instead transition to shrub or grasslands.

Due to decades of fire suppression, California's forests have seen an increase in stem density, with fewer very large diameter trees, reducing the total live tree carbon stocks relative to historic stands and shifting a higher proportion of these stocks into small diameter, fire-sensitive trees (North et al. 2009).

Fuel reduction treatments improve forest resiliency by reducing wildfire severity and related mortality, improving tree growth, and stabilizing carbon retained in trees. Thinning activities implemented should change stand structure to concentrate carbon storage in more widely-spaced trees that are more resistant to wildfire, drought, and insect attack, and reduce the likelihood of wildfire transitioning into the forest canopy. All treatments should focus on treating understory trees and/or brush to reduce surface and ladder fuels, disrupt both vertical and horizontal continuity of vegetative fuels. The net GHG benefit from fuel reduction activities can be calculated as follows:

Net GHG Benefit = Δ in standing live tree carbon stocks in the treatment boundary and impact boundary (optional) as a result of reduced mortality from wildfire – carbon in biomass removed from treatment boundary – mobile combustion emissions from mechanical treatments

FVS may be used to model fire in both a treated vs untreated scenario (see ARB quantification methodology). It is suggested that wildfire events be modeled as if they take place during the peak of fire season (late summer) when fuel moisture levels are very dry, temperatures are at the upper end of the average range for the location, and assuming wind speeds of 25 miles per hour[2].

Use this section to discuss the value of shaded fuel breaks and other forest fuel treatments, and the value and potential of connecting with neighbors for a community based fuel break effort. Identify potential fuel and fire break locations (generally along roads and ridges) and the possibility of reintroducing prescribed fire onto the property. Discuss fire protection practices and specifications for mechanical hand work, herbicide application, and/or prescribed fire for stand and habitat improvement, fuel reduction, and firefighter safety in the event of a wildfire. When possible, material generated from thinning treatments should be utilized as wood products or energy production. Limiting skid trails will reduce the overall compaction of soil and impact on soil productivity.

The following table provides an assortment of management practices that are intended to stabilize sequestered carbon by changing forest stand structure to increase carbon storage in more widely-spaced trees in a more fire resilient stand. Implementation of all practices is not necessary or required. Selection of practices must be done on a site-specific basis. An assortment of practices to suit your circumstance should be selected. NRCS Practice Titles are provided for landowner reference. Contact the local NRCS or RCD field office for technical and/or possible financial assistance.

[2] Daugherty and Fried (2007) use 20-foot wind speeds of 25 mph as the threshold for a potential stand-replacing fire. Using FVS, if a stand had either a torching index or crowing index of ≤ 25mph, then they assume the stand is at risk of a stand-replacing fire.

Table 7-4: Wildfire Hazard and Fuels Reduction Related Conservation and Carbon Beneficial Practices

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Thin small-diameter trees and remove brush in the understory to remove surface, ladder, and/or canopy fuels (manual or mechanical removal)	Shaded Fuel Break (383); Forest Stand Improvement (666)	☐		
Prune the residual stand of trees and shrubs to reduce vertical fuel continuity (6-15' high)	Tree/Shrub Pruning (660)	☐		
Remove conifers and other evergreen tree species encroaching on deciduous oak woodlands to reduce fuels and promote more fire resilient species	Forest Stand Improvement (666); Restoration and Management of Rare or Declining Habitats (643)	☐		
Harvest merchantable trees in the understory and/or overstory, increasing spacing between crowns and capture future mortality and storing carbon in wood products		☐		
Radially thin around vigorous trees of desired species to reduce torching potential of individual trees	Forest Stand Improvement (666)	☐		
Prescribed broadcast burning of forest stands and/or brush fields to consume surface and ladder fuels		☐		

Creation of a permanent or temporary strip of bare or vegetated land (herbaceous species) planned to retard fire	Fire Break (394)	☐		
Treat/remove residual woody material that is created due to management activities or natural disturbances to reduce surface fuels	Woody Residue Treatment (384)	☐		
Management or removal of woody brush species to reduce surface and ladder fuels	Brush Management (314)	☐		
Other:		☐		

FOREST CONSERVATION

Protecting forestland from conversion to non-forest land uses maintains existing carbon stored onsite in forest vegetation and ensures the site will continue to sequester carbon in perpetuity. Conservation easements are a tool that can prevent conversion and protect the property's associated resources. The easement is either voluntarily donated or sold by the landowner and constitutes a legally binding agreement that limits certain types of uses or prevents development from taking place on the land in perpetuity while the land remains in private hands.

