SOWING CIRCLE &
OCCIDENTAL ARTS AND ECOLOGY CENTER

Wildlands Stewardship Plan

15290 Coleman Valley Road
Occidental, California 95465
August 2015, revised May 2016

California Forest Incentives Program Project
#12-NCR-50N-07CA State contract #8A13302

California Forest Improvement Plan

Property Name: Occidental Arts & Ecology Center
Property Location Address: 15290 Coleman Valley Rd, Occidental CA
Owner Name (s): Sowing Circle LLC
Plan Authors and Contributors: Harold C. Appleton, RPF; Lindsay Dailey, Wildlands Program Director; Brock Dolman, WATER Institute, Permaculture & Wildlands Program Director; Jim Coleman, Wildlands Preserve Manager

Signature of Registered Professional Forester:_____
Phone: (707) 875-3976
RPF#: 1977

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.

Landowners
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): Harold C. Appleton

Signature: _____

Date: _____

Organization or Company: Prunuske Chatham, Inc.

Address: 400G Morris St., Sebastopol, CA 95472

Phone: (707) 875-3976 RPF#: 1977

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: _____
RPF#:_____
Signature:_____
Date: _____

ACKNOWLEDGEMENTS

Harold Appleton & the staff of Prunuske Chatham, Inc.
Sonoma County Vegetation Mapping, LIDAR Data

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1. Overview

The Restoration and Stewardship Plan (Plan) describes the natural resources of the property owned by Sowing Circle LLC and leased to the Occidental Arts & Ecology Center (OAEC) for their educational campus, and details specific actions for protecting and enhancing forest, grassland, wetland, and aquatic habitats. The document serves both as a repository of historical land use and management, goals to guide the management of the land, as well as a set of guidelines for future projects. It is intended to be a dynamic document with information appended or projects modified as projects are completed and new information collected. In order to make the Plan useful as a fundraising aid, it also includes information that is required by many public agencies and private foundations for grant applications. The Plan was funded by a grant from CalFire, through the California Forest Improvement Program (CFIP).

This Plan is designed to be used in many different ways - as a source of information for residents, owners, land managers, teachers, students and visitors; as a practical handbook for managing the land; and as a learning tool for other land managers throughout California to gain knowledge about how to manage their land. Chapter 2 provides historical and scientific information about the land and its plant and animal communities. Chapter 3 identifies goals for the stewardship of OAEC. Chapters 4 and 5 identify specific activities to protect and enhance natural resources. Sources of information and help are found in Chapters 8 and 9. The Appendices contain specifications for stewardship activities, plant and wildlife lists, details of erosion sites and other information that could be used independently of the Plan.

A Summary of the Plan can be found on OAEC's website at www.oaec.org.

2. The Site

Owners: Sowing Circle LLC
Members include: Nick Allen, David Berman, Brock Dolman, Kendall Dunnigan, Doug Gosling, Dave Henson, Martha Kowalick, Katy Mamen, Susan McGovern, and Adam Wolpert.

Lessee: The Occidental Arts & Ecology Center, a 501c3 non-profit
Executive Director: Dave Henson

Contacts: Brock Dolman – phone (707) 874-1557 x 106 brock@oaec.org

Location (see Figure 1):
15290 Coleman Valley Road, Occidental, Sonoma County, CA 95465
GPS: N38.411162° W122.955382°
APN: 074-160-034
USGS: Camp Meeker Quadrangle, NE 1/4 of NW1/4 of Sec 34 and SW ¼ of Sec 27, T7N, R10W, MDB&M

General Description:

The Occidental Arts & Ecology Center's 80-acre site is located in the headwaters of the Dutchbill Creek Watershed – a tributary to the lower Russian River Basin, approximately one mile west of the town of Occidental on Coleman Valley Rd. The property is Zoned LEA B6 100 Combining District SR (see Appendix 2).

The 80.26 acres is home to both Sowing Circle and OAEC and provides for a dynamic community of people and their richly diverse gardens, orchards and ornamental landscapes. Well-known for its agro-diversity of cultivated crops in the organic 3-acre "Mother Garden," OAEC is also home to a 70-acre Wildlands Preserve or "Grandmother Garden," a precious heritage of native biodiversity. As land stewards both Sowing Circle and OAEC are committed to ensuring the health and viability of the land under their care.

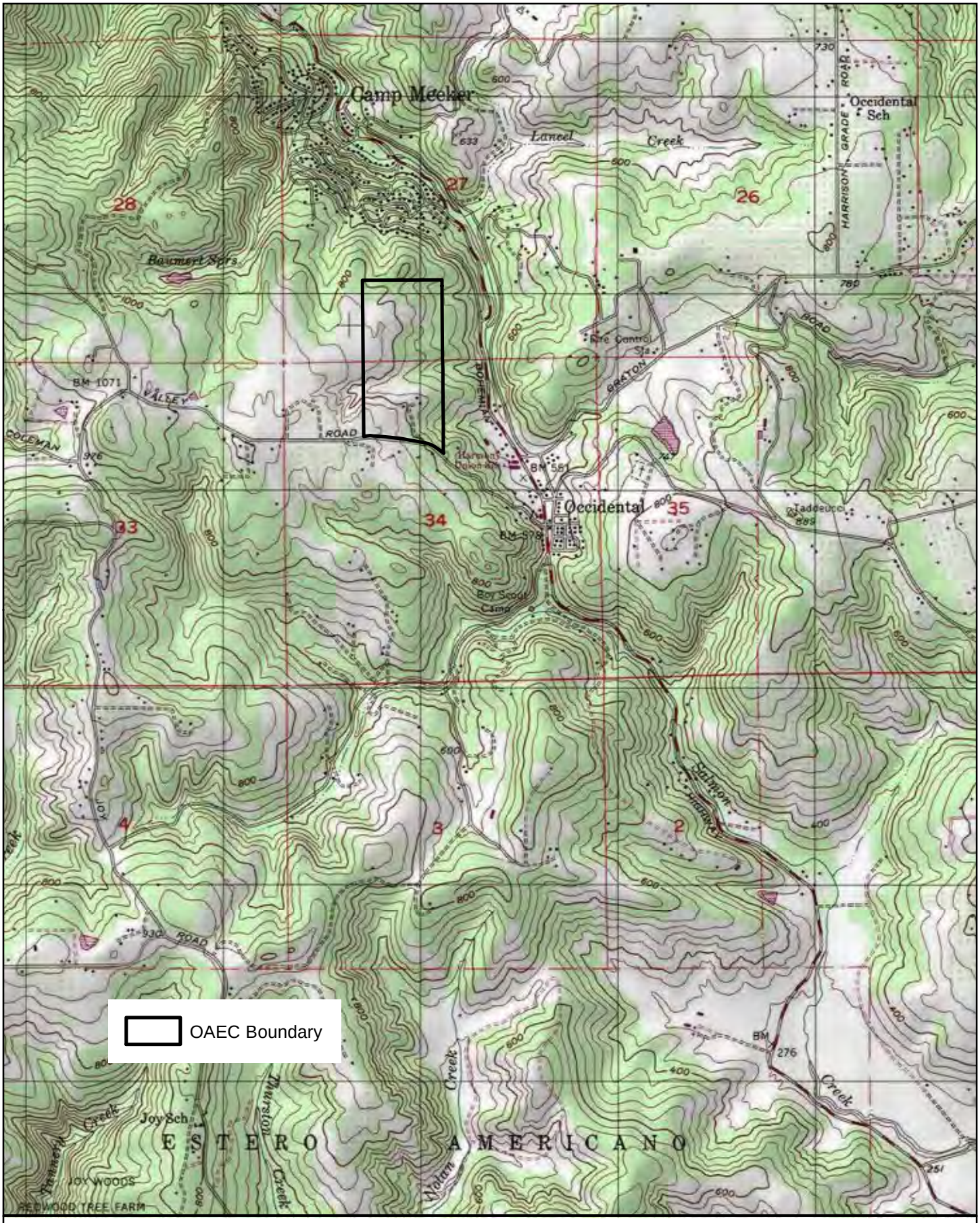

Figure 1. Location - USGS Camp Meeker Quadrangle

3. History

OAEC's landbase is located within the ancestral territory of the Coast Miwok and Southern Pomo people that have inhabited the Sonoma Coast for over 12,000 years. During the many thousands of years that the Coast Miwok and Southern Pomo people (now organized as the Federated Indians of Graton Rancheria) thrived by sustaining themselves on the land, they actively managed the landscape with small-scale disturbances such as digging, low-intensity burning, coppicing, distributing seed and hunting. These intentional disturbances, contrary to common thinking about human disturbances upon the environment in the modern era, were crucial processes that maintained the tremendous biodiversity of flora and fauna that Northern California is known for. In fact, one could argue that the native people were in fact the keystone species responsible for maintaining this biodiversity that supports a vast breadth of human and non-human life.

Archaeological remains of a Coast Miwok village have been found near OAEC just uphill on Coleman Valley Road less than a half-mile away. While no evidence has been found of permanent native settlement of the land, OAEC was surely tended as part of a bioregional landbase that supported the Coast Miwok and Southern Pomo people for hundreds of generations (see Archaeology / Cultural Resources for more information).

In sharp contrast to the land stewardship of California natives, the first European settlers, the White family, arrived on the land that is now known as OAEC in the 1850s as homesteaders, bringing their crops and land management practices from Europe. From the late 1870s through the 1950s, the Francesci family from Italy occupied the land and intensively grazed cattle, managed a woodlot for firewood and timber, and planted vineyards, cherries, and olives over the native vegetation.

The extraction of resources on a larger scale came with the beginning of the logging and railroad era. The railroad through the town of Occidental started operating in 1877, transporting high quality old-growth redwood lumber products out of the area and bringing in supplies and travelers. The first lumber mill near Occidental was built in 1866.[1] Age-dating of redwoods at OAEC shows that the older third growth trees are 85+ years old, indicating a heavy cut of the second-growth in the late 1920s or early 1930s. Subsequent selective harvests are evidenced by smaller stumps and stump sprouts.

After the Francesci's left in the 1950s, a series of landowners inhabited the land for a period of time, including the Somerville's and later the Donnelley's. In response to the

[1] Hill, 1997

destructive deforestation, overgrazing, and resultant erosion and loss of habitat that occurred on the land by the early European settlers, the environmentally-minded landowners of the 70s attempted to restore the land by adopting the common conservationist strategy of the time – to let nature rest by taking a hands-off approach to land management, and allowing nature to heal herself.

In 1974, the land was leased, and then purchased the Farallones Institute, a non-profit organization dedicated to experimenting with and promoting various forms of appropriate technology. Under their leadership, a series of buildings were constructed, including: the residential "Solar Suburbia", a series of passive solar designed homes; the barn; the kitchen and dining facility; bathhouse; organic gardens; water supply well and the large irrigation pond.

The Farallones Institute sold the property in 1990 to the CS Fund that renamed it the Center for Seven Generations, an organization with the mission of continuing the experimental nature of the site. For the majority of the land outside the core area and gardens both the Farallones Institute and the Center for Seven Generations continued with the "let nature rest" mentality, trusting that nature, if left alone, would naturally regenerate.

In 1993, the Center for Seven Generations decided to sell the property. At this time, a group of biologists, activists, and artists were looking to start an intentional community with a mission of promoting sustainability. In July of 1994, seven Sowing Circle members organized as a General Partnership purchased the property. Later in 2000 Sowing Circle reconstituted as an LLC. The property is structured as a no-equity cooperative. It is owned in equal shares by the ten current owners, all of whom live on site along with five children, three staff that aren't members of the LLC, and six seasonal interns.

In 1994, members of Sowing Circle also founded the Occidental Arts and Ecology Center, a nonprofit corporation, to develop horticultural, ecological restoration and social justice programs at the facility. While the Sowing Circle and OAEC maintain two distinct legal and financial entities, they share a common vision, and Sowing Circle has contributed an enormous amount of capital, labor and vision towards creating and caring for the OAEC land, gardens, and facilities.

Through the Sonoma Land Trust, a conservation easement was recorded on the property in 1994 to restrict the use of the 1 acre North Garden and the 0.5 acre South Garden, prohibiting the use of herbicides, pesticides, or chemical fertilizers on the site's organic gardens, as well as the construction of any buildings or structures. The Sonoma Land Trust surveys the easement area annually to ensure compliance, and the gardens covered by the easement must remain certified by California Certified Organic Farmers (CCOF) or a similar successor in perpetuity. This was the first such organic agriculture

easement created in the country. The "Mother Garden" is California's 8th oldest certified organic farm.

A continuation of the environmentally-minded land ethic of the 60s and 70s was carried forward with the arrival of Sowing Circle and OAEC, though with a stark difference. In contrast to the "let nature rest" mentality that previously guided land management decisions, OAEC biologists began to recognize the effect of lack of disturbance on the land. While clearly the large-scale clear-cutting and heavily stocked grazing of livestock was devastating to the land, leaving it alone did not appear to be working either.
Ecological observation and study revealed that the various plant communities at OAEC (coastal prairie, mixed hardwood, mixed conifer, and wetland/riparian) are "disturbance dependent" – adapted to a variety of disturbances such as drought, fire, grazing, and burrowing. In many grasslands, disturbance prevents shrubs and trees from invading surrounding areas and converting prairies to shrubland, woodland, or forest.

With substantial changes in these disturbance patterns - including the displacement of Coast Miwok and Southern Pomo land stewards and the removal of fire from the landscape; changes in natural herbivory patterns of grizzly bear and native ungulates such as elk and deer; the overgrazing of non-native domesticated ungulates such as sheep and cattle; agriculture and urban development; and the introduction of non-native plants and the devastating brown-algae sudden oak death or SOD (*Phytophthora ramorum)* – the long-established balance of the ecosystem had been severely threatened.

Thus emerged the land ethic of OAEC, striving towards the idea of "regenerative disturbance," where humans once again are reassuming an integral role as a beneficial and integral part of nature, responsible for stewarding and tending the diversity of life that surrounds us through carefully managing small-scale disturbances.

In the early 21st century, we find ourselves in an unprecedented time. Humans have drastically altered the California landscape in the past 200 years by genocide of native peoples, extinction and near extinction of wildlife, logging, mining, tillage agriculture, grazing, draining the wetlands, damming the rivers, and urbanization. Climate change creates new challenges, the scale of which is unparalleled. Our generation is faced with the challenge of healing a damaged ecosystem, as well as a people disconnected from place, in a time of rapid ecological change.

Human communities have a choice to either view ourselves as a part of or apart from the fabric of biodiversity. As the current caregivers of this land, OAEC is challenged to interact with this dynamic living process of evolution in a manner that enhances the presence of biodiversity.

The over-arching goal of the Wildlands Program at the Occidental Arts & Ecology

Center is to support communities to restore a regenerative disturbance relationship to wildness, and help the land restore itself to exhibit the healthy, self-willed and "wild-tended" ecological processes it had before European settlement brought clear cuts, extinctions and invasive exotic plants just 150 years ago.

Through intelligent land use decisions and ethno-ecologically proven practices, OAEC is committed to choosing to participate in the process of re-building soil, re-charging groundwater and re-creating wildlife habitat towards re-'story'ing our relationship with the land as an inextricable part of the in the process.

4. Landowner Goals

The following land management goals have been crafted as a pattern for regenerative land management that, while specific to OAEC, can be generally applied to California landscapes and ecosystems. While the details of the techniques and strategies will be as diverse as the people who employ them, we believe these broad management goals are overarching and yet specific enough to guide land managers who seek to build resilience and preserve diversity in a time of great change. Through the utilization of regenerative disturbance regimes, OAEC's overarching goal is to restore keystone processes towards resilience-based regeneration.

These overarching goals will provide the foundation for the management directives in each vegetation community and its associated management units.

4.1. Soil

GOAL: Create a soil-resilient landscape by building living soil structure that sequesters carbon and water.

Logging, the removal of old-growth trees, overgrazing, and the introduction of invasive plants have taken a toll on the health and robustness of soils at OAEC and throughout the world. As the foundation for life, both micro and macro, soil is where the mineral cycle and carbon cycle begins. Carbon, minerals, and nutrients are cycled through the soil primarily via the natural processes of fire, grazing, diverse soil micro-biota, rainfall and infiltration, plant growth and decomposition. A primary goal in the management of the land at OAEC is to assist the regeneration of healthy, robust soils that sequester carbon and contain healthy soil biology and enhances the land's capacity to offer ecosystem services.

4.2. Water

GOAL: Create a water-resilient landscape by improving water quantity and quality through reducing erosion and encouraging groundwater recharge.

OAEC has pioneered the concept of Conservation Hydrology, and has been modeling watershed evaluation, restoration and monitoring techniques to the public for the past 20 years. The focus has included affordable, restorative practices that are applicable to most private landowners — those who retain the majority of land holdings in Sonoma and several other Northern California coastal counties.

The most effective place to store water is in the soil, and thus emerges the guiding principle: slow it, spread it, and sink it. A primary goal is to rehydrate the landscape, as that which infiltrates seeps forth. Slowing the flow is intrinsically connected to soils and a means of erosion control and sediment mitigation affecting the water quality of our creeks and rivers.

4.3. Fire

GOAL: Create a fire-resilient landscape that reduces the threat of catastrophic fire, and allows for fire to function as a regenerative disturbance process in the landscape.

Native Californians managed much of California's diverse ecology with anthropogenic fire – that is, fire intentionally lit, controlled, and used by humans as a land management tool. In fact, anthropogenic fire was probably the single most powerful land management tool responsible for creating and maintaining the tremendous diversity of California's flora and fauna. Controlled burning with low-intensity fires benefits the land in myriad ways: cycling nutrients; germinating native plants with fire-obligate seed; arresting succession and maintaining open meadows and forests by clearing understory plants and removing encroaching seedlings; maintaining alkalinity of the soil; and reducing the threat of catastrophic, stand-replacing forest fires.

OAEC land managers have utilized small scale prescribed fire on various grassland stands a number of times over the past 20 years; luckily the land has not been impacted by a catastrophic forest fire since the Bodega Fire several decades ago. Our goal is to conduct restoration activities that will allow intentional, prescribed fire to benefit the land without threatening the local ecology, including human settlement.

4.4. Life

GOAL: Create a life-resilient landscape that enhances conditions conducive for native biodiversity and the human community.

The term "biodiversity" describes the exuberant expression of life in all its forms and ecological relations. From individual species to populations of interconnected co-evolved symbiotic life forms, biodiversity is the very tapestry upon which life depends for its own continuance.

Conservation International designated 35 regions on the planet as "Biodiversity Hotspots". These biodiversity hotspots "cover only 1.4 % of the earth, but are home to 44% of all vascular plant species and 35% of all vertebrate animal species." Coastal California is listed as one of the world's 35 biodiversity hotspots. However, coastal California has lost to human development over 95% of its old growth coniferous forests, freshwater wetlands, saltwater estuaries, bunch grass prairies and riparian gallery forests. According to studies by the Nature Conservancy, the Bay Area, including Sonoma County, ranks nationally as one of the areas with the highest number of federally listed endangered species. This same area is, coincidentally, leading the nation in rate of growth and median home prices, and is over 95% privately owned. It is imperative that private landowners and residents take on active roles as stewards of biodiversity and engage in the political process to ensure that public land use decisions are made that do not reduce the ecological carrying capacity of the land that supports biodiversity.

We seek to enhance biodiversity of flora, fauna, fungi, the micro-biome and create habitat for native species of vertebrates and invertebrates. While we include Homo sapiens as a species for which we are managing, we strive to not place human needs above and beyond the needs of other species.

As part of the web of life, OAEC's human goals focus on utilizing the land for recreation, forestry products such as building materials, round poles, wild food and medicinal herbs, craft and basketry materials, and forage and fodder for grazing animals, in a way that enhances rather than reduces biodiversity. Recreation, access, and aesthetics are also crucial components to the human goals on the land.

Since the founding of OAEC in 1994, staff biologists have been compiling a species list of wildlife sightings and native plants. As ecological preserve managers, a critical component of the strategy to enhance biodiversity is an accurate list of species utilizing the site. A summary of the species level biodiversity of native plants and vertebrate animals observed on site to date is as follows: Native plants are represented by 185 species. We have documented 165 native vertebrate species at OAEC's preserve represented by 8 species of amphibians, 12 species of reptiles, 120 species of birds and

25 species of mammals. Federally and or state threatened and endangered species which have been documented at the Wildlands Preserve include Sonoma tree vole (*Arborimus pomo*), and spotted owl (*Strix occidentalis occidentalis*); the Dutchbill Creek watershed that OAEC drains into is the spawning ground of federally and state listed coho salmon (*Oncorhynchus kisutch*) and threatened steelhead trout (*Onchorhynchus mykiss*). A Species of Special Concern includes the Western pond turtles (*Emys marmorata*), which inhabit the big pond. A number of other Species of Special Concern utilize the land – see species lists Tables 3.1, 3.2 and 4 for details.

4.5. Education

GOAL: Conduct education, participatory research and demonstration.

An additional component of our human-centric goal includes education, demonstration and outreach, conducting participatory research and sharing the results of our experience with others.

OAEC's Wildlands Program provides education about effective restoration theory and methods and traditional ecological knowledge, as well as collaborates with the Federated Indians of Graton Rancheria, Sonoma State University and the Coastal Prairie Working Group, various youth service-learning programs, our local West County Fire Safe Council and the numerous students who attend workshops and tours. The Wildlands–Program has also been studying the presence of sudden oak death (SOD) and making efforts to protect both infected and uninfected trees.

4.6. Economics

GOAL: Support the organization with economic stability.