Furthermore, conservation easements can contain forest improvement terms, such as requirements to grow large trees and retain some, or all, of them over time. Conservation easements can protect both forestlands that are managed for timber harvest and those that are not. Conservation easements protect land from conversion and fragmentation while allowing owners to retain many private property rights and to live on and use their land, at the same time potentially providing them with direct financial and/or tax benefits.

The net GHG benefit from forest conservation can be calculated as follows:

Net GHG Benefit = Δ in standing live and dead tree carbon stocks in the treatment boundary as a result of avoided conversion

Use this section to discuss feasibility and landowner interest in pursuing a conservation easement for the property, if one is not currently in place. Additionally, list land trusts and other organizations that work in the area that may be interested in purchasing a conservation easement on the property. The Forest Legacy Program, administered by CAL FIRE, may also be referenced (http://www.calfire.ca.gov/resource_mgt/resource_mgt_forestryassistance_legacy). If one already

exists on the property, use this section to reference land management requirements identified in the easement.

Table 7-5: Forest Conservation Related Conservation and Carbon Beneficial Practice

Conservation Practice	NRCS Practice	Current Practice	Planned Implementation Date	Location
Conservation easement on forested land.		☐		
Other:		☐		

8. CONSTRAINTS & PROPOSED ALTERNATIVES

8.1 Operational Constraints

Yarding Access:

Ground based yarding is cheaper and typically results in less residual damage than cable logging, but it is limited to relatively gradual slopes. Typically, in ground-based operations logs are yarded downhill to roads and landings, logs can be yarded uphill but it often requires far more effort, which slows the process down and increases cost. Portions of the timbered area of the property are on steep slopes, and while the current road infrastructure is favorable for uphill cable yarding, the only areas where that would be a necessity are generally in Unit 2, which is mostly so steep that it is planned to be left alone. Deflection is good, and it should be possible to log the entirety of Units 1 and 3 without off property tail holds (cable block location). Most of this ground would likely be logged using ground based systems, but one of the objectives of the landowner is to improve erosion and watercourse sedimentation conditions, which may mean future harvest operations rely on cable yarding.

Steep Slopes:

Slopes throughout the property are often in excess of 40%, which limits ground-based equipment operation to what can be reached from existing skid trails. Slopes greater than an average 40% will likely require hand crews for mechanical thinning operations, and cable yarding systems for logging operations that are farther than what can be feasibly winched from existing trails. There are some newer ground-based techniques that involve tethering equipment with a cable winch so that they may operate on steeper slopes, but this also increases cost and complicates harvest design in uneven-aged silvicultural systems. Steep slopes and poor access can also limit the area in which a pile burn can safely be conducted. The possibility of prescribed fire is not eliminated by the steepness of these slopes, but the application of fire on steep slopes can significantly complicate the operation given fire's natural tendency to race up hill and the difficulty at which traversing steep slopes can be.

Limited Markets:

There are limited Douglas-fir markets in the area. Douglas-fir prices are largely dependent on housing starts, and outside market effects such as wildfires. Prices typically range from $400 per thousand board feet (mbf) to $700/mbf. The closest mills accepting Douglas-fir logs are Mendocino Forest Products (Mendocino Redwood Company) in Ukiah, and Sierra Pacific Industries in Lincoln. Mendocino Forest Products is 75 miles away, with a likely 3.5 hour round-trip, not counting processing time at the mill. Sierra Pacific's mill is 135 miles away, with a likely 6 hour round-trip. These mills are subject to closure once their annual quotas are filled, which may leave projects partially unfinished, especially in good log years when high prices drive many landowners to harvest. There are occasionally overseas markets that open, which would mean logs are delivered to the Port of Oakland, a 2 hour round trip depending on traffic. If no other log mills are available, and if log prices are high enough to warrant it, there are additional log mills in Humboldt County. Humboldt Redwood Company in Scotia, and Schmidbauer Lumber in Eureka which are 6-8 hour round-trip locations without processing time.