In order to ensure the ongoing health of OAEC, these goals must be met with sound economic strategies that sustain the cost of staffing and materials, and support the organization as a whole. A combination of government and foundation grant-funding, cost-share programs, student and volunteer labor, private donations will all contribute to a well-balanced plan.

5. Natural Resources

5.1. Watersheds

OAEC's 10 distinct sub-tributaries are located in the headwaters of the Dutch Bill Watershed, an 11 square mile tributary nested within its larger watershed, the 1480 square mile Russian River basin. Dutch Bill watershed originates on the slopes above the Occidental area, flows northwest through Camp Meeker and finds its confluence with the lower Russian River at Monte Rio, which then wends its way to its river mouth with the Pacific Ocean at Jenner.

At its most basic level, a watershed encompasses all of the land surface that collects and drains water down to a single exit point. A watershed is generally outlined by ridges with all rainfall within the ridge lines flowing to a common creek or drainage.

At the OAEC, we call our philosophical and practical responses to managing watershed challenges and opportunities before us "Conservation Hydrology." Conservation Hydrology utilizes the disciplines of ecology, population biology, biogeography, economics, anthropology, philosophy, planning and history to guide community-based watershed literacy, planning and action. It advocates that human development decisions must move from a "dehydration model" to a "rehydration model."

California is divided into watershed management areas which are given hydrologic unit identification numbers (see Table 1). The Forest Practice Watershed Mapper program allows users to identify the status of a specific planning watershed in accordance with the Anadromous Salmonid Protection (ASP) Rules, which require that every timber operation contribute to salmonid habitat restoration; see http://egis.fire.ca.gov/watershed_mapper/ .

Table 1. Calwater Watersheds

Calwater Planning Watershed	Hydrologic Unit #	Sub watershed	Acreage at OAEC
Dutch Bill Creek	1114.110303		80

The Dutch Bill watershed is within the NOAA[2] Coastal Anadromy Zone. Coho salmon is listed as endangered, steelhead listed as threatened. It is a **303 (d) listed** watershed meaning that it does not meet water quality standards, in this case primarily due to

[2] NOAA = National Oceanic and Atmospheric Administration

sediment and siltation. Any fire, erosion, pollution, or land management activity within a watershed may ultimately impact the downstream resources to the detriment especially of fisheries and human users.

Good watershed stewardship ensures that the land provides clean water as a public benefit. The Occidental area has an average annual rainfall of 55 inches, with the wettest year in 1983 coming in at 111 inches, 2014 the driest year with 35.7".

High intensity rainfall has the potential to move a lot of sediment into stream systems from dirt roads, un-vegetated ground, in-channel incision/bank failure and landslide areas.

When proposing management activities which affect the watershed, such as timber harvesting and road building, one must consider the watershed as a whole, over time, and the cumulative effects to the public resources of forest products, water, air, wildlife, aesthetics, transportation, etc. For example, if one proposes to harvest 10% of a watershed, 90% of which has been logged within the last 10 years, this may create a sediment delivery to the system, which exceeds the carrying capacity of the system, leading to high embeddedness of spawning gravels that can impede the ability of anadromous fish to reproduce. By delaying harvesting and allowing the remainder of the watershed to stabilize one can minimize one's impact to the overall system. Protocols exist for measuring stream temperatures and spawning gravel embeddedness that determine the health of a local stream. Or by correcting chronic erosion problems within the watershed, one may be able to speed up the watershed recovery.

Timber Harvest Plans (THPs) are filed with CDF in Santa Rosa, and landowners within 300 feet of the plan boundary must be notified before approval. However, landowners may or may not be notified about proposed THPs further away in the watershed. The public can subscribe to the CDF "Notification of Submission," which shows all new THPs, Non-Industrial Timber Management Plans, and Major Amendments. This list is mailed out on a regular basis as plans are filed[3] and should be to determine impacts within the Dutchbill Creek watershed. The locations of THPs filed from 1997 to 2003 within the watershed are noted on Figure 2. OAEC can also request of the County Permit and Resources Management Department (PRMD) that it be notified of any application for a change in land use within the watershed.

[3]Contact CALFIRE Coast-Cascade Region Office, Attn: Forest Practice in Santa Rosa (707) 576-2959.

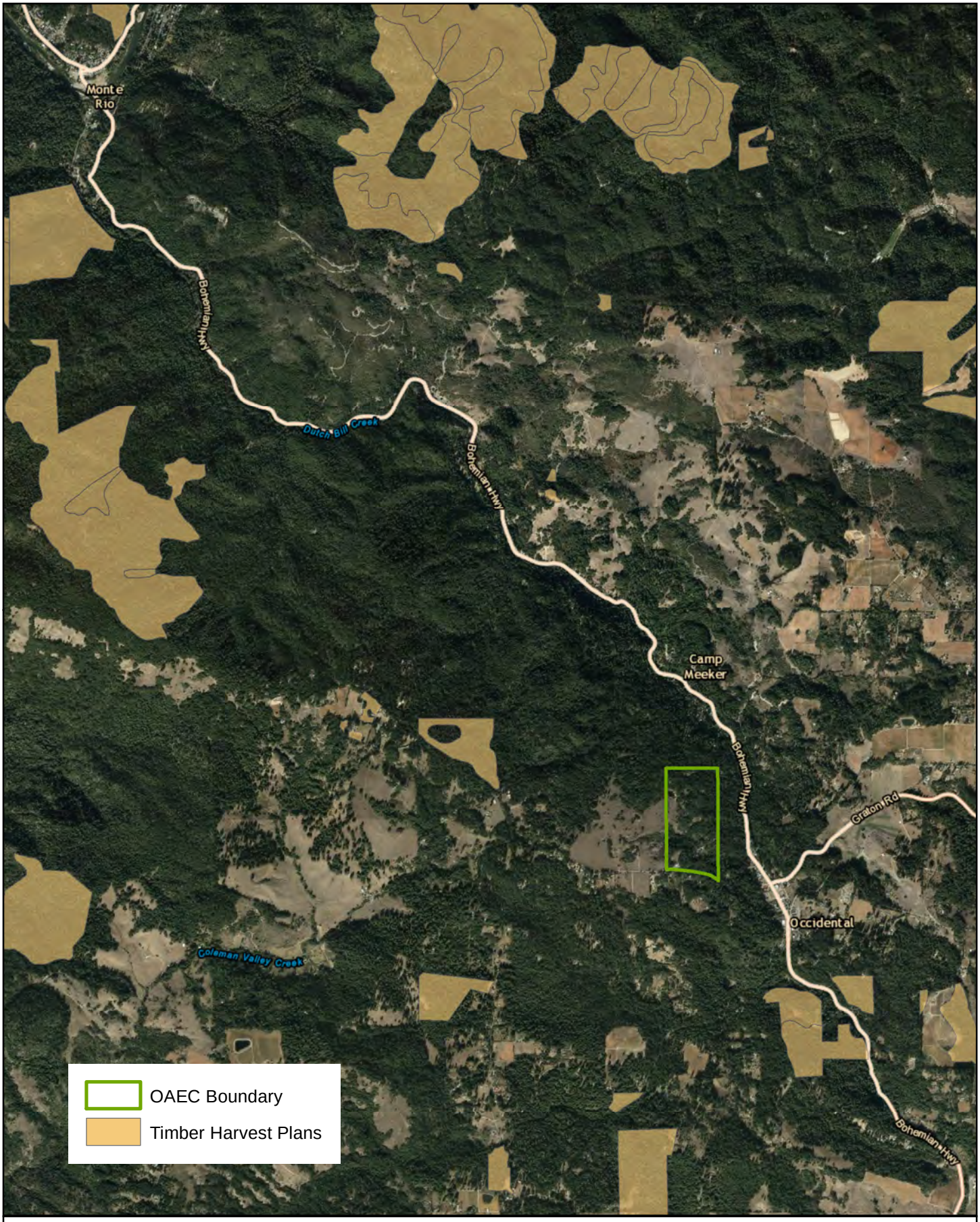

Figure 2. Timber Harvest Plans in Watershed Vicinity, 1997-2014

0 0.25 0.5 1 Miles

N

Sources
Aerial Imagery: ESRI
THPs: CalFire, ftp://ftp.fire.ca.gov/forest/
(See website for detailed information on each THP.)

Subwatersheds within the OAEC property are shown on Figure 3. All streams within the OAEC property are classified under the California Forest Practice Rules (FPRs) as Class II and III:

Class II waters: 1) fish always or seasonally present off-site within 1000 feet downstream and/or 2) aquatic habitat for non-fish aquatic species. Aquatic habitat indicators for Class II watercourses include free water, aquatic plants, water-dependent stages of aquatic insects and the physical condition of the channel and its position in the landscape.

Class III watercourses: do not have aquatic life present, and are capable of sediment transport to Class I and II waters under normal high water flow conditions.

With the exception of Calypso Creek, marked in Figure 3, all waterways at OAEC are classified as Class III. Calypso Creek is unique as it contains the presence of aquatic insects and seasonal amphibians; a yellow-legged frog (*Rana boylii*) was spotted on the western end of the creek. In addition, there is a year-round pool below the culverted road crossing that maintains water throughout the dry season, and is a favorite drinking hole for wildlife.

Figure 3. Subwatershed Map

0 125 250 500 Feet

N

Sources
Hillshade: Sonoma County 2013 LiDAR

5.2. Geology

A geology map shows the general area of surface rock or strata with certain structural features. The currently available geology map of the Camp Meeker USGS quadrangle does not show a lot of detail (see Figure 4). However, it is clear that the northeast quarter of the property shows up as historic landslide deposits. This may affect management for the area. For example, the building of roads, houses, septic and other uses would be limited. Fault lines do not appear in the immediate OAEC area, but that is not to say there may not be an un-mapped fault. For a good explanation of geologic maps see:
http://www.nature.nps.gov/geology/usgsnps/gmap/gmap1.html.

Remnants of marine sediment terraces of Wilson Grove have been found on the land. This is a fossil-rich formation of local interest to paleontologists. It is highly erodible on exposed slopes and slope stability is low near contact with bedrock.[4] Sand Dollar and clam fossils have been found on the land and the adjacent neighbors excavated rich layers of marine fossils during the creation of their pond just west of the Big Pond.

[4] Geology and Slope Stability of the West Sebastopol Study Area
ftp://ftp.consrv.ca.gov/pub/dmg/pubs/ofr/OFR_81-12/OFR_81-12_Text.pdf

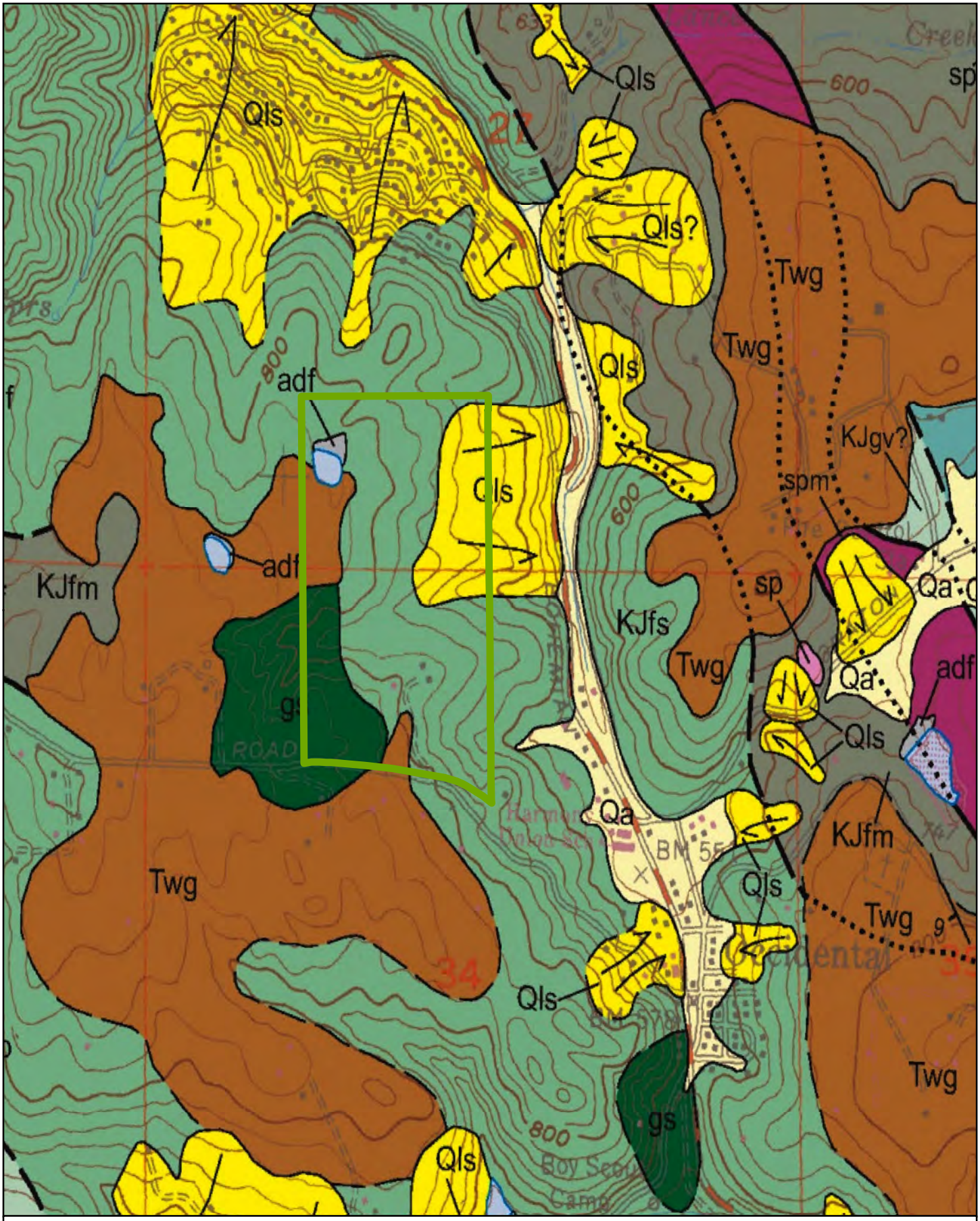

Figure 4. Geology

0 250 500 1,000 Feet

N

Sources
California Geologic Survey,
Preliminary Geologic Maps

Geology Map Legend:
KJfs (majority of area: light green) = **Franciscan graywacke and mélange (Late Cretaceous to Early Jurassic)** – Predominantly broken and locally sheared, massive to distinctly bedded, gray to green, brown- to orange-weathering, lithic wacke, and dark-gray shale. Also includes areas of mélange (see KJfm) not differentiated from the more coherent graywacke due to extensive forest cover, gradational contacts, and/or size relative to map scale.

Qls = Landslide deposits (historical to Pleistocene) – Arrows indicate direction of movement; queried where landslide existence is questionable.

Twg = Wilson Grove Formation (late Pliocene to late Miocene) – Light-gray to yellow-brown marine sandstone. The sandstone is fine- to medium-grained, well-sorted, massive or thick-bedded, and locally fossiliferous or tuffaceous. Well-rounded pebbles of chert and quartz occur in scattered stringers and lenses of pebbly sandstone. Tuffaceous lenses and more persistent beds vary from less than 1 cm to over 5 m thick. Thicker beds distinguishable at map scale (Tt) vary laterally and vertically from gray tuffaceous sandstone to white water-laid tuff and yellow to gray pumice breccia. Portions appear lithologically similar to the informally named Roblar tuff (Sarna-Wojcicki, 1992) that is found interbedded with the Wilson Grove and Petaluma formations farther west, and most reliably dated by Ar/Ar at 6.26 Ma (McLaughlin and others, 2008); however, definitive correlations within the study area remain to be established.

Gs = Greenstone – Variably altered basalt and other mafic volcanic rocks. Dark greenish-gray to black, weathered dark-brown to orange, predominantly massive, occasionally vesicular, or with pillow structure preserved.

5.3. Soils

Figure 5 shows soil typing on the property by what was formerly known as the Soil Conservation Service (SCS) and is now the Natural Resource Conservation Service (NRCS) under the U.S. Department of Agriculture (USDA). This soil typing provides a broad-brush interpretation for soil limitations and capabilities. Table 2 provides an abbreviated interpretation of these soil types. Note that a significant area of soils (RoG) was classified incorrectly in this map and has been re-interpreted in the table.

Soils (and geology) set the stage for how the land evolves and can be managed. The type of vegetation and rate of growth, erodibility, water holding capacity, carrying capacity of the land, engineering properties and more are all a function of soils. Soils, in conjunction with microclimate, slope, seed sources, etc. are the basis for informed decision making on the land. Is the soil grassland, wetland, redwood or hardwood

compatible? Is the texture too light or heavy for agriculture or water infiltration (such as a bio-swale or leach field)? Buildings and road placement are affected by the soil characteristics.

See http://websoilsurvey.nrcs.usda.gov/app/ for additional information.

Table 2. Soils & Site

Soil descriptions derived primarily from the 1972 Soil Survey of Sonoma County.

Soil & Slope	Acres	Annual Forage Pounds/ Acre (Dry)	Timber Site Index*	Erosion Hazard Potential **	Depth to Restrictive Layer	Historic or Typical Use	Available Water Capacity ***
Hugo-Josephine Complex (HnG), 50 to 75% slope	32		DF=150 RW = 150	High	12 to 40 inches	timber & range	3 to 5 inches
Laughlin loam (LgE), 2 - 30% slope	24	1,200 - 2,400	N/A	Low	20 to 36 inches	range, grazing, oak woodland	3 to 5.5 inches
~~**Rock Land**~~ (RoG) - Incorrectly typed in old survey; probably a mix of **LgE and HkF**	22	Currently supports conifer, hardwoods,grassland, agriculture, residential					
Hugo very gravelly loam (HkG), 50 - 75% slope	1.8		DF = 126 RW = 110	Moderate	30 to 60 inches	timber production	4 to 8 inches
Hugo very gravelly loam (HkF), 30 - 50% slope	0.7		DF=120-140 RW = 110	Low	30 to 60 inches	timber & hardwoods	4 to 8 inches
Total acres	80						

*Site index = the average height a tree grows in 100 years in a particular soil & climate. The site indexes for Douglas fir and Redwood listed in the Survey are equivalent to Site Class IV. However, Site index measured at OAEC resulted in Site 150 or III for DF & RW.

**CA Board of Forestry tech rule addendum #1 1990 method. Assumes good residual cover.

***Available water capacity = water held by soil which is available for plant use, expressed in inches of water per inch of soil depth.

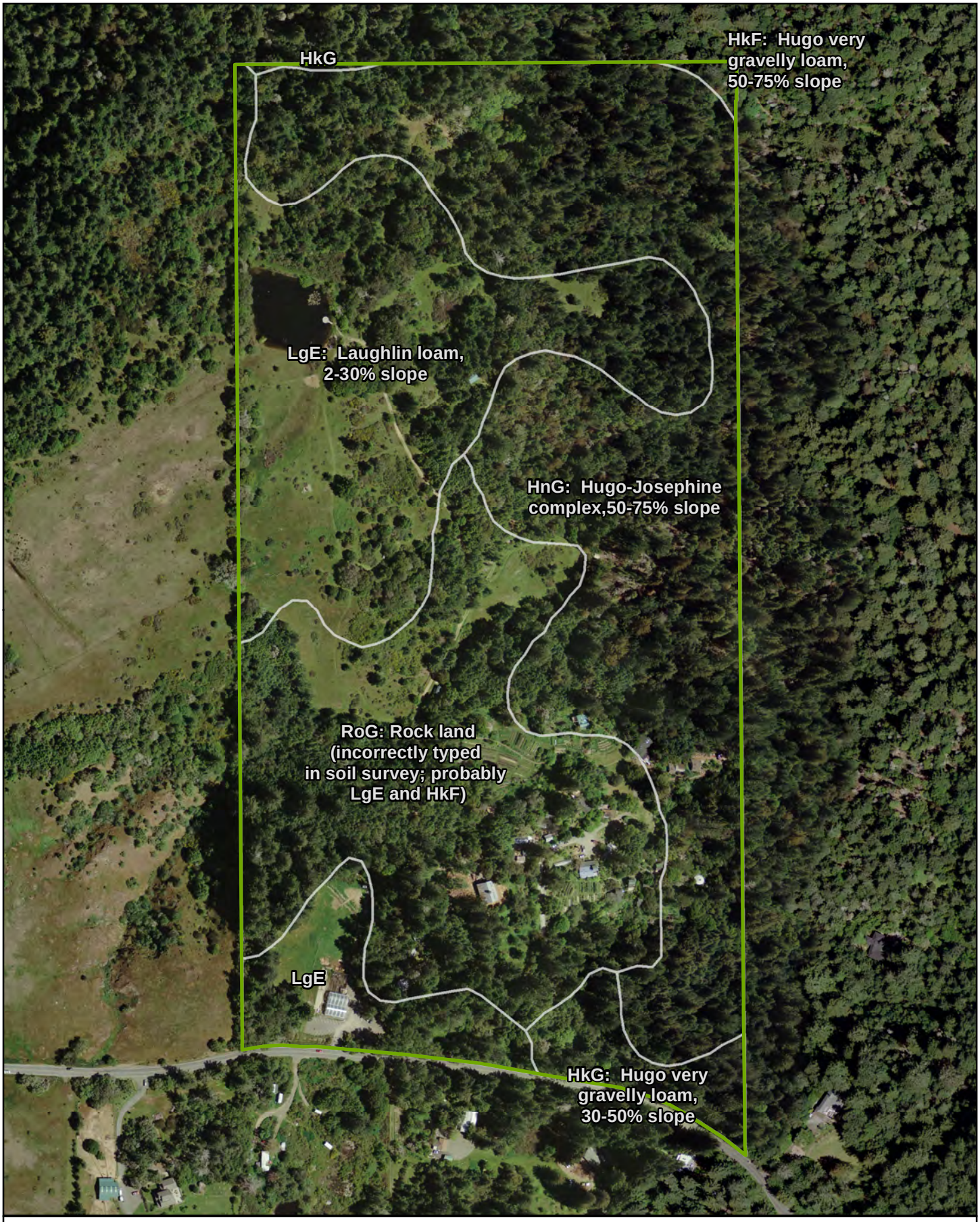

Figure 5. Soils

0 125 250 500 Feet

N

Sources
Aerial Imagery: ESRI
Soils: SSURGO

5.4. Plant and Animal Species

OAEC staff biologists have been documenting the flora, fauna, and funghi of OAEC for the last 20 years, and a comprehensive listing can be found in Table 3.1.

The California Natural Diversity Data Base (CNDDB) site administered by the California Department of Fish and Wildlife (CDFW) was queried to produce a map and report of rare, threatened, and endangered (RTE) plants and animals in the area. Figure 6 shows the general area of recorded occurrences, and a complete report is in the appendix. RTE plants and animals (and birds of prey) are protected by State and Federal regulations which are locally administered by the CDFW.

OAEC staff biologists have observed the following species on the property: Sonoma tree vole nest and babies seen nesting in Monterey pine (*Pinus radiata*) and Douglas fir (*Psuedotsuga menziesii*); Northern spotted owl seen in late summer, not nesting but foraging/feeding/roosting, and pellets have been observed; foothill yellow-legged frog in Calypso Creek; porcupine (*Erethizon dorsatum*) in Douglas fir along the Pond Road; a possible ringtail *(Bassariscus astutus)* sighting near the Core Area; and Western pond turtle in the pond.

In addition, merlin (*Falco columbarius*) and peregrine falcons (*Falco peregrinus*) used the land for hunting, and OAEC manages for neotropical migrant breeding birds such as pacific-slope (*Empidonax difficilis*) and ash-throated flycatcher (Myiarchus cinerascens), tree (*Tachycineta bicolor*), violet-green (*Tachycineta thalassina*) and barn swallows (*Hirundo rustica*), warbling vireo (*Vireo gilvus*), orange-crowned (*Vermivora celata*) and Wilson's warbler (*Wilsonia pusilla*), Western tanager (*Piranga ludoviciana*), and black-headed grosbeak (*Pheucticus melanocephalus*). None of these species are listed but are considered important species to manage.

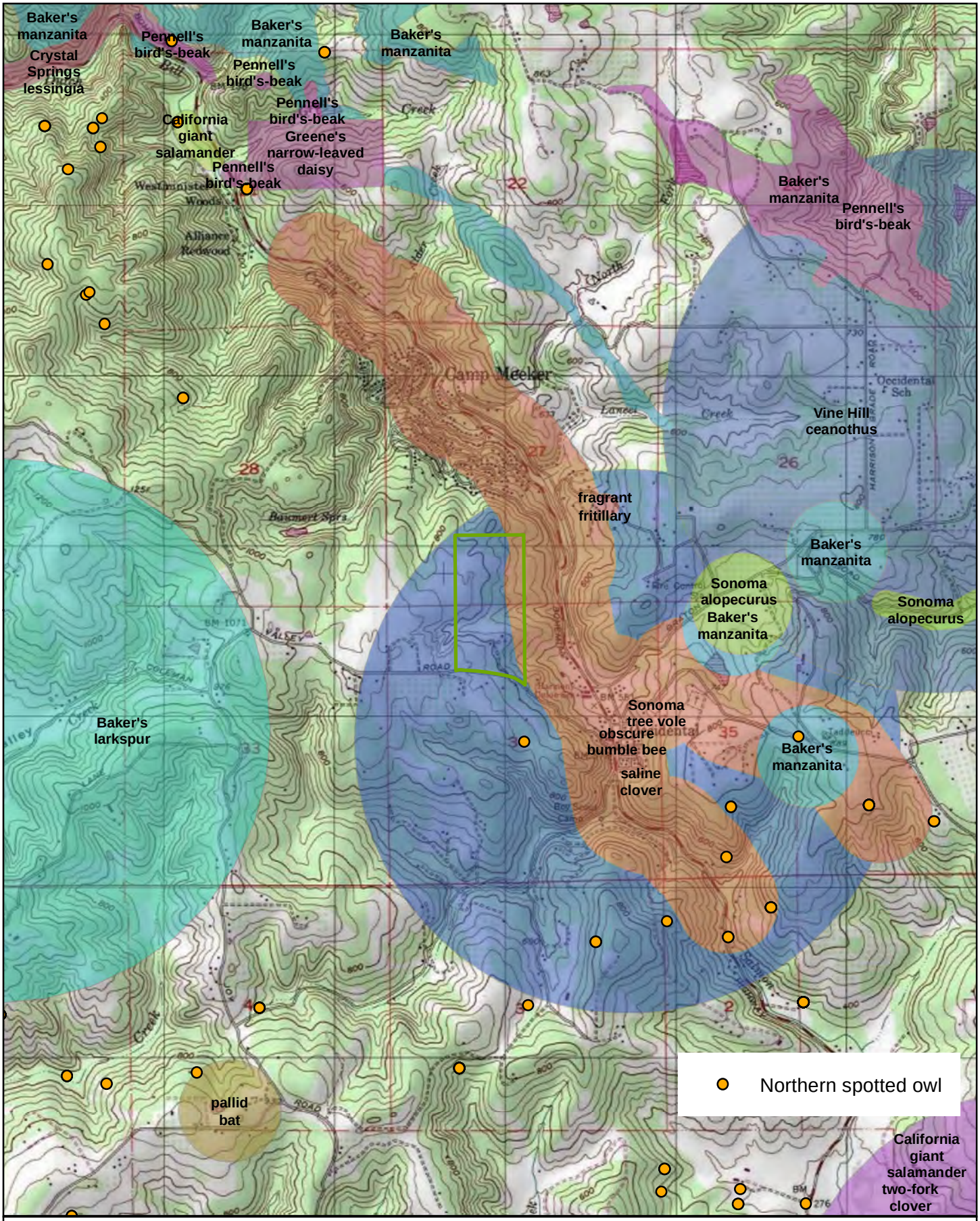

Figure 6. California Natural Diversity Database (CNDDB) Occurrences in the OAEC Vicinity

0 0.125 0.25 0.5 Miles

N

Sources
Aerial Imagery: ESRI
Occurrences: CNDDB 2015

The following plant list was developed by OAEC staff biologists. For special-status species, California Natural Diversity Database Rarity ranking is provided; see below for explanation of codes.[5]

Table 3. 1. Native Plants Observed at OAEC

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
FERNS & FERN ALLIES		
Blechnaceae: Deer Fern Family		
	Woodwardia fimbriata	Giant Chain Fern
Dennstaedtiaceae: Bracken Fern		
	Pteridium aquilinum	Bracken Fern
Dryopteridaceae: Wood Fern Family		
	Athyrium filix-femina	Lady Fern
	Dryopteris argutanitum	Wood Fern
	Polystichum muitum	Western Sword Fern
Polypodiaceae: Polypody Family		
	Polypodium californicum	California Polypody
Pteridaceae: Brake Family		
	Adiantum jordanii	California Maiden-Hair
	Pellaea andromedifolia	Coffee Fern
	Pentagramma triangularis	Goldback Fern
Isotaceae: Quillwort Family		
	Isoetes sp? Nuttallii?	
Selaginellaceae: Spike-Moss Family		
	Selaginella bigelovii	Bushy Spikemoss
GYMNOPSPERMS		
Pinaceae: Pine Family		
	Pseudotsuga menziesii	Douglas-Fir

[5] CNDDB Rank and Status
Global Rank: G2 = 1,000 to 3,000 individuals or 2,000 to 10,000 acres; G5T2 refers to subspecies
State Rank: S2 = 1,000 to 3,000 individuals or 2,000 to 10,000 acres; S2.2 = threatened
CNPS List 1B.2 = rare, threatened or endangered in CA & elsewhere; fairly threatened in CA

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
Taxodiaceae: Bald Cypress Family		
	Sequoia sempervirens	Coastal Redwood
ANGIOSPERMS: DICOTS		
Aceraceae: Maple Family		
	Acer macrophyllum	Big-Leaf Maple
	Acer negundo	Box Elder
Anacardiaceae: Sumac Family		
	Toxicodendron diversilobum	Western Poison Oak
Apiaceae: Carrot Family		
	Angelica tomentosa	Angelica
	Lomatium(utriculatum) or (carulifolium)?	
	Osmorhiza chilensis	Sweet Cicely
	Perideridia kelloggii	Pepper Grass
	Perideridia gairdneri	Yampah
	Sanicula sp?	
Apocynaceae: Dogbane or Indian Hemp Family		
	Apocynum cannabinum	Dogbane
Aristolochiaceae		
	Aristolochia californica	Dutchman's Pipe
	Asarum caudatum	Wild Ginger
Asteraceae: Sunflower Family		
	Achilla millefolium (native?)	Yarrow
	Agoseris grandiflora	Grand Mountain Dandelion
	Anaphalis margaritacea	Pearly Everlasting
	Aster radulinus	Broad-leaved Aster
	Baccharis pilularis	Coyote Brush
	Calycadenia multiglandulosa	Sticky Rosin Weed
	Eriophyllum sp.(lanatum?)	
	Eryngium armatum	Coyote Thistle
	Gnaphalium purpureum	American Cudweed
	Grindelia hirsutula	Gum Plant
	Helianthella californica??	California Helianthella
	Lessingia spp.?	
	Madia madiodes	Woodland Tarweed
	Madia sativa	Coast Tarweed
	Psilocarphus tenellus	Woolly Marbles
	Wyethia angustifolia	Narrow Leaved Mule Ears

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
	Wyethia glabra	Green or Coast Mule Ears
Berberidaceae: Barberry Family		
	Vancouveria planipetala	Inside-Out Flower
Betulaceae: Birch Family		
	Corylus cornuta	California Hazelnut
Boraginaceae: Borage Family		
	Cynoglossum grande	Hound's Tongue
Brassicaceae: Mustard Family		
	Cardamine californica	Milk Maids, Toothwort
	Cardamine oligosperma	Bitter-Cress
Calycanthaceae	Straw-Shrub Family	
	Calycanthus occidentalis	Spicebush
Caprifoliaceae: Honeysuckle Family		
	Lonicera hispidula	Honeysuckle
	Symphoricarpos albus	Snowberry
	Sambucus cerulea	Blue Elderberry
Caryophyllaceae: Pink Family		
	Silene californica	Indian Pink
	Silene gallica (European exotic)	Windmill Pink
Convolvulaceae: Morning Glory Family		
	Calystegia subacaulis or ?	Hill Morning Glory
Crassulaceae: Stonecrop Family		
	Crassula sp.?	
	Dudleya farinose	Bluff Lettuce
	Sedum spathulifolium	Stonecrop
Cucurbitaceae: Gourd Family		
	Marah fabaceus	California Man Root
Ericaeae: Heath Family		
	Arbutus menziesii	Pacific Madrone
	Arctostaphyllos manzanita	Common Manzanita
	Vaccinium ovatum	California Huckleberry
Euphorbiaceae	Spurge Family	
	Eremocarpus setigerus	Turkey Mullein/Dove Weed
Fabaceae: Legume Family		
	Astragalus gambelianus ?	
	Lathrus sp.	Wild Pea
	Lathyrus vestitus or jepsonii	
	Lotus micranthus	Desert Deervetch
	Lotus purshianus	Spanish Clover

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
	Lotus scoparius	California Broom
	Lupinus albifrons (?) Large perennial	*Silver Lupine*
	Lupinus varicolor	Many-colored Lupine
	Lupinus bicolor	Miniature Lupine
	Thermopsis macrophylla	Golden Pea, False-Lupine
	Triflolium bifidum	Pinole Clover
	Triflolium microcephalum	Maiden Clover
	Trifolium willdenovii	Tomcat Clover
	Rupertia physodes	California Tea
	Vicia sp?	
Fagaceae: Oak Family		
	Notholithocarpus densiflorus	Tan Oak
	Quercus agrifolia	Coast Live Oak
	Quercus wislizenii	Interior Live Oak
	Quercus kelloggii	Black Oak
	Quercus garyana	Oregon Oak
	Q. kelloggii X Q. wislizenii	Oracle Oak Hybrid
Hippocastanaceae: Buckeye Family		
	Aesculus californica	California Buckeye
Hydrophyllaceae: Waterleaf Family		
	Nemophila menziesii	Baby Blue Eyes
	Nemophila parviflora	Small-Flowered Nemophila
	Phacelia nemoralis ?	Shade Phacelia
Lamiaceae: Mint Family		
	Monardella villosa	Coyote-Mint
	Prunella vulgaris	Self-Heal
	Satureja douglasii	Yerba Buena
	Stachys ajugoides	Hedge Nettle
Lauraceae: Laurel Family		
	Umbellularia californica	California Bay, California laurel,
Malvaceae: Mallow Family		
	Sidalcea malviflora	Checker Mallow
	???	ssp purpurea is G5T2, S2.2,1B.2
Oleaceae: Olive Family		
	Fraxinus latifolia	Oregon Ash
Onagraceae: Evening Primrose Family		
	Camissonia ovate	Sun Cup

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
	Clarkia concinna	Red Ribbons
Oxalidaceae: Oxalis Family		
	Oxalis oregano	Redwood Sorrel
Papaveraceae: Poppy Family		
	Dicentra Formosa	Bleeding Heart
	Eschscholzia californica	California Poppy
Philadelphaceae: Mock Orange Family		
	Whipplea modesta	Yerba de Selva, Modesty
Polygalaceae: Milkwort Family		
	Polygala californica	California Milkwort
Polygonaceae: Buckwheat Family		
	Eriogonum nudum	Naked Buckwheat
	Rumex sp.	
Portulacaceae		
	Claytonia perfoliata	Miner's Lettuce
Primulaceae: Primrose Family		
	Dodecatheon hendersonii	Shooting Star
	Trientalis latifolia	Starflower
Ranunculaceae: Buttercup Family		
	Aquilegia Formosa	Columbine
	Delphinium nudicaule	Red Larkspur
	Ranunculus californicus	Buttercup
Rhamnaceae: Buckthorn Family		
	Ceanothus thyrsiflorus	Blue Blossom
	Rhamnus californica	California Coffeeberry
Rosaceae: Rose Family		
	Crataegus douglasii	Hawthorne
	Fragaria vesca	Wood Strawberry
	Heteromeles arbutifolia	Toyon
	Holodiscus discolor	Ocean Spray
	Physocarpus capitatus	Ninebark
	Rosa californica	Wild Rose
	Rosa gymnocarpa	Wood Rose
	Rubus parviflorus	Thimbleberry
	Rubus ursinus	California Blackberry
Rubiaceae: Madder Family		
	Galium sp.	Bedstraw
	Galium porrigens	Climbing Bedstraw
Salicaceae: Willow Family		

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
	Salix scoulerana	Scouler's Willow
	Salix exigua	Sandbar Willow
	Salix lasiolepis	Arroyo Willow
Saxifragaceae: Saxifrage Family		
	Heuchera sp?	
	Lithophragma affine	Woodland Star
	Lithophragma heterophyllum	Hillside Star
Scrophulariaceae: Figwort Family		
	Castilleja exserta	Purple owl's Clover
	Castilleja sp.	Yellow owl's clover
	Collinsia sparsiflora or tinctoria?	
	Mimulus aurantiacus	Sticky Monkeyflower
	Mimulus guttatus	Large Monkeyflower
	Pedicularis densiflora	Indian Warrior
	Scrophularia californica	California Figwort
	Triphysaria versicolor versicolor	
Urticaceae		
	Urtica diotica	Stinging Nettle
Valerianaceae		
	Plectritis sp. (2 species? round vs pointy)	
Violaceae: Violet Family		
	Viola sempervirens	Redwood Violet
	MONOCOTS	
Cyperaceae: Sedge Family		
	Carex sp. Several unidentified species	
	Eleocharis macrostachya	Spikerush
	Schoenoplectus spp.?	Tule
Iridaceae: Iris Family		
	Iris douglasiana	Douglas Iris
	Sisyrinchium bellum	Blue-Eyed Grass
Juncaceae: Rush Family		
	Juncus bufonius	Toad Rush
	Juncus occidentalis	Western Rush
	Juncus patens	Spreading Rush
	Juncus phaeocephalus	Brown-Headed Rush
	Luzula comosa	Wood Rush
Liliaceae: Lily Family		

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
	Brodiaea elegans	Harvest Brodiaea
	Brodiaea terrestris	Ground Brodiaea
	Calochortus luteus	Yellow Mariposa Lily
	Chlorogalum pomeridianum	Soap Root, Amole
	Clintonia andrewsiana.	Andrews Clintonia
	Dichelostemma capitatum	Blue Dicks
	Disporum hookeri	Hooker's Fairy Bell
	Fritillaria affinis	Checker Lily
	Scoliopus bigelovii	Fetid Adders Tongue, Slink Pod
	Smilacina stellate	False Solomon's Seal
	Trillium ovatum	White or Western Trillium
	Triteleia hyacinthine	White Brodiaea
	Triteleia laxa	Ithuriel's Spear
Orchidaceae: Orchid Family		
	Calypso bulbosa	Calypso Orchid
	Corallorhiza maculate	Spotted Coral Root Orchid
	Piperia transversa	Rein Orchid
	Piperia elegans	
Poaceae: Grass Family		
	Agrostis???	look for blasdalei, G2,S2,1B.2
	Bromus carinatus	California Brome
	Bromus laevipes	Sitka brome
	Danthonia californica	California Oatgrass
	Deschampsia cespitosa holciformis	Pacific Hairgrass
	Elymus glaucus	Blue Wildrye
	Festuca californica	California Fescue
	Festuca idahoensis	Idaho Fescue
	Festuca occidentalis	Western Fescue
	Festuca rubra	Red Fescue
	Hierochloe occidentalis	Vanilla Grass
	Hordeum brachyantherum	Meadow Barley
	Koeleria macrantha	Junegrass
	Melica californica	California Melic
	Melica harfordii	Harford's Melic
	Melica torreyana	Torrey's Melic
	Stipa lepida	Foothill Needlegrass
	Stipa pulchra	Purple Needlegrass

FAMILY	LATIN NAME	COMMON NAME and rarity status/ranking
	Trisetum canescens	Tall Trisetum
Typhaceae: Cattail Family		
	Typha sp? (latifolia?)	Cattail

Table 3. 2. Non-Native Plants Observed at OAEC

Level of invasiveness represented by San Francisco Bay Regional Water Quality Control Board Tiers: 1 = Highly invasive; 2 = moderately invasive; 3 = relatively unaggressive.