Hauling prices are largely dependent on proximity to mills, having the ability to run multiple loads per work day is extremely valuable in terms of labor and fuel costs.

Redwood markets are slightly more accessible than Douglas-fir. Redwood empire has a mill in Cloverdale, which is 50 miles away and a roughly 2 hour round trip, and Willits Redwood is 100 miles and a 3.5 hour round trip away. Mendocino Redwood Company accepts both Douglas-fir and redwood, they also share a space with Conrad Forest Products – a company based in Oregon – these would be likely choices to award a mixed species timber sale.

There are no commercial markets for any other species on the property. There is a limited firewood market for hardwoods, and no current markets for biomass or chip. Select hardwoods could be milled and sold to niche markets and individual buyers for high-end furniture lumber.

8.2 Proposed Alternatives

No Action Alternative: The No Action Alternative would avoid any operational disturbance on the property. This would eliminate the landowner' ability to reduce standing dead fuels that increase the risk of future catastrophic wildfire on the property, it would also eliminate the possibility for the landowner to manage the forest to increase available late seral habitat and create a stable carbon sink; this is inconsistent with the landowner's objective of preserving the ecological integrity of the property.

Alternative Land Uses: This alternative would involve the landowners utilizing the forest in ways beyond recreation and the protection of forest, water, and wildlife values. These alternative land uses would most likely be commercial timber or vineyard development. However, the property owners have no desire to commercialize their forest beyond what makes sense as a byproduct of management actions to improve the health of residual trees, to speed the development of late-seral characteristics, and to create defensible space around access roads and buildings.

Carbon Offset Market: This alternative would require the landowners to invest a large amount of capital in a detailed carbon inventory over the property at no more than ten-year intervals. Additionally, to be certified to participate in the carbon offset market, audits by third party verifiers are needed. To initiate an accredited project and retain certification is incredibly cumbersome and capital intensive, meaning a

large land base is necessary to see a return on investment. Few certified projects that are less than 2,000 acres, and most are on properties 5,000 acres or greater. It is deemed economically infeasible for the landowners to enter into the carbon offset market at this time.

Recognizing that none of these alternatives meet the intended goals set forth by the landowners, they were not considered feasible.

8.3 Economic Sustainability

To the landowners, the sustainability of the property is focused more on the conservation and wildlife values of the forestland, rather than its economic value. The conservation value of this property is significant given its proximity to Occidental and trending vinicultural development in the region. Ideally, small thinning operations may provide some economic return on desired conservation and enhancement efforts. If a harvest were to be implemented, single-tree selection would be the primary silvicultural method. The goal of harvest would be to maintain stand volume, increase average tree size, improve stand quality and future value, and reduce fire hazard on the property. It is worth noting that low volume timber harvests can increase the logging price on a board foot basis due to the time that it takes to obtain the same volume of timber. 5MBF per acre is typically the break even point, operations in timber stands with volumes lower than that may experience per board foot logging costs at least $100 more per harvested MBF.

9. PLANNED MANAGEMENT ACTIVITY

9.1 Management Activity Schedule and Tracking

Schedule proposed activities in an orderly timeline covering at least five years. Use this table to track implementation of the actions that identified in this plan. Additional pages can be added as needed to adequately document all practices that are planned. Provide a project map delineating each treatment.

Treatment Unit	Apprx. Acres	NRCS Practice Code	Treatment Activity Short Description**	Dates		Cost Share Type	Net per Acre Cash Flow*		
				Planned	Comp.		Approx. Total Cost	Approx. Gov-Cost Share	Approx. Income
3	50	666, 384	Understory brush treatments	2023	2023	EQIP	$100,000	$60,000	-$40,000
3	30	314	Chemical follow-up for hardwood management	2023	2023	EQIP	$7,000	$5,200	-$1,800

* Costs are based on the most current NCRS practice scenario cost list. These costs are based on a national average and actual costs for landowner projects will vary by location and contractor selection.

** This is just an example scenario; treatment schedules and activities are at the discretion of the landowner

9.2 CEQA and NEPA Information and List of Required Permits

Forest management activities including conservation practices may impact special environmental and/or cultural values such as threatened or endangered species and archaeological sites. Environmental and cultural reviews by regulatory agencies are required when a ground practice is proposed, and a permit and/or government assistance becomes part of the project.

Most commercial biomass and timber removal activities need a CAL FIRE permit or other entity permit. Identify the need or current CAL FIRE THP, NTMP, and/or Categorical Exclusion for proposed timber management activities. All commercial treatments must comply with the California Forest Practice Act.

Other agency permits may be necessary for proposed management activities related to other types of conservation projects such as, but not limited to, water drafting, ponds, road maintenance, crossing replacements and upgrades, and dust control. Identify the required permits needed for any proposed treatments. Furthermore, discuss both proactive and required monitoring for regulatory compliance.

Any future projects funded by a CAL FIRE or NRCS cost-share program requires a CFIP Environmental Checklist (CEQA) or an NRCS CPA-52 (NEPA) Checklist to satisfy CEQA or NEPA, respectively. Along with this checklist a process of "discovery" or survey for unknown values along with a discussion of possible mitigations is required. Additionally, the checklist must be filled out by an RPF or Certified Planner. Archaeological values require an Archaeological Records Check from the California Historical Resources Information System ("CHRIS"), an entity Archaeologist review, and Native American notification for the practice area.

Before a ground disturbing project is initiated, it is suggested that a project notification to the following agencies:

a) County Clerk
b) California Department of Fish and Wildlife
c) North Coast Regional Water Quality Control Board
d) Native American Heritage Commission
e) Tribal contacts within Mendocino County

Projects affecting the bed, bank, or channel of a stream or other water body, notify the Department of Fish and Wildlife, the Regional Water Quality Control Board, and Army Corps of Engineers. Projects may require a permit. Your local Resource Conservation District may also be available to assist with permit applications.

For harvesting activities removing commercial timber, a CAL FIRE permit is needed to comply with the California Forest Practice Act. For treatments recommended in this plan, identify needed or current CAL FIRE THP, NTMP, and/or Categorical Exclusions for the proposed timber management activities.

9.3 List of Potential Funding Sources for Project Implementation

List and briefly describe any potential funding and/or cost-share programs the landowner may apply for to implement recommended projects. Below are commonly available programs.

USDA Natural Resource Conservation Service (NRCS) provides cost share funding assistance for forest practice and road related projects through the following program:

The Environmental Quality Incentive Program (EQIP) provides financial and technical assistance to agricultural producers and forest landowners in order to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved ground and surface water, reduced soil erosion and sedimentation or improved or created wildlife habitat.

CAL FIRE provides cost share funding assistance for forest stand improvement projects and other vegetation treatments through the following programs:

California Forest Improvement Program (CFIP): The purpose of the CFIP program is to encourage private and public investment in, and improved management of, California forestlands and resources. This focus is to ensure adequate high quality timber supplies, related employment and other economic benefits, and the protection, maintenance, and enhancement of a productive and stable forest resource system for the benefit of present and future generations.

Vegetation Management Program (VMP): CAL FIRE's VMP is a cost-sharing program that focuses on the use of prescribed fire, and some mechanical means, for addressing wildland fire fuel hazards and other resource management issues on State Responsibility Area (SRA) lands. VMP allows private landowners to enter into a contract with CAL FIRE to use prescribed fire and/or mechanical treatments to accomplish a combination of fire protection and resource management goals. Implementation of VMP projects is by CAL FIRE Units. The projects which fit within a unit's priority areas (e.g., those identified through the Fire Plan) and are considered to be of most value to the unit are those that will be completed. Landowners who choose to apply for participation in the Vegetation Management Program should contact their local Battalion Unit for more details.