LATIN NAME	COMMON NAME	TIER
Anagallis arvensis	Scarlet pimpernel	
Andropogon virginicus	Broomsedge	
Avena barbata	Wild oats	2
Brachypodium distacyon		
Brassica nigra	Wild mustard	
Briza maxima	Rattlesnake grass	
Briza minor		
Bromus catharticus		
Bromus diandrus	Ripgut brome	2
Bromus hordeaceus	Softchess	2
Carduus pychnocephalus		
Cirsium vulgare		
Conium maculatum		
Cotoneaster sp.	Cotoneaster	
Cynodon dactylon		
Cynosurus echinatus	Hedgehog dogtail	
Cytisus scoparius	Scotch broom	1
Daucus carota	Wild carrot	
Erhardta erecta		
Erodium botrys	Wild geranium	
Festuca arundinaceae	Tall fescue	
Filago gallica	Filaree	
Galium aparine	Cleaver	
Genista monspessulana	French broom	1
Geranium dissectum	Wild geranium	
Holcus lanatus	Purple velvet grass	2
Hordeum marinum	Sea barley	
Hordeum murinum	Wall barley	
Hypochaeris radicata	False dandelion	2

LATIN NAME	COMMON NAME	TIER
Lactuca seriola	Wild lettuce	
Leontodon taraxacoides		
Linum bienne	European flax	
Lolium multiflorum (Festuca perenis)	Rye grass	
Lotus (Acmispon) corniculatus		
Lythrum hyssopifolium(perhaps not salicaria?)		
Lythrum salicaria	Purple loosestrife	1
Medicago polymorpha		
Mentha pulegium		
Phalaris aquatica		
Picris (Helmenthotheca) echiodes		
Plantago lanceolata	Narrowleaf plantain	3
Polypogon monspeliensis	Rabbitsfoot grass	
Ranunculus muricatus		
Rubus armeniacus	Himalayan blackberry	1
Silene galica		
Silybum marianum		
Soliva sessalis		
Sonchus asper		
Torilis arvensis		
Trifolium dubium		
Trifolium subterraneum		
Vicia sativa	Vetch	
Vulpia (Festuca) bromoides		
Watsonia spp.?	Bugle lily	

Table 4. Vertebrate Species of OAEC

* Indicates that species has not been positively sighted to date, but is expected to occur. The remainder on the list of animals were actually sighted by Brock Dolman from 7/31/94 to 2015. California Natural Diversity Database (CNDDB) status and rank are listed in right tabs and defined below.[6]

KINGDOM: ANIMALIA PHYLUM: CHORDATA SUBPHYLUM: VERTEBRATA

CLASS: AMPHIBIA
- ORDER: CAUDATA (Salamanders)
  - FAMILY: DICAMPTODONTIDAE (Mole Salamanders and Relatives)
  - California Giant Salamander (*Dicamptodon ensatus*)
  - FAMILY: SALAMANDRIDAE (Newts)
  - California Newt (*Taricha torosa*)
  - FAMILY: PLETHODONITDAE (Lungless Salamanders)
  - Ensatina (*Ensatina eschscholtzi*)
  - California Slender Salamander (*Batrachoseps attenuatus*)
  - Arboreal Salamander (*Aneides lugubris)*
  - Black Salamander (*Aneides flavipunctatus*)
- ORDER: SALIENTIA (Frogs and Toads)
  - FAMILY: HYLIDAE (Treefrogs and Relatives)
  - Pacific Chorus Frog (*Pseudacris regilla*)
  - FAMILY: RANIDAE (True Frogs)
  - Bullfrog (*Rana catesbeiana*) Non-native
  - Foothill Yellow-Legged Frog (*Rana boylii)* G_3S_3 SSC

CLASS: REPTILIA
- ORDER: TESTUDINES (Turtles)
  - FAMILY: EMYDIDAE (Pond and Marsh Turtles)
  - Western Pond Turtle (*Emys marmorata*)
  - Pond Slider (*Trachemys scripta*) Non-native
- ORDER: SQUAMATA (Lizards and Snakes)

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[6] CNDDB Rank and Status
Global Rank: G_3 = 3,000-10,000 individuals OR 10,000-50,000 acres; G_5 = Population demonstrably secure to ineradicable due to being commonly found in the world.
State Rank: S_3 = 3,000-10,000 individuals OR 10,000-50,000 acres; S_4 = There is some threat, or somewhat narrow habitat
SSC Ca. Dept. Fish & Wildlife species of special concern
WL Ca. Dept. Fish & Wildlife watch list

SUBORDER: SAURIA (Lizards)
FAMILY: IGUANIDAE (Iguanids)
Northwestern Fence Lizard (*Sceloporus occidentalis occidentalis*)
FAMILY: SCINCIDAE (Skinks)
Western Skink (*Eumeces skiltonianus skiltonianus*)
FAMILY: ANGUIDAE (Alligator Lizards and Relatives)
Northern Alligator Lizard (*Gerrhonotus coeruleus*) Sub-species ??
*Southern Alligator Lizard (*Gerrhonotus multicarinatus multicarinatus*)
SUBORDER: SERPENTES (Snakes)
FAMILY: BOIDAE (Boas)
Rubber Boa (*Charina bottae bottae*)
FAMILY: COLUBRIDAE (Colubrids)
Pacific Gopher Snake (*Pituophis melanoleucus catenifer*)
Western Terrestrial Coast Garter Snake (*Thamnophis elegens terrestris*)
Western Aquatic Garter Snake (*Thamnophis couchi aquaticus*)
California Red-sided Garter snake (*Thamnophis sirtalis infernalis*)
Western Yellow-bellied Racer (*Coluber constrictor mormon*)
Pacific Ringneck Snake (*Diadophis punctatus amabalis*)
Sharp-Tailed Snake (*Contia tenuis*)

CLASS: AVES
ORDER: PODICIPEDIFORMES
FAMILY: PODICIPEDIDAE
Pied-billed Grebe (*Podilymbus podicpes)*
ORDER: PELECANIFORMES
FAMILY:PELECANIDAE (Pelicans)
American White Pelican (*Pelecanus erythrorhynchos*)
FAMILY: PHALACROCORACIDAE (Cormorants)
Double-crested Cormorant (*Phalacrocorax auritus*)
ORDER: CICONIIFORMES (Herons, Storks, Ibises, and Relatives)
FAMILY: ARDEIDAE (Herons and Bitterns)
Great Blue Heron (*Ardea herodias*) G_5 S_4
Great Egret (*Ardea albus*)
Green-backed Heron (*Butorides striatus*)
Black-crowned Night-Heron (*Nycticorax nycticorax*)
ORDER: ANSERIFORMES (Screamers, *Ducks*, and Relatives)
FAMILY: ANATIDAE (Swans, Geese, Ducks)
Canada Goose (*Branta canadensis*)
Mallard (Anas platyrhynchos)
Common Goldeneye (*Bucephala clangula*)
Bufflehead (Bucephala albeola)

Green-wing Teal (*Anas crecca*)
Wood Duck (*Aix sponsa)*
Hooded Merganser (*Lophodytes cucullatus*)
Ring-Necked Duck (*Aythya collaris*)
American Wigeon (*Anas Americana)*
Gadwall (*Anas strepera*)

ORDER: GRUIFORMES (Cranes, Rails, and Relatives)
FAMILY: RALLIDAE
American Coot (*Fulica americana)*
FAMILY: CHARADRIIDAE
Killdeer *(Charadrius vociferus*)
FAMILY: SCOLOPACIDAE
Common Snipe (*Gallinago gallinago*)
Red-Necked Phalarope (*Phalaropus lobatus)*
FAMILY: LARIDAE (Gulls and Terns)
Western Gull (*Larus occidentalis*)

ORDER: FALCONIFORMES (Vultures, Hawks, and Falcons)
FAMILY: CATHARTIDAE (American Vultures)
Turkey Vulture (*Cathartes aura*)
FAMILY: ACCIPITRIDAE (Hawks, Old World Vultures, and Harriers)
White-tailed Kite (*Elanus leucurus*)
Sharp-shinned Hawk (*Accipiter striatus*)
Cooper's Hawk (*Accipiter cooperii*)
Red-shouldered Hawk (*Buteo lineatus*)
Red-tailed Hawk (*Buteo jamaicensis*)
Golden Eagle (*Aquila chrysaetos*)
Bald Eagle (Haliaeetus leucocephalus)
Osprey (*Pandion haliaetus*) G_5 S_3 WL
FAMILY: FALCONIDAE (Caracaras and Falcons)
Merlin (*Falco columbarius*)
Peregrine Falcon (*Falco peregrinus*)
American Kestrel (*Falco sparverius)*

ORDER: GALLIFORMES (Megapodes, Currassows, Pheasants)
FAMILY: PHASIANIDAE (Quails, Pheasants, and Relatives)
Wild Turkey (*Meleagris gallopavo*)
California Quail (*Callipepla californica*)

ORDER: COLUMBIFORMES (Pigeons and Doves)
FAMILY: COLUMBIDAE (Pigeons and Doves)
Band-tailed Pigeon (*Columba fasciata*)
Mourning Dove (*Zenaida macroura*)

ORDER: STRIGIFORMES (Owls)
FAMILY: TYTONIDAE (Barn Owls)

Barn-Owl (*Tyto alba*)
FAMILY: STRIGIDAE (Typical Owls)
Western Screech-Owl (*Otus kennicotti*)
Great Horned Owl (*Bubo virginianus*)
Northern Pygmy-Owl (*Glaucidium gnoma*)
Northern Saw-whet owl (*Aegolius acadicus*)
Northern Spotted Owl (*Strix occidentalis occidentalis*) G_3, S_2, S_3
ORDER: CAPRIMULGIFORMES (Poorwills)
FAMILY: CAPRIMULGIDAE
Poor-Will (*Phalaenoptilus nuttallii*)
ORDER: APODIFORMES (Swifts and Hummingbirds)
FAMILY: APODIDAE (Swifts)
Vaux's Swift (*Chaetura vauxi*)
FAMILY: TROCHILIDAE (Hummingbirds)
Anna's Hummingbird (*Calypte anna*)
Allen's Hummingbird (*Selasphorus sasin*)
Rufous Hummingbird (*Selasphorus rufus*)
ORDER: CORACIIFORMES (Kingfishers and Relatives)
FAMILY: ALCEDINIDAE (Kingfishers)
Belted Kingfisher (*Ceryle alcyon*)
ORDER: PICIFORMES (Woodpeckers and Relatives)
FAMILY: PICIDAE (Woodpeckers and Wrynecks)
Acorn Woodpecker (*Melanerpes formicivorous*)
Red-breasted Sapsucker (*Sphyrapicus ruber*)
Red-naped Sapsucker (*Sphyrapicus nuchalis*)
Hairy Woodpecker (*Picoides villosus*)
Downy Woodpecker (*Picoides pubescens*)
Nuttall's Woodpecker (*Picoides nuttallii)*
Northern Flicker (*Colaptes auratus*)
Pileated Woodpecker (*Dryocopus pileatus*)
ORDER: PASSERIFORMES (Perching Birds)
FAMILY: TYRANNIDAE (Tyrant Flycatchers)
Ash-throated Flycatcher (Myiarchus cinerascens)
Olive-Sided Flycatcher (*Contopus borealis*)
Western Wood-Pewee (*Contopus sordidulus*)
Pacific-slope Flycatcher (*Empidonax difficilis*)
Black Phoebe (*Sayornis nigricans*)
FAMILY: HIRUNDINIDAE (Swallows)
Tree Swallow (Tachycineta bicolor)
Violet-green Swallow (*Tachycineta thalassina*)
Cliff Swallow (*Hirundo pyrrhonota*)
Barn Swallow (*Hirundo rustica*)
FAMILY: CORVIDAE (Jays, Magpies, and Crows)

Steller's Jay (*Cyanocitta stelleri*)
Western Scrub-Jay (*Aphelocoma californica*)
American Crow (*Corvus brachyrhynchos*)
Common Raven (*Corvus corax*)
FAMILY: PARIDAE (Titmice)
Chestnut-backed Chickadee (*Parus rufescens*)
Oak Titmouse (*Parus inornatus*)
FAMILY: AEGITHALIDAE (Bushtit)
Bushtit (Psaltriparus minimus)
FAMILY: SITTIDAE (Nuthatches)
Red-breasted Nuthatch (*Sitta canadensis*)
Pygmy Nuthatch (*Sitta pygmaea*)
FAMILY: CERTHIIDAE (Creepers)
Brown Creeper (*Certhia americana*)
FAMILY: TROGLODYTIDAE (Wrens)
Bewick's Wren (*Thryomanes bewickii*)
Pacific Wren (Troglodytes pacificus)
FAMILY: MUSCICAPIDAE (Kinglets, Bluebirds, Thrushes and Wrentit)
Golden-crowned Kinglet (*Regulus satrapa*)
Ruby-crowned Kinglet (*Regulus calendula*)
Western Bluebird (*Sialia mexicana*)
American Robin (*Turdus migratorius*)
Hermit Thrush (*Catharus guttatus*)
Swainson's Thrush (*Catharus ustulatus*)
Varied Thrush (*Ixoreus naevius*)
Wrentit (Chamaea fasciata)
FAMILY: MIMIDAE (Mimic Thrushes)
Northern Mockingbird (*Mimus polyglottos*)
FAMILY: BOMBYCILLIDAE (Waxwings)
Cedar Waxwing (*Bombycilla cedrorum*)
FAMILY: STURNIDAE (Starlings)
European Starling (*Sturnus vulgaris*) Non-native
FAMILY: VIREONIDAE (Typical Vireos)
Hutton's Vireo (*Vireo huttoni*)
Warbling Vireo (*Vireo gilvus*)
Cassin's Vireo (*Verio cassinii)*
FAMILY: EMBERIZIDAE (Wood Warblers, Sparrows, Blackbirds, etc.)
Orange-crowned Warbler (*Vermivora celata*)
Yellow-rumped Warbler (*Dendroica coronata*)
Townsend's Warbler (*Dendroica townsendi*)
Hermit Warbler (Dendroica occidentalis)
Common Yellowthroat (*Geothlypis trichas*)
Wilson's Warbler (*Wilsonia pusilla*)

MacGillivray's Warbler (*Oporornis tolmiei*)
Western Tanager (*Piranga ludoviciana*)
Black-headed Grosbeak (*Pheucticus melanocephalus*)
Spotted Towhee (*Pipilo maculatus*)
California Towhee (*Pipilo crissalis*)
Fox Sparrow (*Passerella iliaca*)
Song Sparrow (*Melospiza melodia*)
Lincoln's Sparrow (*Melospiza lincolnii*)
Golden-crowned Sparrow (*Zonotrichia atricapilla*)
White-crowned Sparrow (*Zonotrichia leucophrys*)
White-throated Sparrow (*Zonotrichia albicollis*)
Dark-eyed Junco (*Junco hyemalis*)
Western Meadowlark (*Sturnella neglecta*)
Red Wing Blackbird (*Agelaius phoeniceus*)
Brewer's Blackbird (Euphagus cyanocephalus)
Brown-headed Cowbird (*Molothrus ater)*
FAMILY: FRINGILLIDAE (Finches)
Pine Siskin (*Carduelis pinus*)
American Goldfinch (*Carduelis tristis*)
Lesser Goldfinch (*Carduelis psaltria*)
Red Crossbill (Loxia curvirostra)
Purple Finch (Carpodacus purpureus)
House Finch (Haemorhous mexicanus)

CLASS: MAMMALIA
ORDER: MARSUPIALIA (Opossums, Kangaroos, and Relatives)
FAMILY: DIDELPHIDAE (Opossums)
Virginia Opossum (*Didelphis virginiana*) Non-native
ORDER: INSECTIVORA (Shrews and Moles)
FAMILY: SORICIDAE (Shrews)
*Vagrant Shrew (*Sorex vagrans*)
*Pacific Shrew (*Sorex pacificus*)
*Ornate Shrew (*Sorex ornatus*)
*Trowbridge's Shrew (*Sorex trowbridgii*)
FAMILY: TALPIDAE (Moles)
Shrew-Mole (Neurotrichus gibbsii)
Broad-footed Mole (*Scapanus latimanus*)
*Coast Mole (*Scapanus orarius*)
ORDER: CHIROPTERA (Bats)
FAMILY: VESPERTILIONIDAE (Vespertilionid Bats)
*Little Brown Myotis (*Myotis lucifugus*)
Yuma Myotis (*Myotis yumanensis*)
*Long-eared Myotis (*Myotis evotis*)

*Fringed Myotis (*Myotis thysanodes*)
*Long-legged Myotis (*Myotis volans*)
*California Myotis (*Myotis californicus*)
*Western Pipistrelle (*Pipistrellus hesperus*)
*Big Brown Bat (*Eptesicus fuscus*)
*Silver-haired Bat (*Lasionycteris noctivagans*)
*Red Bat *(Lasiurus borealis*)
*Hoary Bat (*Lasiurus cinereus*) G_5 S_4?
*Townsend's Big-eared Bat (*Plecotus townsendii*)
*Pallid Bat (*Antrozous pallidus*) G_5 S_3 SSC
FAMILY: MOLOSSIDAE (Free-tailed Bat)
*Brasilian Free-tailed Bat or Guano Bat (*Tadarida brasiliensis*)
ORDER: LAGOMORPHA (Rabbits, Hares, and Pikas)
FAMILY: LEPORTIDAE (Rabbits and Hares)
Brush Rabbit (Sylvilagus bachmani)
*Audubon's Cottontail (*Sylvilagus audubonii*)
Black-tailed Hare (*Lepus californicus*)
ORDER: RODENTIA (Squirrels, Rats, Mice, and Relatives)
FAMILY: ERETHIZONTIDAE
Porcupine (Erethizon dorsatum)
FAMILY: SCIURIDAE (Squirrels, Chipmunks, and Marmots)
Western Gray Squirrel (*Sciurus griseus*)
Douglas Squirrel (Tamiasciurus douglasii)
Redwood Chipmunk (*Tamais ochrogenys)*
FAMILY: GEOMYIDAE (Pocket Gophers)
Botta's Pocket Gopher (*Thomomys bottae*)
FAMILY: CRICETIDAE (Deer Mice and Relatives)
*Western Harvest Mouse (*Reithrodontomys megalotis*)
*Deer Mouse (Peromyscus maniculatus)
*Brush Mouse (*Peromyscus boylii*)
Dusky-footed Woodrat (*Neotoma fuscipes*)
Black Rat (*Rattus rattus*) Non-native
FAMILY: ARVICOLIDAE (Voles and Allies)
California Vole (Microtus californicus)
Sonoma Tree Vole (*Arborimus pomo*) G_3 S_3 SSC
ORDER: CARNIVORA (Carnivores)
FAMILY: URSIDAE (Bears)
Black Bear (Ursus americanus)
FAMILY: CANIDAE (Foxes, Wolves, and Relatives)
Coyote (Canis latrans)
Gray Fox (Urocyon cinereoargenteus)
FAMILY: PROCYONIDAE (Raccoons and Relatives)
Raccoon (Procyon lotor)

Ringtail *(Bassariscus astutus)* unconfirmed sighting
FAMILY: Mephitidae (Skunks)
Striped Skunk (*Mephitis mephitis)*
FAMILY: MUSTELIDAE (Weasels, Badgers, and Relatives)
Long-tailed Weasel *(Mustela frenata*)
American Badger (*Taxidea taxus*) G5 S4 SSC
FAMILY: FELIDAE (Cats)
Mountain Lion (*Felis concolor*)
Bobcat (*Lynx rufus*)
ORDER: ARTIODACTYLA
FAMILY: CERVIDAE (Deer, Elk, and Relatives)
Black-tailed Deer (*Odocoileus hemionus*)

5.5. Wildlife Habitat Relationship System Classifications

The broad habitat descriptions that follow are similar to the California Wildlife-Habitat Relationship System (WHR). The WHR habitat stages described in Table 5 give plant size classes and canopy density to help provide more of a physical-spatial description. Figures 7.1, 7.2, 7.3, and 7.4 show the variety of habitats on the property. Table 9 in a later section simplifies the WHR mapping to primarily soils, WHR types, and Forest Units only.

Table 5. WHR Habitat Stages

Standards for Tree Size					**Standards for Canopy Closure**		
WHR	WHR Size Class	Conifer Crown Diameter	Hardwood Crown Diameter	DBH	WHR	WHR Closure Class	Ground Cover (Canopy Closure)
1	Seedling Tree	n/a	n/a	<1″	S	Sparse Cover	10-24%
2	Sapling Tree	n/a	<15′	1″-6″	P	Open Cover	25-39%
3	Pole Tree	<12′	15′-30′	6″-11″	M	Moderate Cover	40-59%
4	Small Tree	12′-24′	30′-45′	11″-24″	D	Dense Cover	60-100%
5	Medium/ Large Tree	>24′	>45′	>24″			
6	Multi-Layered Tree	Size class 5 trees over a distinct layer of size class 4 or 3 trees, total tree canopy closure >60%					

5.5.1. Riparian

Although not called out as a specific habitat on the property, all the class II and III streams have some degree of riparian habitat along them. According to A Guide to Wildlife Habitats of California, "All riparian habitats have an exceptionally high value for many wildlife species. Such areas provide water, thermal cover, migration corridors and diverse nesting and feeding opportunities." [7]

5.5.2. Annual/Perennial Grassland (AGS/PGS)

Grasslands and meadows conform to WHR habitat stage AGS/PGS 2D (tall, dense). These areas are designated as "coastal prairies" on Figure 7.1. Grasslands in California were once dominated by native perennial species. Along with their livestock feed, early European settlers brought annual and some perennial grass and weed species which flourished in California's Mediterranean climate and have now largely taken over the native grasslands. Perennial grasses respond to the first rains and stay green long into the summer, thereby providing forage for wildlife and livestock over a longer period than annuals. They also provide superior erosion control, water infiltration, and structural diversity over most monotypic stands of exotic annuals. Deep-rooted perennial grasses with high lignin content in roots increase soil carbon retention on range and grazing lands (US DoE, 1999 and Follet et al., 2000). Some of the native perennial grasses (such as purple needle grass (*Stipa pulchra*) - the California State grass) can live up to several hundred years. As California has lost most of its native perennial grasslands, it is important to be aware of where these are on the property and how best to protect them. Management strategies to protect grasslands may include controlled grazing, fire, mowing, weeding, and harvesting as discussed in a later section.

Annual and mixed grasslands provide habitat and foraging opportunities for a range of wildlife species, including a variety of ground foraging birds such as Western bluebird (*Sialia mexicana*), American robin (*Turdus migratorius*), song sparrow (*Melospiza melodia*), dark-eyed junco (*Junco hyemalis*), and numerous other resident and migratory birds. Predatory hawks, including American kestrel (*Falco sparverius)*, white-tailed kite (*Elanus leucurus*), red-shouldered (*Buteo lineatus*) and red-tailed hawks (*Buteo jamaicensis*), frequent these areas as well. Small vertebrates and invertebrates within the habitat are likely to serve as a food source for these birds and other predatory vertebrates.

Subterranean foragers such as Botta's pocket gopher (*Thomomys bottae*), California vole (*Microtus californicus*) and American badger (*Taxidea taxus*) commonly occur in coastal prairie. In addition, small mice, brush rabbit (*Sylvilagus bachmani*), black-tailed

[7] Mayer, et al, editors, 1988.

jackrabbit (*Lepus californicus*), and blacktail deer (*Odocoileus hemionus*) can be found in this habitat type as well. Reptiles of this community include western fence lizard (*Sceloporus occidentalis occidentalis*), alligator lizard (*Gerrhonotus coeruleus*), and snakes. Bat species also forage over this habitat type.

5.5.3. Mixed Chaparral

The dense areas of chaparral consist of mostly coyote brush (*Baccharis pilularis*), poison oak (*Toxicodendron diversilobum*), California blackberry (Rubus ursinus) with patches of French broom (*Genista monspessulana*). Chaparral is part of the rich mosaic of habitats found on the property, providing both cover and forage for a number of wildlife species. California quail (*Callipepla californica*) are typically found under cover of chaparral next to open grasslands.

5.5.4. Mixed Conifer: Redwood/Douglas Fir (RDW/DFR)

The stands of conifers mostly conform to WHR habitat stages RDW or DFR/5/D. Bay (*Umbellularia californica*), Tanoak (*Notholithocarpus densiflorus*), and to a lesser degree madrone (*Arbutus menziesii*) are intermixed. This habitat is critical for spotted owl and Sonoma tree vole as well as numerous other species of birds and mammals such as porcupine, Douglas squirrel (*Tamiasciurus douglasii*) and redwood chipmunk (*Tamais ochrogenys)*. The redwood (*Sequoia sempervirens*) forest is important for the hydrological function of the watershed because its dense leaf structure and deep accumulation of duff on the soil surface facilitate the infiltration and slow release of precipitation. The leaves can literally rake moisture out of passing fog as well as break up the erosive forces of heavy rainfall impact. These forests also purify the air, sequester carbon, produce wood products, and provide habitat for recreation and wildlife. More detail is provided in the following section on Resource Management.

5.5.5. Coastal Oak Woodland (COW)

The coastal oak woodland is a broad classification for a variety of "mixed hardwood" found on the site. Dominant species include Bay and Tanoak. Some coast live oak and madrone is also present. Several one-half to one acre patches of hardwoods have succumbed to sudden oak death syndrome (SOD) one of which is identified as the "tanoak graveyard" on the map.

Hardwood forests provide habitat for wildlife - especially in dead or rotting trees that create snags for cavity nesting species such as pileated woodpecker and many others. Oak woodland offers abundant food for wildlife (acorns, berries and abundant insects), as well as wood products for people.

The mixed hardwood and redwood forests support a large variety of wildlife species. Bird species most frequently observed in forested habitats include thrushes, warblers, flycatchers, vireos, kinglets, brown creeper, jays and a variety of other migratory and residents birds. Suitable foraging and breeding habitat also exists for raptors including

Cooper's, sharp-shinned, and red-shouldered and red-tailed hawks. Small vertebrates within the habitat are likely to serve as a food source for predatory birds. The large trees on-site are prime habitat for nesting raptors. Nocturnal avian predators may include northern spotted owl, western- screech owl, great horned owl, and northern saw-whet owl.

Native oaks found on the property serve as a significant resource for many wildlife species. Acorns serve as an important food source especially for mammal and bird species, including the western gray squirrel, Steller's and western scrub jays, acorn woodpecker, and oak titmouse. Oak trees also provide cover, roosting sites, food storage sites, and nesting opportunities for native wildlife. Potential roosting sites for various bat species exist in the crevices and hollows of the mature trees found on the property. The large trees and snags also provide nesting opportunities for cavity-nesting birds, such as the chestnut-backed chickadee, northern flicker, Nuttall's woodpecker, and white-breasted nuthatch. Woody debris piles and layers of duff provide habitat for amphibians such as California slender salamander and ensatina.

Forested environments also create habitat for a variety of mammal species. The dense understory and tree cavities provide escape and cover for mammals. The presence of small vertebrates on the property may serve as a significant food source for larger predatory mammals (e.g. bobcat and mountain lion). Some of the most commonly observed mammals include western gray squirrel, black-tailed deer, and dusky-footed woodrat.

Additional detail is provided in the following section on Resource Management

5.5.6. Aquatic Habitat –Pond, Wetland

The constructed pond, the wetland swale leading into it and the surrounding patches of wetland and riparian shoreline provide important habitats for the entire area. Wetlands slow, filter, and allow for absorption of runoff from adjacent hillsides. The area provides standing puddles of fresh water for wildlife, and allows for a diverse plant mix to develop. Another important value of wetlands is the high "primary productivity." This refers to the growth of some of the smaller life forms that are at the foundation of the food chain. Wetlands in general are some of the most biologically productive habitats and provide microclimate conditions required by many wildlife species during critical life stages. Shallow pools and pockets of water provide breeding habitat for common amphibians such as Pacific chorus frogs, which are most active during winter months. Birds, like the black phoebe, are often seen sallying over water sources for aerial insects. Wading birds such as herons and egrets may frequent this area and forage in shallows with water of sufficient depth. In the winter a number of migrating ducks utilize the pond for foraging.

5.5.7. Additional Wildlife Habitat Elements

Habitat elements are mentioned in the above sections, but their importance is great enough to merit a section of its own. Snags, hardwoods with acorns, berries, riparian vegetation, downed logs, rock piles, springs, and pools of water in the dryer creeks are examples of only a few wildlife habitat elements critical to animals. Obviously, year-round sources of fresh water, such as the pond and portions of the creeks, are important for many wildlife species. Not so obvious is that many California streams and forests are lacking in important habitat elements that have routinely been removed in the past. Dead standing trees or snags were once targeted for removal as a fire hazards because lightning or other ignition sources could easily ignite the entire tree. In some snags a smoldering fire could persist in the rotting internal wood for days or weeks, releasing embers into surrounding vegetation during drier periods that can support wildfire. It may be justifiable to remove snags from ridges if the snag represents a safety threat and does not have active wildlife in it. However, whenever possible, snags should be left for wildlife nesting, perching, and as a substrate for foods such as insects and acorns. A rule of thumb is to leave one to three snags per acre. Rotten logs and slash on the forest floor can provide habitat for insects and wildlife as well. When clearing the forest to reduce fuel loads for fire protection, one should leave rotting logs and branches lying on the forest floor in a discontinuous pattern. To protect or restore suitable habitat for specific species of concern, one should perform a reference search to determine which habitat elements are beneficial to that particular wildlife species. Habitats for listed species found in the OAEC California Natural Diversity Database (CNDDB) search are described in the individual species reports found in the appendix.

5.6. Archaeology/Cultural Resources

The following background quote is from a 1999 Cultural Resources Study of the Occidental area performed for the Occidental County Sanitation District by Janine Loyd and Vicki Beard of Tom Origer & Associates: "Archaeological evidence indicates that human occupation of Northern California probably began by at least 12,000 years ago (Fredrickson 1984:506). Early occupants appear to have had an economy based largely on hunting, with limited exchange, and social structures based on extended family units. Later, milling technology and an inferred acorn economy were introduced.

This diversification of economy appears coeval with the development of sedentism, population growth and expansion. Sociopolitical complexity and status distinctions based on wealth are also observable in the archaeological record, as evidenced by an increased range and distribution of trade goods (e.g., shell beads, obsidian tool stone), which are possible indicators of both status and increasingly complex exchange systems.

At the time of European settlement, the study area was included in the territory controlled by the Southern Pomo (McLendon and Oswalt 1978). The Pomo were

hunter-gatherers who lived in a rich environment with a large carrying capacity that allowed for dense populations with complex social structures (Barrett 1908; Kroeber 1925). They settled in large, permanent villages about which were distributed seasonal camps and task-specific sites. Primary village sites were occupied continually throughout the year and other sites were visited in order to procure particular resources that were especially abundant or available only during certain seasons. Sites often were situated near freshwater sources and in ecotones where plant and animal life was diverse and abundant." (For the complete report with references see the Appendix.)

On March 19, 2014, J. Charles Whatford, Associate State Archaeologist for CAL FIRE performed an in-person archaeological and historical records search of the OAEC property. The detailed report is on file with Calfire and the Northwest Information Center at Sonoma State. The summary is as follows.

5.6.1. Archaeological Sites

The Northwest Information Center (NWIC) had no record of any previously recorded archaeological sites within or adjacent to the OAEC parcel.

5.6.2. Built-Environment Resources

No buildings or structures over 50 years of age have been recorded within or adjacent to the OAEC property boundary. Review of the 1868 GLO plat map showed "Road from Coleman Valley to Sebastopol" in approximately the present location of Coleman Valley Road, which passes along the southern boundary of the OAEC parcel.

5.6.3. Assessment of Adequacy of Previous Archaeological Surveys

"The previous survey conducted within a portion of the OAEC property (Collins et al. 2004 --S-29782) included no more than 10% of the property. While this previous survey effort appears to be adequate, I recommend archaeological review of projects proposed within the as-yet unsurveyed portions of the OAEC property that have the potential to disturb cultural resources be conducted prior to implementation." J. Charles Whatford in Memorandum to Jill Butler Cal Fire March 26, 2014.

Cultural resources encountered during a project should be avoided, and project personnel should not collect cultural resources. A cultural resource consultant should evaluate any discoveries before continuation of a project that might impact such resources. All timber harvest plans, including exemptions, require an archaeological records check and survey. Similar requirements may apply to other projects that involve ground disturbance. Damage to sites may result in fines. CAL FIRE retains a regional archaeologist who may be available for on-site inspections.

See list of contacts in Section 11 of this report.

6. Resource Management

Resource management involves first knowing what resources are on the property, then deciding how to utilize, restore, and/or protect them. Previous sections addressed plant and wildlife species, watershed, soil, and other resources. What resources contribute to the community at large? Which are part of the public trust? What resources need to be protected or enhanced? What are the threats to the resources? What resources can be utilized to help sustain the ownership, providing goods or services? What is the cumulative impact or our actions within a watershed? Again, some of these issues were addressed in previous sections.

This section deals with short and long-term overall land management issues, and Table 13 lists a number of specific projects with budgets.

The overall guidance for resource management is provided in the owner's goals and objectives including maintaining a healthy matrix of plant communities or habitats. The following sub-sections outline a description, history, and specific management opportunities to achieve these goals.

6.1. Management Units

The landowner goals outlined in section 4 apply to each vegetation community and management unit within. The following section describes the land at OAEC, organized by vegetation communities (coastal prairie, mixed hardwood, mixed conifer, wetland and riparian) with general descriptions of the vegetation type; and then individual management units within each vegetation community, along with management goals, strategies, and projects specific to each unit. See Figures 7.1, 7.2, 7.3, and 7.4 for management units and Figure 8 for roads and other landmarks.

6.1.1. Vegetation Community – Coastal Prairie

Coastal Prairie - General Description

California coastal prairie is a grass and forb plant community that stretches from the coast of southern California to southern Oregon. Often these ecosystems are referred to as grasslands, but prairies are increasingly becoming recognized for their floristic diversity beyond grasses; thus, they are often referred to as prairies rather than grasslands.

Coastal prairie is a distinct prairie type that is unique in the influence it receives from the maritime climate, which brings frequent moisture in the form of fog and heavy rains. This allows for a more moderate climate; while inland California prairie ecosystems experience hot dry summers and cold wet winters, coastal prairies are more buffered by the moderating impact of the ocean.

Containing twice as many species as any other North American prairie, Coastal prairie is the most biodiverse prairie of North America.[8] Given California's prime coastal real estate, coastal prairie is also the single most urbanized major vegetation type in the U.S.; 24% of coastal prairie has been lost to pavement, and more to agriculture.[9] These facts place coastal prairie among the most diverse, as well as most endangered, ecosystems in California.

The roughly seven acres (in total) of coastal prairie at OAEC are comprised of a mix of nonnative grasses and forbs, as well as native perennial bunchgrasses such as blue wildrye (*Elymus glaucus*), California oatgrass (*Danthonia californica*), and purple needlegrass (*Stipa pulchra*), and wildflowers including indigenous food sources such as multiple species of yampah (*Perideridia* spp.), bluedicks (*Dichelostemma* spp.), and yellow mariposa lily (*Calochortus luteus*). Also providing wildlife habitat for a plethora of birds, insects, mammals and reptiles, the swaths of prairie dotting OAEC hum with life.

Coastal prairie is known to be "disturbance dependent," adapted to a variety of disturbances such as drought, fire, grazing, and burrowing. In many prairies, disturbance prevents shrubs and trees from invading surrounding areas and converting prairies to shrubland, woodland, or forest.

[8] Stromberg et al. 2002
[9] (Loveland, 1995)

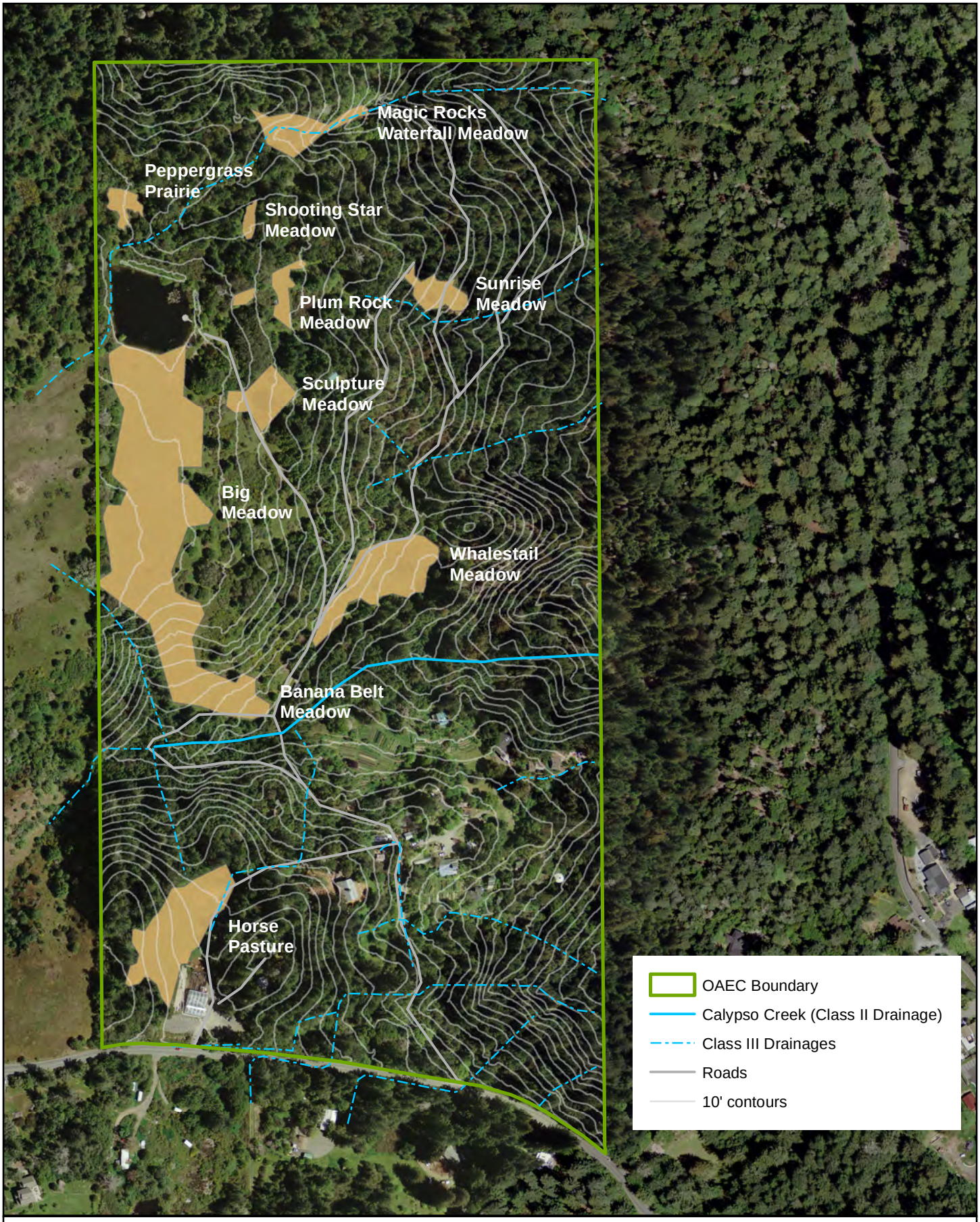

Figure 7.1 Coastal Prairie Management Units

0 125 250 500 Feet

N

Sources
Aerial Imagery: ESRI

With substantial changes in these disturbance patterns - including the displacement of Coast Miwok and Southern Pomo land stewards and the removal of fire from the landscape; changes in natural herbivory patterns of native ungulates such as elk and deer; the overgrazing of non-native domesticated ungulates such as sheep and cattle; agriculture and urban development; and the introduction of non-native plants – the precious balance of coastal prairie has been severely threatened.

Due to the removal of keystone disturbance regimes such as regular, low-intensity fire and changes in grazing patterns, the encroachment of conifers and chaparral, marching inwards from meadow edges, steadily reduces the remaining area of prairie. Historical aerial photographs of OAEC dating back to 1953 show a steady shrinking of the total surface area of coastal prairie, as surrounding Douglas fir and coyote brush drop their seed and multiply deeper and deeper into the prairies. Aerial photos show that as recently as 65 years ago, the meadows on average were 20 – 50% larger than their current surface area. Based on this analysis, we adopt an additional goal unique to coastal prairie of no net-loss.

Non-native grasses and forbes have also established themselves, proving effective as outcompeting many of the natives, and difficult to eradicate. Particularly aggressive is purple velvet grass (*Holcus lanatus*), an invasive nonnative perennial grass introduced from Northern Europe that threatens to wipe out the diversity of Sonoma County coastal prairies, where it is well-adapted to the cool moist climate. Other invasive grasses include: ripgut brome (*Bromus diandrus),* wild oats *(Avena fatua),* dominant forbs include plantain (*Plantago* spp.*)* and false dandelion *(Hypochaeris radicata).*

Without a regenerative disturbance regime in place, the prairies are quickly being encroached upon along the edges by Douglas fir, and from the middle by coyotebrush. In order to maintain the mosaic of vegetation types which creates maximum edge and habitat for biodiversity, it is essential to actively manage the encroachment of OAEC's coastal prairies – which, without human management, would completely disappear in a manner of decades.

Coastal Prairie Management History

The history of the land greatly informs our management strategies, as we employ the a combination of regenerative disturbance regimes including mowing, grazing of goats, mechanical forest thinning, and prescribed burning to mimic the historical disturbances that maintained the meadow mosaic and its associated biodiversity. Consistent efforts to push back on encroaching trees and shrubs have successfully helped to maintain the meadow edges, often an effort of hundreds of hours of student and volunteer participation.

Use of low-intensity controlled burning has shown mixed results thus far. While it has

beaten back certain invasives and benefited the native bunchgrasses, the low-lying non-native forbs – particularly plantain and false Dandelion – have thrived under the burning strategy. The consumption of thatch via burning opened up space between the bunchgrasses, releasing native bunchgrasses and also opening up space for forbs.

Mowing has proven to be a successful strategy in mimicking historical grazing patterns, enhancing native grasses and forbs, and reducing the population of invasives – particularly, ripgut brome. Beginning in May of 2003, the various units of OAEC's coastal prairie have been mowed annually in springtime, typically in May - once the grasses have reached a mowable height, but before the flowers form seeds. By mowing ripgut brome for multiple years, we reduced their presence dramatically which appears to be a successful strategy for short-lived annual exotics that have short-lived seed. Timing has proven to be the key element in successful mowing; in 2004 the mowing was a bit late, and the purple velvet grass seeds had already dried, resulting in successfully removing thatch but also dispersing seeds of unwanted invasives. If there was still soil moisture and we mowed too early, the plants were able to produce a second round of seed heads, lower to the ground and more difficult to mow. Therefore, the prescription is to mow as late as possible before the seed becomes viable. Typically mowing is followed by a weedwhipping treatment to catch velvet grass that flowers later in the season. Another crucial component of the mowing strategy is to leave large stands of blue wildrye *(Elymus glaucus)* intact for habitat and seed, which is then collected in summer.

Another factor that influences mowing timing is the seasonality of nesting birds; OAEC staff generally coordinates the mowing so as not to disrupt any ground-nesting birds that might be utilizing the tall grasses as habitat. Each year, patches of grass are left as unmowed islands of habitat for.

By 2010, the velvet grass proved itself as the most aggressively invasive nonnative taking hold in the coastal prairie ecosystem of Sonoma County. For purple velvet grass, the mowing may have slowed down seed production, but the perennial crowns are not killed by mowing, and the crowns simply widen after a mowing. Weed-whipping and hand-pulling velvet grass has also supplemented mowing in areas where the tractor cannot access, or for sporadic grasses that flower later in the year. Hand pulling of crowns towards the end of the dry season in September / October has proven more successful in eradicating velvet grass, but is also a more difficult strategy to scale up. Timing on this strategy is crucial, due to the fact that as soon as any significant moisture arrives, the velvet grass kicks into a more active growth period and individual plants are more difficult to remove.

Despite its mixed results in reducing the population of invasives, we continue mowing to mitigate non-native seed production, minimize plant invasions of shrubs including broom and coyotebrush, maintain trails, remove thatch, create accessible camping

areas, and reduce fire hazard.

In order to monitor the efficacy of mowing, in May of 2003 OAEC staff set up various 2-meter plots in Sunrise Meadow, Whales Tail Meadow, Plum Rock Meadow, and the Big Meadow, with one mowed plot and one control plot for each area. Data was collected for four years, and results showed after the third year a drastic decline in annual invasive grasses like *Bromus diandrus* with mowing. Mowing appears to have also promoted the successional state of low-growing exotics such as *Aira caryophylla* and *Vulpes spp.* It appears that the *Hemizonia* sp. population in the draw of Big Pond Meadow has drastically been reduced, perhaps as a result of mowing, although the cause is unclear. Overall, the presence of healthy, robust native bunchgrasses seems to have increased. While our goal has never been to eradicate the non-natives, we hope to mitigate their invasiveness and contain the spread in order to maintain native biodiversity while learning to co-exist with these newer arrivals. Due to limited resources, we tend to protect the best of what's left and control the spread of the worst.

To complement the mowing and burning, seed has been collected annually from different native perennial grasses and forbs to be sown via "shuck-n-huck" after burning and mowing, just before the first fall rains. Again, the timing is crucial: seed collection occurs as soon as they are mature, and then sown late in the season so that harvester ants don't decimate the seed before it germinates. In order to maintain seed contact with the ground, freshly dug gopher mounds offer loose bare soil in which to create a seed bed.

OAEC is a partner in the Coastal Prairie Working Group, which published the 2010-2011 Coastal Prairie Enhancement Feasibility Study, defining over 34 coastal prairie dominant vegetation types and experimenting with different management strategies. As part of the Coastal Prairie Working Group, OAEC has participated in research efforts, mapping, education and quantitative monitoring. For more information, visit www.sonoma.edu/preserves/prairie/.