CAL FIRE provides several competitive grant funding programs for vegetation treatments:

Greenhouse Gas Reduction Fund (GGRF) – Fuels Reduction: CAL FIRE will solicit and competitively award grants that reduce hazardous fuels and are designed to meet greenhouse gas emission objectives. Payments will be made to grantees via reimbursements. All projects shall be designed to meet greenhouse gas emission objectives. These objectives include increased carbon sequestration in trees retained on the project site, reduction of wildfire hazards to reduce wildfire emissions, utilization of biomass to offset use of fossil fuels, and utilization of solid wood materials to offset emissions resulting from removal of vegetation. Vegetation treatment forestry prescriptions will focus on treating understory trees and brush with a goal of reducing fire hazards, improving tree growth, stabilizing carbon in retained trees, and increasing forest resilience. All projects will include a scientific methodology to calculate and quantify the GHG emission reductions resulting from the project. Priority shall be given to projects which utilize biomass and other solid wood products; provide assurance of achieving and retaining GHG benefits, and projects which are included in a local fire plan or conservation plan; and projects that have a documented assessment of need for providing wildfire protection of

human infrastructure and watershed values, while providing other co-benefits (reduced forest pest damage, airshed improvements in non-attainment air basins, invasive weed control, improvement to wildlife habitat, etc.)

Forest Health Greenhouse Gas Reduction Fund (GGRF) Grants: The Forest Health GGRF Grant Program is a new program and will use funds provided by the Greenhouse Gas Reduction Fund for California Climate Investments administered by CAL FIRE. Through the Forest Health GGRF Grant Program, CAL FIRE funds and implements projects to proactively restore forest health in order to reduce greenhouse gases, to protect upper watersheds where the state's water supply originates, to promote the long-term storage of carbon in forest trees and soils, minimize the loss of forest carbon from large, intense wildfires, and to further the goals of the California Global Warming Solutions Act of 2006 (Assembly Bill 32, Health and Safety Code Section 38500 et seq.) (AB 32).

Forest Health GGRF Grant projects must focus on large, landscape-scale forestlands composed of one or more landowners, which may cover multiple jurisdictions. Projects must be comprised of logical management units and greater consideration will be given to organizations with a proven record of success in achieving consensus-based solutions between stakeholder groups with different priorities and perspectives. Forest Health GGRF Grant projects may include reforestation, fuel reduction, pest management, conservation, and biomass utilization intended to increase forest health, increase carbon storage in forests, reduce wildfire emissions and protect upper watersheds, where much of the State's water supply originates. Projects that implement a mix of these activities, with multiple partners will be given priority.

State Responsibility Area Fire Prevention Fund (SRAFPF) Grant Program: The State Responsibility Area Fire Prevention Fund (SRAFPF) Grant Program provides funding for projects related to the removal of dead or dying trees, hazardous fuel (vegetation) reduction, fire prevention education, and fire prevention planning. Projects funded by the SRAFPF and TM grants will reduce the risk of fire ignition and spread in and adjacent to communities, educate owners of habitable structures about wildfire risks, allow for strategic, long-term planning to reduce the risk of wildfire to communities in the SRA throughout the State, or remove dead or dying trees that pose a threat to public health and safety. This grant funding source is highly competitive and is focused on areas with higher densities of residents or tree mortality.

More information about CAL FIRE's grant programs can be found online at: http://www.fire.ca.gov/grants/grants.

9.4 List of Additional Professional Assistance

California Department of Fish and Wildlife
Bay-Delta Region, Santa Rosa Field Office
5355 Skylane Blvd., Suite B,
Santa Rosa, CA 95403
(707) 576-2882

CAL FIRE
Sonoma-Lake-Napa Unit (LNU)
1199 Big Tree Road
St.Helena, CA 94574
(707) 967-1400

Tom Knect, CAL FIRE
VMP Coordinator
1199 Big Tree Road
St.Helena, CA 94574
(707) 967-1408

Ben Harris, CAL FIRE Associate State Archaeologist
Northern Region Headquarters 135 Ridgway Avenue
Santa Rosa, CA 95401 (707) 576-2966

Michael Jones, UCCE
Forestry Advisor for Mendocino, Lake and Sonoma Counties
890 N. Bush St
Ukiah, CA 95482

Hopland Research and Extension Center 4070 University Road
Hopland, CA 95449
Phone: (707) 744-1424

James Burke, Senior Engineering Geologist
North Coast Regional Water Quality Control Board (NCRWQCB)
5550 Skyland Blvd., #A
Santa Rosa, CA 95403
(707) 576-2289

Sonoma County Sheriff
2796 Ventura Ave
Santa Rosa, CA 95403
(707)565-2511

Meghan Reeves, CAL FIRE
Regional CFIP Forestry Assistance Specialist
135 Ridgway Avenue
Santa Rosa, CA 95401
(707) 888-7331

L.A. Moran Reforestation Center 5800 Chiles Road
Davis, California 95618
(530) 753-2441

Bodega Volunteer Fire Department
17240 Bodega Highway
Bodega, CA 94922
(707) 876-9438

Northern Sonoma County Air Pollution Control District (NSCAPCD)
150 Matheson Street
Healdsburg, CA 95448
(707) 433-5911

Sonoma Resource Conservation District
1221 Farmers Lane, Suite F.
Santa Rosa, CA 95405
(707) 569-1448

Natural Resource Conservation Service (NRCS)
Petaluma Field Office
5401 Old Redwood Highway
Suite 100,
Petaluma, CA 94954
(707) 794-1242

Steven Swain, UCCE
Environmental Horticulture Advisor
Sudden Oak Death Expert
1682 Novato Boulevard, Suite 150-B
Novate, CA 94947
(415) 473-4204

Raymond Baltar
Sonoma Ecology Center
Director, Sonoma Biochar Initiative
(707) 996-0712 ext. 104

10. REFERENCES

Barret, S. A. *The Ethno-Geography of the Pomo and Neighboring Indians.* Berkeley, The University Press, 1908.

Brown, P. M. and W. T. Baxter. *Fire History in Coast Redwood Forests of the Mendocino Coast, California.* Northwest Scientific Association, 2003.

Clark, J., J. Sessions, O. Krankina, and T. Mannes. 2011. Impacts of Thinning on Carbon Stores in the PNW: A Plot Level Analysis. College of Forestry, Oregon State University. 72pp.

Forest Carbon Action Team. 2017. California Forest Carbon Plan: Managing our Forest Landscapes in a Changing Climate. Draft for Public Review. Sacramento, California. 201pp.

http://goldridgercd.org/documents/12-pagePublicSummary_000.pdf

Gudde, Erwin G. and William Bright. *California Place Names: The Origin and Entymology of Current Geographical Names, 4th edition.* Berkeley and Los Angeles, California, University of California Press, 1949.

Huffman, M. E. *Forest Carbon Action Team. 2017. California Forest Carbon Plan: Managing our Forest Landscapes in a Changing Climate*. California Geological Survey. Sacramento, California, 1972.

Mallek, C., H. Safford, J. Viers, and J. Miller. 2013. Modern departures in fire severity and area vary by forest type, Sierra Nevada and Southern Cascades, California, USA. Ecosphere. 4(12): 1-28.

North, M., M. Hurteau, and J. Innes. 2009. Fire suppression and fuels treatment effects on mixed-conifer carbon stocks and emissions. Ecological Applications 19(6):1385-1396.

"The Heart of Occidental." *Occidental Community Church: Occidental, California,* https://www.occidentalcommunitychurch.org/history.html

Sonoma County Library Digital Collections. "Residence of M. C. Meeker." *Sonoma County Historical Society Collections,* 21 Mar. 2007, digital.sonomalibrary.org/digital/collection/p15763coll8/id/994.

Stindt, Fred A. *Trains to the Russian River.* Pacific Coast Chapter of the Railway & Locomotive Historical Society, 1974.

Westerling, A.L., H.G. Hidalgo, D.R. Cayan, and T.W. Swetnam. 2006. Warming and earlier spring increase western U.S. forest wildfire activity. Science 313:940–943.

11. APPENDICES

Appendix A: Glossary

Appendix B: Maps

Appendix C: NRCS Soil Survey Geographic Database Report

Appendix D: Upland & Aquatic Wildlife List and Special Status Species Fact Sheets

Appendix E: Burn Information and Fire Preparedness Information

Appendix F: Tax and Business Management

Appendix G: Selected Standards & Specifications

Appendix H: Supporting Data

Appendix I: Confidential Addendums

Appendix J: Past Plans, Amendments, and Updates

Appendix K: Road Treatment Guides