In order to monitor shifts in species composition of coastal prairie units, in spring of 2014 OAEC staff set up various CNPS relevee plots in several meadows to continue monitoring species count and distribution; those plots are monitored annually each spring to track changes over time.

Management Objectives for Coastal Prairie Units

- No net coastal prairie loss: maintain the current surface area of all coastal prairie units.
- Reduce the population of non-native grasses and forbs such as ripgut brome, purple velvetgrass, plantain, false dandelion, etc.
- Increase the population of native grasses and forbs – such as *Wyethia spp.*,

Perideridia spp., *Stipa pulchra,* etc; we prioritize native bunchgrasses and forbs because of their capacity to build soil, sequester carbon and water, and support a diversity of vertebrate and invertebrate organisms that have co-evolved together

- Enhance the functional carrying-capacity of our prairies to support prairie-dependent wildlife populations for species such as American badger, American kestrel, white-tailed kite, gopher snake, Western bluebird, and neo-tropical cavity-nesting species
- Maintain access for the dominant camping area for OAEC guests and students
- Maintain trails and roads for access and recreation
- Provide forage for high intensity, short duration livestock

Strategies

In order to effectively achieve these directives and manage OAEC's coastal prairie holistically over time, we need to be active participants in a regenerative disturbance regime. We will employ a host of disturbance strategies including: the removal of encroaching conifers, chaparral, and hardwoods along meadow edges with mechanical thinning, burning, grazing, mowing; physical weed removal of woody species through hand-pulling, digging and use of weed-wrenches; seed collection and dispersal; the construction of bird boxes and lizard castles. Developing an intensively managed grazing program seems to offer the most long-term scalable strategy for coastal prairie management, and the program at OAEC needs additional infrastructure and support to develop. Each management strategy is selected and utilized based on seasonal conditions based on the discretion of the land managers.

Coastal Prairie Management Units

I. Banana Belt Slope

Description & History: The 1.5 acre steep slope of coastal prairie just outside of the deer fence that leads up to the Big Meadow offers a unique microclimate of warm, south-facing exposure. Encroached upon by Douglas fir on the northwestern edges, the Calypso Creek corridor on the southern edge, and broom and coyotebrush on the eastern edge, this meadow has been the focus of many fir encroachment control efforts. The slope contains a healthy population of blue wildrye and a small stand of gumweed (*Grindelia hirstula*), established from seed originally collected in Sunrise Meadow. A few patches of coyotebrush dot the meadow, as well as a stand of fennel towards the top. Several olive trees were planted near the base of the slope in the late 90s, to take advantage of the warm sunny microclimate.

In the mid 1990s, OAEC staff fenced the white oak at the base of the meadow to protect it from herbivores; it is now a healthy oak, one of the few white oaks outside of the "White Oak & Fescue" unit on the northeast corner of the property, and is safely

past browse height.

In 1995, OAEC staff and students dug a swale at the base of slope to spread out runoff and reduce erosion along the slope.

Mowed annually since 2003 along with the other units of coastal prairie, Banana Belt Slope was managed using prescribed fire twice; the first time higher on the main slope in November of 2005, and the second time with a focus on the Elymus patch below the slope in November of 2009.

Management Objectives & Strategies:

- Maintain meadow edge
- Thin and limb firs around meadow edge
- Collect acorns off of white oak to propagate
- Continue collecting gumweed and other forb seed to propagate
- Potential site for short duration, high intensity grazing

II. Big Meadow

Description & Management History: Located high up on the western edge of the property and near the top of the ridge, the Big Meadow is a 3-acre coastal prairie with an expansive view, primarily dominated by nonnative, invasive grasses and forbes. Native grasses include a healthy population of *Elymus glaucus*, as well as a less robust smattering of *Stipa pulchra* and *Danthonia californica*. There are a few plants of *Wyethia angustifolia* scattered throughout the meadow. In the Northwest corner there is a well-managed patch of Yampah (*Perideridia sp.)*, dominated on the eastern edge by *Perideridia gairdneri*, and the western portion by the endemic *Perideridia kelloggii*. Coyotebrush (*Baccharis pilularis*) and coast live oak dots the meadow, as well as a few patches of Himalayan Blackberry. A wetland runs through the meadow, draining the neighboring property into the pond. The meadow is ringed by coast live oak and mixed hardwood woodlands.

The largest unit of coastal prairie at OAEC, the Big Meadow was likely prime grazing land for the early European settlers, who stocked the land heavily with sheep and cattle. In the 1970s, The Farallones Institute plowed a section of the field southwest of the large rock in the meadow in an (unsuccessful) attempt to establish a lavender crop for a few seasons; this short-lived experiment significantly impacted the presence of native perennial grasses… Other than that, the Big Meadow was mostly left untouched, with no grazing or active management.

In addition to annual spring mowing since 2003, a controlled burned was conducted in the Big Meadow in November of 2005. Sporadic hand-pulling has removed outliers of Bull Thistles, Italian Thistle, and velvet grass.

Along the wetland there are unique stands of Brown-Headed Rush *(Juncus phaeocephalus)* indicating its wetland status. A patch of dogbane (*Apocynum cannibanum*), and a handful of elderberry (*Sambucus* spp.?) and red dogwood *(Cornus sericea?)* have been planted amongst a few patches of Himalayan blackberry and coyotebrush, which act as nurse plants that protect the young plants from deer browsing and provide a barrier from wind and sun. Both species of *Perideridia*, have been sowed in the wetland and successfully established. Meadowfoam has been seeded with moderate success.

Because of its ideal habitat for nesting songbirds, - as part of a larger contiguous open grassland complex (continuing onto the neighbor's land), open foraging among mowed grasses, and adjacency to the pond for water – the Big Meadow has been a focal point for bird box installation. The short-cropped grass seems to be particularly important for Western bluebirds, and the proximity of the pond for swallows. Bird box installations in 2004, 2006 (eight boxes), 2012 (eight boxes), and 2014 (four boxes) have proved successful in providing nesting habitat for resident Western bluebirds, and neo-tropical migrant species including tree swallows, violet green swallows, and ash-throated flycatcher. In 2014 OAEC received funding from NRCS to place 30 bird boxes, about half of which will go around the Big Meadow edges.

Management Objectives & Strategies for the Big Meadow:

- Manage the spread of velvet grass
- Collect and sow native grass and forb seed to enhance native biodiversity (species of notice: *Wyethia, Perideridia spp., Stipa pulchra, Elymus glaucus, Danthonia californica, Achillea millefolium*)
- Reduce coyotebrush populations through hand-pulling, weed-wrenching, mowing and burning
- Reduce broom populations through hand-pulling, weed-wrenching, mowing and burning
- Enhance the diversity of the wetland component by planting edible camas (*Camassia quamash*)
- Maintain the meadow surface area by removing encroaching conifers and coyotebrush from meadow edges; remove encroaching Douglas fir along the eastern edge, favoring oak savannah
- Potential site for short duration, high intensity grazing

III. Peppergrass Prairie

Description & History: Perhaps the most healthy relic of a native coastal prairie, the .25 acres of Peppergrass Prairie is home to a healthy population of peppergrass *(Perideridia kelloggii* – the common name "peppergrass" *alludes to* the Kashaya Pomo word translation of 'sibuta' referring to the spicy nature of the edible greens.*)*, as well as

native bunchgrasses including California oatgrass and purple needlegrass. A wild rose and manzanita make their home along the edge, and the meadow is surrounded by coast live oak, Douglas fir, and a planted cypress (*Cupressus spp.)* which are steadily encroaching upon the meadow. Coyotebrush, Scotch broom and poison oak can be found along the edges, as well as velvet grass particularly along the western edge.

Since 2004, OAEC staff have actively managed Peppergrass Prairie in a similar fashion to other coastal prairie units: removing encroaching conifers, broom, and Velvet grass, collecting seed from unique species. Along the Eastern edge of the path you'll find the only known population of *Lessingia sp.* on the property, whose seed has been saved and collected. This small unit of prairie was burned once in 1998.

Management Objectives & Strategies Specific to Peppergrass Prairie:

- Remove encroaching conifers (Douglas fir and cypress), broom, coyotebrush, velvet grass
- Continue collecting seed on Peppergrass
- Potential site for short duration, high intensity grazing

IV. Sunrise Meadow

Description & History: Sunrise Meadow, a .25 acre east-facing slope of coastal prairie surrounded by Douglas fir, on its southern edge a drainage that flows into Dutchbill Creek. Sunrise Meadow is fondly known both as an ideal place to watch the sun rise over the forest, as well as for its stunning display of the native edible Mariposa Lily (*Calochortus luteus*), an incredible pollinator plant for native bees and source of seed that has been distributed. The meadow is also home to a few original *Gumweed* plants that have provided seed to sow around the property, and now are present in the Magic Rocks meadow and Orangecado Slope.

Dense Douglas fir dominated forests surround the meadow on all edges, providing significant encroachment pressure; the meadow itself is dotted with a few young coast live oak, which provide an island of habitat within the meadow. The lower edges of the meadow include a small population of Scotch broom, which has been actively managed for the last 20 years with hand-pulling. The "slash" generated by the broom removal has been utilized as material for headcut mitigation through a process of focused brush-packing, a method which has proven successful at slowing erosive processes in various locations throughout the land.

After a few years of mowing, land managers determined that Sunrise Meadow is simply too steep to mow, and thus this section of grassland has not benefited from the annual mowing regime of other coastal prairie units - though it has benefited from a controlled burn in 2001. Because a fire break couldn't be mowed, and the meadow is surrounded

by dense forest with a heavy fuel load, burning has also proven to be a difficult management strategy to maintain. Amidst the limited management, plantain and false dandelion have been successful in establishing and increasing their population.

Management Objectives & Strategies Specific to Sunrise Meadow:

- Maintain meadow by thinning and limbing firs along edges to reduce encroachment and mitigate seed drop
- Continue removing fir seedlings as young as possible
- Continue to collect, propagate, and sow native grass and forb seed (notably *Calochortus* and *Grindelia)*
- Potential site for short duration, high intensity grazing

V. Plum Rock Meadow

Description & History: The .25 acres of Plum Rock meadow hosts a beautiful stand of purple needlegrass, islands of coyotebrush, and a young coast live oak. The meadow is named for a series of plum trees planted in the Farallones days, as well as remnants of the original Francesci vineyard which show up as small earthen mounds, much to the mystification of many a visitor. Along the road that arrives at Plum Rock there is a healthy population of Douglas Iris *(Iris douglasiana)* established amidst a patch of bracken fern *(Pteridium aquilinum)*, and on the north side of the road lies one of the healthiest patches of yerba buena *(Satureja douglasii)* on the property. These stands can provide mother stock for propagation elsewhere on the land.

The meadow has been mowed and whipped annually, and also burned once in 2005. There is a monitoring plot in Plum Rock Meadow, with data collected annually each spring since 2002. In 2003 land managers made a big push of clearing conifers from along the road to Plum Rock; the remnants of stumps can still be seen, and offer a clue as to the rate of decomposition of fir stumps. The slash from Poison Oak removal has created excellent habitat for woodrats, who have refashioned the slash into a woodrat nest, proving the efficacy of habitat piles.

Management Objectives & Strategies Specific to Plum Rock:

- Continue to maintain meadow edge with mowing, especially for Baccharis
- Release small oak by rock along road
- Leave an island of chaparral but push back on the edges, especially the encroachment on the lower eastern edge and all invasion by both broom species
- Restore access to road
- Potential site for short duration, high intensity grazing

VI. Shooting Star Meadow

Description & History: This small .10 acre patch of the prairie mosaic includes a booming population of early spring shooting stars (*Dodecatheon hendersonii*), and the edges of the meadow are lined with a healthy yet senescing stand of manzanita (*Arctostaphylos manzanita*); one of the few stands on the property. A small patch of Scotch broom has been steadily reduced over time, the slash being utilized to repair head cuts in the overflow of the pond.

Management Objectives & Strategies Specific to Shooting Star Meadow:

- Support health of current Manzanita and recruitment of young seedlings by removing Douglas fir that has sprouted amongst it - other strategies?
- Eliminate broom by hand-pulling
- Limb up big firs to maintain meadow edge
- Potential site for short duration, high intensity grazing

VII. Whale's tail Meadow

Description & History: This one-acre unit of coastal prairie lies close to the heart of OAEC, and many a camper has enjoyed resting under the night sky amidst sculptures – one of a whale's tail, from which the meadow earned its name. The meadow is surrounded by Douglas fir to the north, roads to the west, the Calypso Creek drainage to the south, and the Tanoak graveyard to the east.

A lizard castle was placed as a cairn where the Bay Road and Pond Road split, providing lizard habitat for Western fence lizards.

Whales Tail has been mowed annually since 2003, and burned once in November of 2009. There was already a significant amount of new green growth, and not much fuel load, leaving a patchy and incomplete burn.

A patch of broom has been steadily pulled from the meadow each year. A few small islands of coyotebrush and poison oak have served as nursed plants for a few hardwoods to take root and survive despite the deer pressure, including madrone and coast live oak.

Management Objectives & Strategies Specific to Whale's Tail Meadow:

- thin and limb firs around meadow edge to reduce fuel load and maintain meadow edge
- continue removing recalcitrant stands of scotch broom
- collect native grass seeds for shuck-n-huck expansion
- potential site for short duration, high intensity grazing

VIII. Horse Pasture

Description & History: 1.1 acres of coastal prairie located behind the nursery and adjacent to the road leading from the nursery to the barn, the Horse Pasture was full-time home to two horses from 1994 – 2010. The Horse Pasture is surrounded by oak woodland on the south and western edges, and Douglas fir on the north; a road lies to the east. The horses left OAEC in 2010, and the pasture has since been dominated by an annual mix, with a substantial thistle population.

When the new nursery was constructed in 2010, the stormwater retention plan included the construction of a "swedge" – or a hedgerow planted upon a swale – to infiltrate stormwater from the greenhouse roof runoff. The native hedgerow with angelica *(Angelica hendersonii),* mugwort *(Artemesia douglasiana*), elderberry *(Sambucus cerulea)*, and redbud *(Cercis occidentalis)* was planted by OAEC Food Forest students in 2011. The same year, lower portions of the meadow were keyline plowed utilizing a Yeoman's plow, a special plow with a shank designed for subsurface water harvesting, and seed-drilled with a native grass mix. It has been mowed and whipped annually in the spring since 2010.

Management Objectives & Strategies Specific to Horse Pasture:

- manage the meadow with animals rather than tractor

IX. Magic Rocks

Description & History: The .4 acres of meadow at the Magic Rocks provide a home to the greatest wildflower diversity on the property; meadowfoam, *Nemophila spp.*, checker lily (*Fritillaria affinis*), *Brodaeia terrestris* and *elegans*, *Tritileia laxa* and *hyacinthina*, tomcat clover (*Trifolium willdenovii*), *Melica torreyana*, Chinese Houses (*Collinsia spp.?*), *Delpinium nudicaule* all make an appearance. Especially significant, the lower portion of the prairie is home to Red Ribbons (*Clarkia concinna*), and *Lithophragma spp.*, the only place to find these species at OAEC.

This portion of coastal prairie is particularly wet, as the pond spillway drains through. The northeast bank contains a healthy stand of California fescue.

Data has been collected from a monitoring point at the path crossing the spillway creek since 2003, and is organized and maintained by staff ecologist Jim Coleman.

Management Objectives & Strategies Specific to Magic Rocks:

- Collect and save seed on the diversity of forbs that could be spread to other coastal prairie units

X. Sculpture Meadow

Description & History: Sculpture Meadow is a .4 acre patch of the prairie mosaic along the Pond Road, and is home to OAEC's largest stand of *Brodaeia elegans*, as well as a remnant patch of Peppergrass. A series of sculptures dot the meadow. A controlled burn took place in Sculpture Meadow once in 2003. This diminutive meadow is aggressively being encroached upon by Douglas fir on all sides.

Management Objectives & Strategies Specific to Sculpture Meadow:

- push back on broom and Bachharis
- maintain purple needlegrass, blue wildrye, California oatgrass populations by collecting and sowing seed
- potential site for short duration, high intensity grazing

6.1.2. Vegetation Community - Chaparral

Chaparral – General Description

Chaparral is a shrubland ecosystem dominated by woody, drought-hardy plants. The chaparral of OAEC is primarily comprised of coyotebrush, poison oak, California blackberry and coffeeberry with an herbaceous understory. Invasion by Scotch and French broom, two woody non-native and invasive shrubs from Europe, have proven to be incredibly successful at occupying the chaparral niche and competing with native counterparts. A few rare patches of hardwood chaparral comprised of manzanita are scattered along the edges of various chaparral and prairie units.

Chaparral serves many important ecological functions, primarily as habitat. It provides forage for birds and insects during seasons when forage is not in abundance – coyotebrush flowering in the winter and offering nectar and pollen for dozens of native insects, and poison oak fruiting in the late fall and offering berries for birds in a time of scarcity. In addition to forage, the dense stands of brush provide cover and nesting habitat for chaparral specialists such as the wrentit, as well as islands of cover for many species of mammals, birds and reptiles.

Grazing and fire have historically provided disturbances that arrested or reversed succession and limited the expansion of chaparral. With the removal of those disturbances, the few stands of chaparral at OAEC have steadily expanded over the last several decades. While coastal prairie has diminished due to the expanding footprint of the chaparral, true to the general pattern of ecological succession, the oak woodlands appear to be benefiting from this expansion. The chaparral community provides a "nursery habitat" for young Douglas fir and mixed hardwood seedlings including coast live oak, California bay, toyon, and madrone, which establish amidst the dense thicket of chaparral. This protects them from deer browse pressure and thus allows them to grow above the height of deer browse and evolve into mature trees. As older oaks die

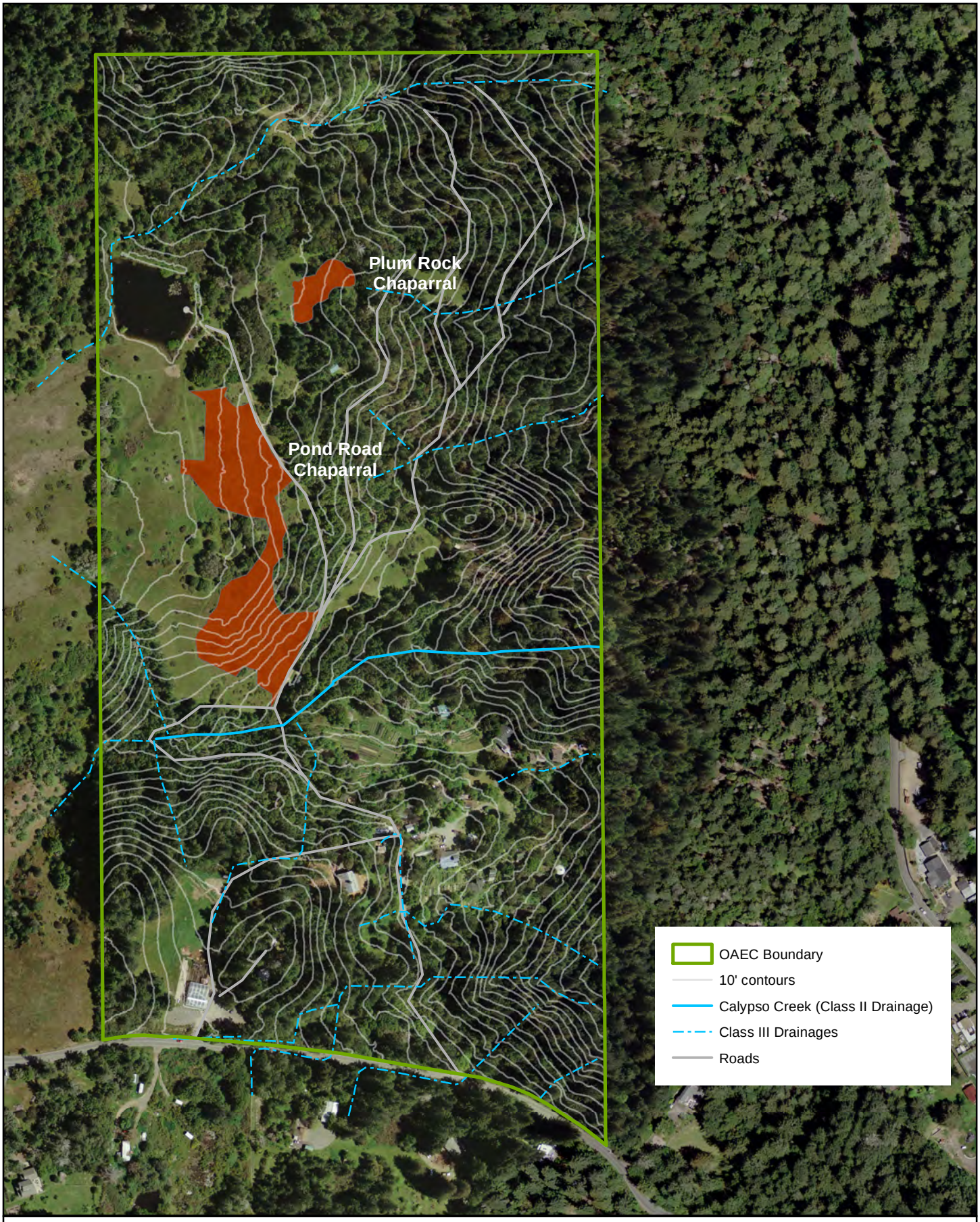

Figure 7.2 Chaparral Management Units

0 125 250 500 Feet

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Sources
Aerial Imagery: ESRI

of sudden oak death and young oaks germinating out in the open rarely survive the constant pressure of deer grazing, the habitat and protection provided by chaparral is crucial to the future of mixed hardwood recruitment.

Chaparral Management History

Much of the management of the chaparral at OAEC has involved keeping the chaparral in balance with surrounding plant communities – preserving its qualities as beneficial habitat for native flora and fauna, while limiting encroachment on coastal prairie. Land managers have experimented with reintroducing a regenerative disturbance regime in a number of ways – tractor mowing, hand-pulling, burning, and grazing chaparral – to attempt to achieve this dynamic balance. Several lessons have been gleaned from this experimentation.

Broom removal has been an ongoing endeavor for the last 20 years. In the core of the chaparral management units, where broom is solid and mature and drops thousands of seeds that are viable for decades[10], it has proven impractical to entirely eradicate the broom. The strategy has been to: 1) "hold the line" on the expansion of the edges of the chaparral stands 2) allow the broom to act as nurse plants for young hardwood seedlings, who will eventually mature and shade out the broom, pushing the chaparral more towards an mixed hardwood plant community, and 3) systematically eradicate isolated populations that appear in other plant communities.

The treatment of coyotebrush requires a more subtle strategy. In places where there is a small cluster of mature coyotebrush within coastal prairie, at times land managers have allowed them to persist. Where coyotebrush is actively seeding out and encroaching upon prairie, however, we have actively worked to eliminate encroachment by removing all young seedlings.

Managing the woody shrub invasion has proven successful manually with weed wrenches, root jacks, and strong hands; mowing has also proved a useful tool, as well as prescribed fire, which both eliminate young brush seedlings in coastal prairie. Hand pulling is successful for removing small plants with immature root systems, and the tools are effective in pulling larger plants that have developed a woody stem that the tools can grip. Timing is important, as pulling broom is easier in moist soil that is still soft.

In soil conditions where either the soil is too dry to manually pull, or the slope is steep

[10] Getting a Handle on Broom, John LeBlanc, UC Agriculture and Natural Resources

and soil disturbance creates a potential for erosion and stimulate the latent broom seed bank, and a "lop and torch" strategy has shown to be effective. This strategy involves first lopping the chaparral at the base in early fall at the height of the dry season, stressing the plants and causing some mortality. We found that lopping in the spring was not as successful, as plant roots still had access to sufficient moisture to survive the year. The next steps involves returning the following year once the plant has resprouted, and torching or flaming the crownsprout during the burn season utilizing a propane tank with a hand torch attachment.

Torching has also been an effective method for killing young broom seedlings after removing mature chaparral from an expanding edge. Again, timing is an important element of this strategy; as soon as the first flush of seeds germinates with the first fall rains, running a propane torch quickly along the carpet of seedlings in the early cotyledon stage can eliminate the entire population. In a normal rainfall year, the second flush of seeds then germinates with later rains, offering the season's second opportunity for removing yet another germination event. This has proven successful along the roads to hold back broom expansion; then other plants such as California blackberry, coyotebrush and mixed hardwood seedlings are given a competitive edge.

The many tons of brooms that have been pulled from OAEC have served as a crucial material for headcut mitigation, as the long and fairly straight woody branches offer organic matter to weave into eroding streambanks (see Drainages & Ponds section for more details).

Management Objectives for Chaparral

1. Enhance the carrying capacity of chaparral for native flora and fauna (such as wrentit, towhees, quail, sparrows, small mammals, and reptiles etc.)]
2. Enhance the few remaining stands of manzanita (by hermitage, Shooting Star Meadow, above the nursery, and in Peppergrass Prairie)
3. Maintain trails and roads for access and recreation

Strategies & Tactics

1. Limit the spread of brooms by "holding the line" on the edges of core populations and eradicating outlier broom from other plant communities
2. Encourage coast live oak and madrone regeneration amidst the chaparral, while limiting Douglas fir and California bay recruitment
3. Strengthen the goat grazing program as a chaparral management strategy

CHAPARRAL MANAGEMENT UNITS:

I. Pond Road Chaparral

Description & History: A stand of 4.7 acres along the western edge of the Pond Road is

actually quite diverse, containing coyotebrush, Scotch and French broom, poison oak, coast live oak, honeysuckle, California blackberry, and more. Coast live oak is successfully regenerating in this zone, and as you walk along the Pond Road it is a delight to spot young oaks towering above the mature coyotebrush and broom – a hallmark of succession in process.

The northern portion is comprised primarily of brooms, particularly Scotch broom, with some coyotebrush and a few other natives. There have been several aggressive efforts to remove brooms from the center, completely removing the old and young broom alike, only to see the return of young broom seedlings in a matter of years. There are also a few fruit trees on the northwestern edge that are not productive and mostly crowded by brooms, though still alive.

The southern portion is more dominated by French broom, and in this area the core of the broom in this section has not been substantially managed, though the edges have been maintained. The succession seems to be more active in this zone, with hardwoods and firs and emerging.

Management Objectives & Strategies Specific to Pond Road Chaparral:

- clear the trail from the Pond Road through the big meadow with manual removal and grazing
- reduce the coyotebrush and broom presence from the edge of the purple needlegrass stand at the north end of the Pond Road

II. Plum Rock Chaparral

Description & History: A small .27 acre patch of chaparral adjacent to coastal prairie, Plum Rock Chaparral is comprised of a similar mix of brooms, coyotebrush, and natives associated with the chaparral plant community. Land managers have actively removed brooms and fir from this unit. There previously was a tractor mowed path on the southeastern edge that is not currently maintained with a tractor, as there are a number of legacy sudden oak death trees blocking the road access; the amount of chainsaw work to reopen this section of road has been prohibitive to reopening the road.

Management Objectives & Strategies Specific to Plum Rock Chaparral:

- maintain the current edges of the chaparral and prohibit it from encroaching on the coastal prairie, as well as minimizing brooms

6.1.3. Vegetation Community – Mixed Hardwood

General Description:

Interspersed with the mosaic of coastal prairie, chaparral, and mixed conifer, pockets of mixed hardwood dot the hillsides of OAEC. This vegetation community is primarily dominated by the pungent California bay, with an intermingling of coast live oak, madrone, an occasional white or black oak, California hazelnut, and very often the ever-encroaching Douglas fir. The understory contains California blackberry, yerba buena, yerba de selva (*Whipplea modesta)*, California honeysuckle (*Lonicera hispidula*), and more. In areas dominated by California bay, the understory tends to be fairly barren.

This plant community provides a bucolic visual and appealing aesthetic, enjoyed by all. The iconic oaks of OAEC have become a favorite subject of artwork and are central to the imagery that has become associated with OAEC.

The mixed hardwood plant community is where the food tends to be found, for humans and non-humans alike. Acorns, bay nuts, hazel nuts, and madrone berries are all edible, delicious, and nutritious, and have been highly prized as a food source by the native people of this area for many thousands of years. Foragers among the OAEC community value the mixed hardwood zones as the primary source of wild fruits, nuts and mushrooms.

Many birds and mammals rely upon these wild foods as well, which provide an abundant and nutritious fall forage source. In addition to their forage value, oaks in particular provide crucial habitat for nesting birds as perching sites, and as they slowly decay, their structure provides opportunities for cavity nesting as well. In fact, oak trees are the most important tree for wildlife on the North American continent due to the many ecosystem services they provide.

The oaks at OAEC have suffered due to the combined threats of fire suppression and changes in herbivory patterns by native ungulates, who overbrowse young oak seedlings. Walking along the trails at OAEC one will find the constant reminder of Sudden Oak Death (SOD), a forest disease which has killed nearly all of the mature tanoaks on the property as well as many of the heritage coast live and black oaks; their fallen trunks scatter the hillsides and open up niches that California bay and Douglas fir seem to have great success in filling.

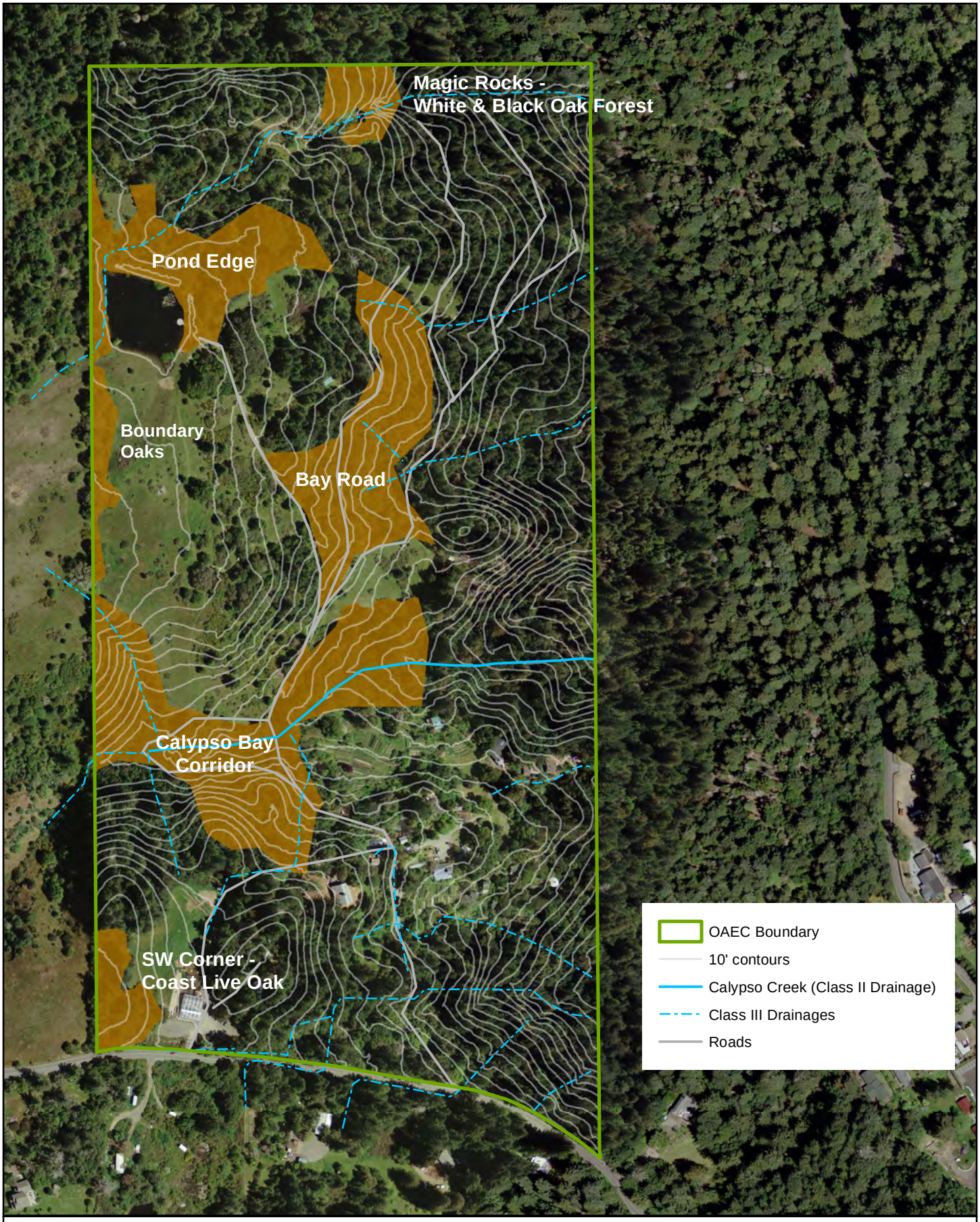

Figure 7.3 Mixed Hardwood Management Units

0 125 250 500 Feet

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Sources
Aerial Imagery: ESRI

Mixed Hardwood Management History:

The first signs of SOD appeared in the early 2000s, as staff biologists started to notice a mysterious decline in the health and massive die-off of tanoaks. Science soon revealed that many of the oaks (live oaks, black oaks, and tanoaks) were being infected by a pathogen, *Phytopthera ramorum*, that caused a slough of symptoms that eventually lead to the death of the infected oak.

OAEC has been involved in experimenting with multiple strategies to slow the spread of SOD and attempt to save the remaining oaks.

Because California bays are both hosts and vectors of the pathogen, actively spreading it to neighboring oak trees, land managers have prioritized the removal of California bay branches and trees within the canopy of neighboring oaks – where practical. Often the bay is so dense that entirely removing bays within a 15-foot radius around oaks proves impossible due to resource constraints. Nevertheless, hundreds of bay trees have been removed, especially around heritage oaks. Thinning and limbing around oaks has also improved airflow and circulation, which seems to benefit neighboring oaks. Agrophos was applied to several heritage oaks in Solar Suburbia behind Sowing Circle homes.

In 2005, OAEC collaborated with Sonoma Mountain Institute and Dr. Elaine Ingham to conduct an experiment testing the efficacy of actively aerated compost tea as a foliar treatment on dozens of trees, which were already infected with SOD and far along in the infection process; results were mixed and did not offer conclusive direction around Sudden Oak Death treatment or prevention. Utilizing a microscope to examine microbiology on the leaves showed an increase in microbiology, but not a decrease in the symptoms of SOD, likely because it was so late in the game.

There has been a targeted individual effort to save the Bell Oak by the kitchen, which stands at the heart of the Core Area and offers shade to the picnic tables below. Treatments included foliar and subsoil compost tea application, and application of compost and mulch underneath the canopy. More recently in 2014 during a workshop the trunk of the tree was flamed as a "fire mimicry" experimental treatment, with unknown results. The tree is still alive and does not show signs of advanced SOD.

In addition to attempting to slow the spread of SOD, OAEC staff was strategic about increasing the diversity and presence of oak species that are not susceptible to SOD, namely white oak, by collecting and planting acorns throughout the property.

Recent samples taken in the spring of also in 2005 2015 confirm that California bays at OAEC are still indeed active carriers of *Phytopthera ramorum*, and that SOD is still present throughout the site.

The California bays, compared to the oaks, are thriving. Cut by the early European homesteaders and coppiced for firewood, most stands of bay have stump-sprouted and are multi-stemmed; many of the bays have been thinned and limbed as part of fuel load reduction efforts.

Unrelated to SOD, in 2001, OAEC received a grant from Partners With Wildlife and the U.S. Fish & Wildlife Service to improve mixed hardwood habitat for neo-tropical migrant breeding birds. The grant supplied a cost-share to the organization to conduct thinning and limbing to release oaks, remove broom, and save and sow of native forbs and grasses.

As part of an effort to move towards a more focused nutrient-cycling, closed-loop system, slash from these thinning efforts has been utilized in the following order of priority: 1) as biomass strategically place in gullies to mitigate headcuts in class III drainages; 2) as material for building wildlife habitat piles; and 3) as round pole building material (in the case of Douglas fir). Only when these options have been exhausted does slash become part of a burn pile.

Management Objectives for Mixed Hardwood Units:

1. Enhance the functional carrying-capacity of our mixed hardwood forests to support forest-dependent wildlife populations, and diversity of fungal and plant communities.
2. Select for madrone, oaks and hazel over California bay where possible
3. Experiment with treatment for sudden oak death
4. Preserve genetics of oak species through acorn collection and propagation, and protection of young oaks from deer browse
5. Maintain trails and roads for access and recreation

Strategies:

In order to effectively achieve these directives and manage OAEC's woodlands holistically over time, and in keeping with the theme of regenerative disturbance, we will employ a host of strategies including: the removal of encroaching conifers, prescribed fire, thinning and limbing, seed-saving and sowing, building wildlife habitat piles, and erosion control for headcut mitigation. Each management strategy is selected and utilized based on seasonal conditions and the discretion of the land managers.

MIXED HARDWOOD MANAGEMENT UNITS:

I. Southwest Corner

Description & History

Beginning at the southwest corner of the property and continuing to the north hugging the western fence line above the Horse Pasture coastal prairie, the Southwest Corner unit is comprised primarily of coast live oak, with a small amount of California bay intermixed, and an aggressive edge of Douglas fir. The understory contains poison oak, California blackberry, angelica (*Angelica tomentosa)*, and California sunflower (*Wyethia glabra)*, the latter two of which are specific to this locale. There is also a stand of French broom in the understory, which has been actively removed for many years, and is now at a scale where hand-pulling can keep the growth at bay. Called out in the Chaparral section, there is a manzanita on the edge of the woodland just uphill from the nursery.

The oaks in this stand are of mixed age, with mid-size oaks, and younger trees regenerating. Many of the oaks show signs of both SOD and stress, including a less than full leaf canopy, dead limbs, and fruiting bodies of hypoxylon.

This unit is connected to the Horse Pasture, and was a favorite place for horses to rest in the shade for nearly 15 years, resulting in significant soil compaction. Perhaps part of the recent success of *Angelica* and *Wyethia* is due to the removal of horses.

Management Objectives & Strategies Specific to Southwest Corner

- continue to remove encroaching broom and conifers
- save seed and attempt to propagate the manzanita, angelica, and wyethia

II. Pond Edge

Description & History

The OAEC pond is surrounded by the Pond Edge management unit, dominated by California bay and Douglas fir with an occasional intermingling of coast live oak and madrone. This area is proximal to the pond and contains a trail network, making it well-traveled and an important viewshed for aesthetics and demonstration value.

Below and to the east of the pond spillway the vegetation is incredibly dense and fairly inaccessible. A legacy of plantings from the Farallones days still hangs on, including *Ceanothus cuneatus*, and wild plums. There are a few box elders, Oregon ash, and black and white oaks on the lower northern slopes of the spillway.

Past Peppergrass Prairie to the east there is a large stand of Douglas fir with substantial

coast live oak. After a significant thinning and limbing effort of the firs beginning with a first push in 2004, the Indian warrior took off and has become a favorite of OAEC herbalists. Land stewards sowed California fescue seed in this area which came from the Magic Rocks. This zone has witnessed the most successful native understory establishment.

A small knoll of coast live oaks with a healthy understory of California fescue marks the winding end of the Pond Road. While many are not of optimum health, efforts to remove encroaching Douglas fir and California bay have opened up circulation and reduced the threat of SOD and encroachment. The unit contains broom and fir regeneration, which are ongoingly removed.

Management Objectives & Strategies

- remove encroaching broom and Douglas fir
- diversify understory
- prioritize treatment along well-traveled trails (Pond – Magic Rocks – Plum Rock loop)

III. Calypso Creek Corridor

Description & History

The mixed hardwood corridor that runs along Calypso Creek is dominated by California bay and Douglas fir, with a sprinkling of coast live oak, madrone, hazel nut, and one lone redwood.

At the time of the arrival of Sowing Circle and OAEC, the corridor hugging the creek to the west of the road crossing on Calypso Creek was densely vegetated with Himalayan blackberry and poison oak. Beginning in 2001 with the Partners With Wildlife grant, the area was heavily cleared of blackberry and poison oak, and then Douglas fir thinned and limbed. The California bay has been coppiced for firewood, and some of the material ended up as on-contour piles for bank stabilization. The goal is to continue coppicing the bays towards selecting for a single or double stem while managing the percent canopy cover, maintaining a balance between allowing in enough light to allow riparian species to establish, without encouraging poison oak and blackberry to return. In addition to thinning and limbing the western upper reach of Calypso, several riparian species have been planted along the banks of Calypso, including blue and red elderberry, spicebush, salmonberry, several species of willow, pipevine, big leaf maple, wild ginger, and basket sedge.

Standing at the road crossing one can look downstream and observe the stark comparison of a riparian corridor that has been actively stewarded, versus one that has been virtually left alone. The section of the Calypso Creek Corridor to the east of the road crossing is less tended, as it becomes increasingly dominated by multi-stemmed

California bay and Douglas fir. Towards the lower reaches, it transitions into separate management unit dominated by Douglas fir and redwood.

The area to the north of Calypso and east of the Big Meadow, there have been multiple fir removal and thinning pushes to mitigate encroachment on the coastal prairie and headcutting flowing south into Calypso.

There has been substantial SOD dieoff in the section below the corporate yard, and the dead trees were laid on contour. There has been minimal fir thinning and limbing, as the spacing is mostly adequate.

The north bank of Calypso south of Whalestail from the creek edge to the grassland had major treatments beginning in 2003, thinning and limbing firs and stuffing a side headcut at the Chain Fern seep that feeds into Calypso. The remainder of material went into wildlife habitat piles.

Management Objectives & Strategies Specific to Calypso Creek Corridor

- enhance riparian species
- reduce fir and broom encroachment
- erosion control and sediment mitigation
- maintain aesthetics and education/demonstration value of areas along the road that receive high traffic
- maintain trails

IV. Bay Road

Description & History

The Bay Road management unit is contained on the western edge by the Pond Road; on the southern edge by Whalestail Meadow; on the eastern edge by the lower portion of the Bay Road; and on the northern edge by Sunrise Meadow.

This unit is also dominated by California bay with a mix of coast live oak, madrone Douglas fir, and an occasional hazel; successful fir encroachment has already started to shift the species composition of this management unit, which is losing many of the hardwoods - especially oak and madrone which are quickly topped by Douglas fir, and cannot survive in the shade as well as the California bay. This area historically was the most diverse mosaic of hardwoods in a contiguous island, thus maintaining the hardwoods here is of particular significance.

Along both sides of the pond road, efforts to thin and limb for increased circulation and fuel load reduction have opened up a lovely view into the forest, offering an effective demonstration to visitors around forest management. The edges along the road

continue to be a priority to maintain aesthetics and high quality demonstration for the large numbers of visitors that walk along the road to the pond.

SOD has created a multitude of challenges in this management unit, which has been hit hard by the disease, especially midway along the eastern side of the lower road (below Bay Road). Several trees in this area were selected for treatment with compost tea application, and as previously mentioned, the trees were too far along in the SOD progression and the treatments were not ultimately successful. There are several places where oaks have fallen, leaving a large amount of down woody debris, as well as a newly created gap of sunlight. Without active management, likely the niche will be filled by Douglas fir and California bay, which are already successfully regenerating. Due to this success, thinning Douglas fir is crucial, and the young Douglas fir poles provide optimum material for gully stuffing. Land managers opt to select for oak and madrone when possible. Standing dead oaks also pose a threat to hikers and wanderers; hazard trees along roads and trails are a priority for removal.

In the northwestern section of this unit, on the western side of the road as it reaches Sunrise Meadow, a stand of Douglas fir is a prime candidate for a third entry thinning, limbing, and utilization of timber as round poles. Where conks show up on Douglas fir as indicators of decay, managers opt to select these as "leave trees" to become snags for habitat, especially pileated woodpeckers.

Along the Bay Road are three upload drainage crossings, each of which has an associated legacy headcut on the downhill side. All of these gullies have ongoingly and intensively been actively managed for headcut mitigation, packed with brush.

Management Objectives & Strategies Specific to Bay Road:

- reduce fir and broom encroachment
- continue managing fir for round pole production
- maintain hardwood diversity legacy and aggressively select for hardwoods when possible in thinning and limbing

V. Magic Rocks

Description & History

This small .8 acre pocket of oak woodlands contains a unique remnant of a thriving deciduous oak woodland, comprised of black and white oaks and an impressive understory of California fescue and Indian warrior as well as numerous other wildflowers that in many cases only occur in this part of the property. Because white oak is resistant to SOD, this stand is incredibly important as a preserve of local SOD-resistant genetics. The oaks are surrounded by Douglas fir and redwood, which have been steadily encroaching on this precious patch. On the north bank of the waterfall up to the property line there was a substantial Douglas fir thinning and limbing effort,

utilizing the slash as contoured brush piles on the steep slopes. Because of its proximity to the property line, this area demonstrates the dramatic difference of land management styles.

It seems the whitetail kites breed in this area, as pairs have been witnessed multiple times.

Management Objectives & Strategies Specific to Magic Rocks:

- preserve genetics of white oaks by gathering acorns and propagating
- maintain oak woodland through thinning and limbing surrounding conifers
- manage for diverse wildflower and grass population – collect and sow seed, protect unique species from deer browse to ensure seed production

VI. Boundary Oaks

Description & History

Bordering the Big Meadow, a row of coast live oaks dot the boundary line, providing a savannah edge to the meadow and a visual screen from the neighbor's property. The grove at the southern end is a remnant stand from the previously united 160 acres, marking the point where four 40 acre parcels met. This area contains the largest coast live oak (recently deceased by SOD), madrone, and California bay. A few madrones and young coast live oak seedlings pop up among the mature oaks, many of which show signs of stress – scanty canopies, cracked and weeping bark, and many dead limbs. Recently several have died and fallen.

The area has long been a favorite camping site for OAEC guests as well as a ceremonial gathering space, and thus has been maintained and beautified. There have been multiple efforts to thin out young Douglas fir seedlings as well as broom removal. The well-established purple velvet grass under the oak canopies has been mowed annually to reduce its spread.

The Boundary Oaks have been part of a conservation effort with neighbors to the west, and several young oak and madrone seedlings were caged in spring of 2015 to protect them from deer browse. Several sections of the fence have been removed to promote wildlife corridors.

Management Objectives & Strategies Specific to Boundary Oaks:

- reduce broom and fir encroachment and non-native grasses
- ongoing maintenance for recreational uses
- place birdboxes in oaks for ash-throated flycatchers

6.1.4. Vegetation Community – Mixed Conifer

General Description:

A dense canopy of second and third growth Douglas fir and redwood, interspersed with California bay, coast live oak, and tanoak, dominate approximately 42 acres of OAEC. The understory of this vegetation community tends to be fairly minimal, especially in the deep shade, while the edges that receive more sunlight contain yerba de selva, Douglas iris, yerba buena, and some native grasses.

Since the arrival of Europeans, the mixed conifer plant community has experienced two extreme ends of the disturbance scale. Several rounds of intensive logging impacted the forests of OAEC. The first round began with clearcutting of redwoods in the late 1800s, initiating the destructive process of soil disturbance, erosion, and loss of old-growth forest characteristics. Based on age-dating of third growth trees at OAEC, the second logging wave came in the 1920s and 30s, along with the associated road building, exacerbating the high level of disturbance that had already overtaxed the system. Based on stories from locals in the area, there was also significant removal of Douglas fir throughout the region post World War II to build houses for the returning veterans.

From the 1950s onwards, with a change in ownership away from homesteaders making a living off of the land, towards more environmentally-minded landowners with a "let nature restore" approach, the next 40 years or so saw the opposite end of the disturbance spectrum, with very little disturbance of any kind. The end result is an overstocked third growth forest. The regrowth of redwood has not been actively managed, and has stump-sprouted in a manner that has not selected for health and vigor. Within the original conifer stands where it has been cut, Douglas fir has reseeded to create dense "dog hair thickets" of young saplings stocked at a rate of hundreds of stems per acre. In addition, as the nation-wide fire suppression policy came into effect in the 1920s, Douglas fir dramatically expanded its distribution by reseeding into the neighboring vegetation communities of coastal prairie, chaparral, and mixed hardwood. The combination of the legacy of logging which has favored Douglas fir regeneration; a reduction in intensive grazing that would have limited the success of Douglas fir seedling expansion; and fire suppression, has created an unprecedented situation of overstocked conifer forests and conifers encroaching upon neighboring plant communities. These factors together have resulted in the expansion and overstocking of the coniferous forests to the detriment of wildlife, fire resilience, plant diversity and overall forest health.

Despite the compromised state of the mixed conifer stands, rare arboreal mammals

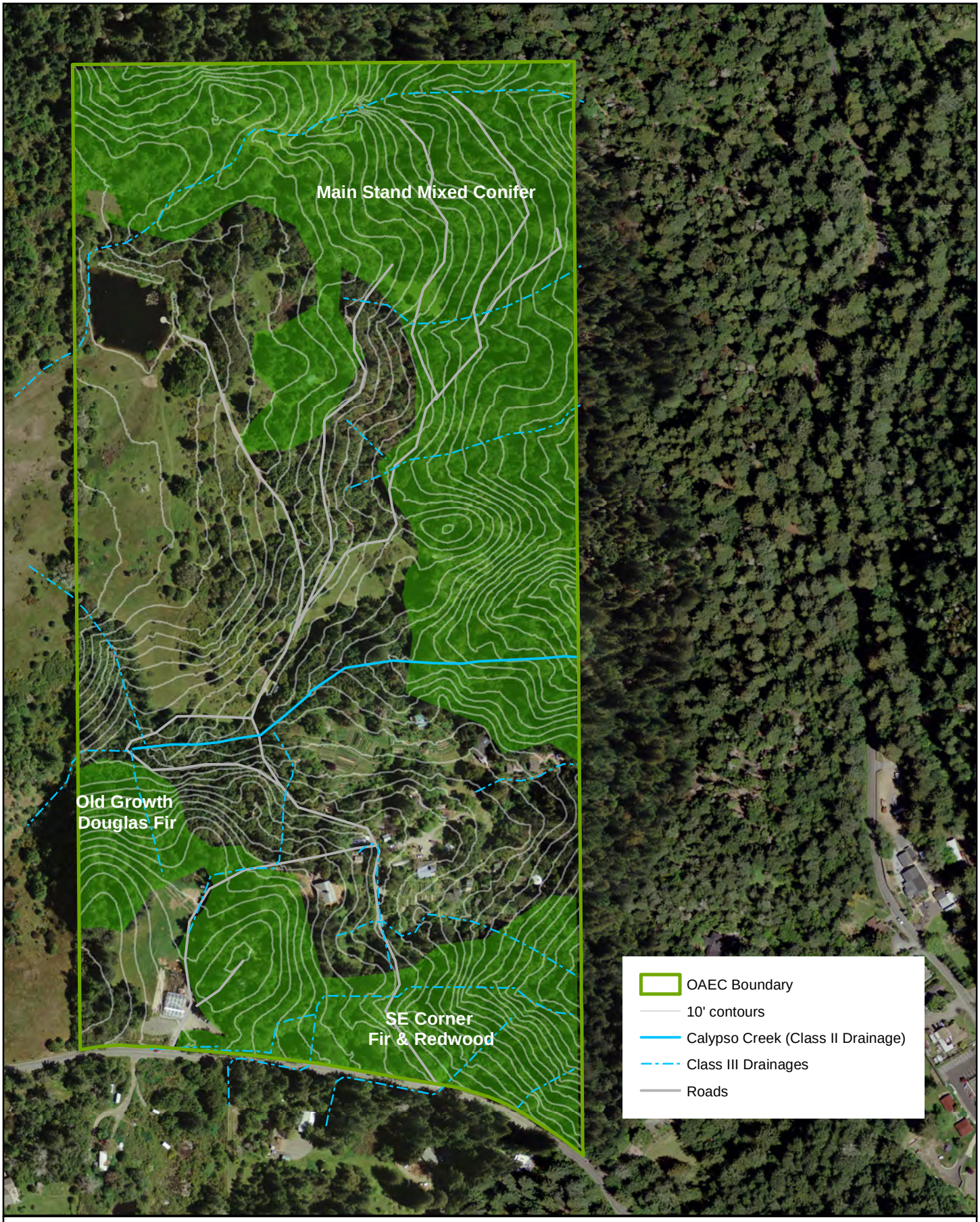

Figure 7.4 Mixed Conifer Management Units

0 125 250 500 Feet

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Sources
Aerial Imagery: ESRI

such as Sonoma tree vole, porcupine, as well as Douglas squirrel, and redwood chipmunk, have all been observed in various locations throughout these vegetation communities. Spotted owl has also been observed, as well as a probable pair of nesting white-tailed kite. Other species of owls on the property are often found in this community, including great-horned, Western screech, Northern pygmy and sawhet owls. It appears that the documented breeding of pileated woodpecker occurred in an SOD tanoak snags.

Mixed Conifer Management History:

Under OAEC's stewardship, an attempt to restore a healthy balance through human-scale regenerative disturbance has led to a site-wide goal of removing encroaching conifers from neighboring plant communities. In addition, ongoing thinning and limbing of Douglas fir has helped move towards the goals of fuel load reduction, enhancing biodiversity, and increasing accessibility for wildlife and people along roads, trails, and in the forest. As outlined in the Mixed Hardwood Management Section, slash generated from thinning and limbing activities has ongoingly been utilized to brushpack gullies and mitigate headcuts, especially at road crossings. Round poles have also been selected for onsite construction projects, and where appropriate, slash was also utilized to create wildlife habitat piles. Land managers have also collected and distributed native grass seed (*Bromus laevipes*, *Melica californica*, *Festuca californica, and Elymus glaucus*), Douglas iris and yerba buena in encroachment areas after thinning, due to the fact that these heavily shaded encroached areas have little understory.

A guiding principle of mixed conifer management has included the mantra "less trees and more forest," implying the importance of reducing overall basal area and stem density in favor of improving the forest structure, function and composition and move towards its original pre-logging characteristics of a late seral stand condition.

Management Objectives for Mixed Conifer Units:

1. Enhance the functional carrying-capacity of our forests to support forest-dependent wildlife populations for species such as spotted owl and Sonoma tree vole
2. Manage for a fire resilient forest
3. Manage towards late seral stage (old growth) characteristics
4. Enhance diversity of understory
5. Manage for small-scale onsite timber production – primarily round poles with the potential of a portable mill
6. Maintain trails and roads for access and recreation
7. Strive to manage forests for carbon sequestration in soils and vegetation
8. Manage to improve water quality and quantity

Strategies:

In order to effectively achieve these directives and manage OAEC's coniferous forests holistically over time, OAEC is committed to being active participants in a regenerative disturbance regime. Land managers employ a host of disturbance strategies including: thinning and limbing for fuel load reduction and wildlife habitat enhancement; the removal of encroaching conifers along neighboring plant communities with mechanical thinning, burning, grazing, mowing; seed collection and dispersal; construction of wildlife habitat piles; and brushpacking gullies for headcut mitigation. Each management strategy is selected and utilized based on seasonal conditions and the discretion of the land managers.

MIXED CONIFER MANAGEMENT UNITS:

Roman numerals reference Forest Units as described in Section 6.8, Figure 9 and Table 9.

I. Southeast Corner

Description & History:

The Southeast Corner dominated by Douglas fir and redwood runs along the eastern portion of Coleman Valley Road, and moves north and adjacent to the Core Area, bounded by the driveway on the western end. DBH of Douglas fir and redwood in this unit, both second and third growth, ranges from 7" – 51", with an average DBH of 31". There is a small amount of coast live oak and bay interspersed in the subcanopy.

As a highly trafficked area that receives high visibility both from Coleman Valley Road and the OAEC driveway, this unit has been placed high priority for both demonstration forestry as well as maintaining the roadsides for aesthetics.

The Southeast Corner unit was thinned and limbed in 2004 as part of the shaded fuel break funded by the BLM's Community Fire Preparedness grant program, and slash was utilized for brush-packing gullies. The unit is ready for a light-handed second entry. Many of the stump-sprouted redwood could be reduced from several to a few stems, and the Douglas fir seedlings thinned. Its adjacency to the road, a common fire vector, as well as to the Core Area where the residences are located, places it on the high priority list for ongoing fuel load reduction efforts. Broom and fir seedlings have been ongoingly removed along the western and southern edges of the unit.

There is a substantial gully from from the runoff of Coleman Valley Road which is culverted and drains onto the property. Additionally, there is a second significant gully from the drainage right before the cattle guard that runs under the driveway. The culvert was completely replaced and regraded as part of the Fish Friendly Roads project in 2006. The western portion of this drainage functions as a seep which provides valuable habitat for California giant salamander, a native amphibian which has been

observed in this area.

The primary power and phone lines from the road to the Core Area run through the eastern portion of this unit, and PG&E maintains an easement for access and maintenance of the line. They periodically come through to clear around the lines.

Management Objectives & Strategies Specific to the Southeast Corner:

- optimize fire resiliency of stand to ensure ingress/egress of primary access point in the case of a catastrophic fire
- maintain road edges for aesthetics
- ongoing erosion control in the two drainage networks that convey significant volumes of runoff from Coleman Valley Road

II. Pear Meadow Unit

Description & History:

This 1.8 acre stand is dominated by Douglas fir and hardwoods, with California bay, coast live oak, madrone, and hazel mixed throughout, as well as a small pocket of coastal prairie, an occasional California buckeye and one of the only two Oregon ash (*Fraxinus latifolia*) found on the property. It runs from the eastern edge of the nursery parking lot down towards the driveway, and is bounded by Coleman Valley Road on the south, the barn slope fencing on the north, and the driveway on the east. Douglas fir DBH ranges from 6" – 28" with a 17.5" average.

A drainage from Coleman Valley Road deposits road runoff onto the property in the middle section of the unit, where a swale was dug in 2014 to reduce erosion and increase infiltration, and seeded with native grasses. A drainage runs through this unit from west to east, collecting in a pool fed by a year-round spring just to the west of the driveway, a favorite place for wildlife. The spring was strategically excavated and expanded during the Fish Friendly Road projects in 2006 to provide a critical water source for wildlife in the dry season, and wildlife trap cameras have captured numerous species of mammals utilizing this water source throughout the year. Repeated efforts to remove encroaching fir and broom have generated material to mitigate headcuts through gully brush-packing efforts higher up along this drainage.

A trail running through this area connects the nursery parking lot with the driveway, and due to the foot traffic, it has been maintained both for access, aesthetics, and demonstration and education value. The slope uphill from the trail towards the water tanks was the beneficiary of the first thinning and limbing treatment in 1995. It is also a high priority fuels reduction area, as it lies adjacent to Coleman Valley Road.

<u>Management Objectives & Strategies:</u>

- reduce fir and broom encroachment
- high priority area for fuel load reduction treatments

IV. Main Stand Mixed Conifer

Description & History:

This large 20+ acre unit running along the lower reaches of the property up to the eastern fenceline is dominated by redwood and Douglas fir, with a mixed hardwood subcanopy including California bay, coast live oak, madrone, and tanoak sprouts. The tanoak in this area has been virtually eliminated by SOD, and a nearly solid 2-acre portion of this unit is littered with tanoak snags and fallen woody debris, making this section dangerous for hikers. The eastern most skid road, now a walking trail, runs on the north slope of the lower reaches of Calypso Creek along the eastern edge of the property, walking through the heart of this unit and the SOD damage. The trail is nearly impassable due to fallen tanoaks. Hundreds of redwood seedlings were planted in January of 2006, with about a 10% success rate. Interestingly, a few new species such as *Ceanothus thrysiflorus* have appeared in the SOD dieoff that have not previously been seen on the property.

A rare albino redwood has been found in the middle of the unit, just north of the SOD dieoff, and was catalogued by Tom Stapleton as part of his effort to document albino redwoods throughout the coastal redwood belt.

This unit contains the lower reaches of the only Class II and three largest Class III subwatersheds that drain off of the property, which tend to have the most volume and hence highest level of erosional impact. They drain through the neighboring property and directly into the steelhead and Coho salmon bearing Dutchbill Creek. Each of these discharge points as these drainages leave the property would be an ideal location for monitoring water quality and turbidity during the rainy season as an indicator of the efficacy of upstream management.

Spotted owl individuals and pellets have been repeatedly located in the central to northeastern portion of this unit, especially in the span from 2012-2015. This informs a management priority of maintaining a more open forest structure to support aerial foraging by spotted owls. Douglas' squirrels and redwood chipmunk have also been observed uniquely in this unit.

The legacy logging road and trail network in this unit is significantly impacted by falling SOD trees, and needs clearing and chainsaw work to stay maintained.

There have been ongoing issues over the years with trespassers along the northern and eastern boundary; signs need to be maintained.

Management Objectives & Strategies:

- manage for an open forest structure on behalf of spotted owl and other wildlife
- thin and limb for fuel load reduction and enhancement of biodiversity
- manage succession of tanoak die-off to encourage diversity and hardwoods
- monitor and manage drainages for water quality and quantity
- clear and maintain roads and trails for fire safety, ongoing management, and recreational access
- maintain signage for trespassing along northeastern boundaries

V. Old Growth Douglas Fir

Description & History: A 5 acre stand of old growth Douglas fir straddles two hilltops, including the knoll on the western boundary, just north of the Horse Pasture, and crossing the Nursery Road to the knoll that sits between the nursery and the barn. The knoll of the eastern portion contains a trail that connects the nursery parking lot to the Sowing Circle storage unit, water tanks, well, and ending up down at the deer fence gate that leads to the barn.

This unit represents a forest stand with unique characteristics, as it is dominated by old growth Douglas fir, with DBH ranging from 2" – 40". An occasional California bay, and hazel dot the subcanopy, with yerba de selva and sword fern in the understory.

The most productive spring and one of the more productive seeps are within this unit, which have been managed for vegetation diversity by planting chain fern, lady fern, and elk clover. These pools could be improved to provide water in the dry season for wildlife. The Corporate Yard drainage below Thimble Seep is significantly erosive with numerous headcuts and delivery of sediment to Calypso Creek below, and managers have actively brushpacked the gullies with slash and regraded the road to allow for sediment storage on the old road bed.

Sonoma tree vole has nested in Douglas fir in the western portion of this section, likely due to its old growth characteristics. Wild turkeys have the only observed roosting area in the larger diameter Douglas fir of this unit.

Right above the barn, a pair of red-shouldered hawks have maintained an active nest for several years. Pygmy nuthatch has also been documented in a Douglas fir snag near to the upper nursery area.

Management Objectives & Strategies:

- manage towards old growth characteristics

- enhance habitat for spotted owl and Sonoma tree vole
- improve springs and seeps to create year-round water source for wildlife
- regrade the old road along Calypso near the upper foot bridge crossing to enhance sediment storage and continue to mitigate headcut migration upstream of the drainage
- maintain trails and access
- manage hazard trees around the water tanks, well and storage units

6.1.5. Management Unit - Core Area

Description & History:

The ten acres within the deer fence at OAEC is known as the Core Area, and contains the residential and organizational infrastructure including houses and outbuildings, gardens, power lines, plumbing, animal structures, and parking lots. It is bordered on the southern edge by the Southeast Corner mixed conifer management unit, and the eastern edge is demarcated by the property boundary; the northern and western boundaries are marked by the deer fence.

The Core Area is heavily vegetated, landscaped with mostly edible and some ornamental landscaping, and the edges of the Core Area are thick with a densely stocked mixed conifer and hardwood forest. Because of the presence of residential structures, a densely stocked forest, as well as its adjacency to fire vectors such as Coleman Valley Road and the town of Occidental, which is about ¼ of a mile downhill, the Core Area is the highest priority for fuel load reduction and fire safety. The way the topography works, the Core Area sits on a finger-ridge of a peninsula with southeast facing slopes that are part of a canyon that runs to the north end of Occidental; the northeast facing slopes are part of Calypso Creek canyon moving towards Camp Meeker. Both of these canyons can help to funnel uncontrolled fire up to the Core Area.

Due to the significant amount of impervious surfaces (rooftops and roads) there is a substantial amount of runoff which is managed with swales and rain gardens to encourage infiltration and decrease runoff.

The gardens within the Core Area are protected within the organic agriculture conservation easement held by Sonoma Land Trust (see Appendix).

The wildlife biodiversity of the Core Area is significantly enhanced by the ample presence of water and food and cover resources throughout the gardens. The bird and insect biodiversity are particularly notable in the Core Area. Because of the deer fence which excludes all deer browse pressure, the plants are not browsed at all, which has a unique impact on the native plant life which receives a great amount of deer pressure outside of the deer fence.

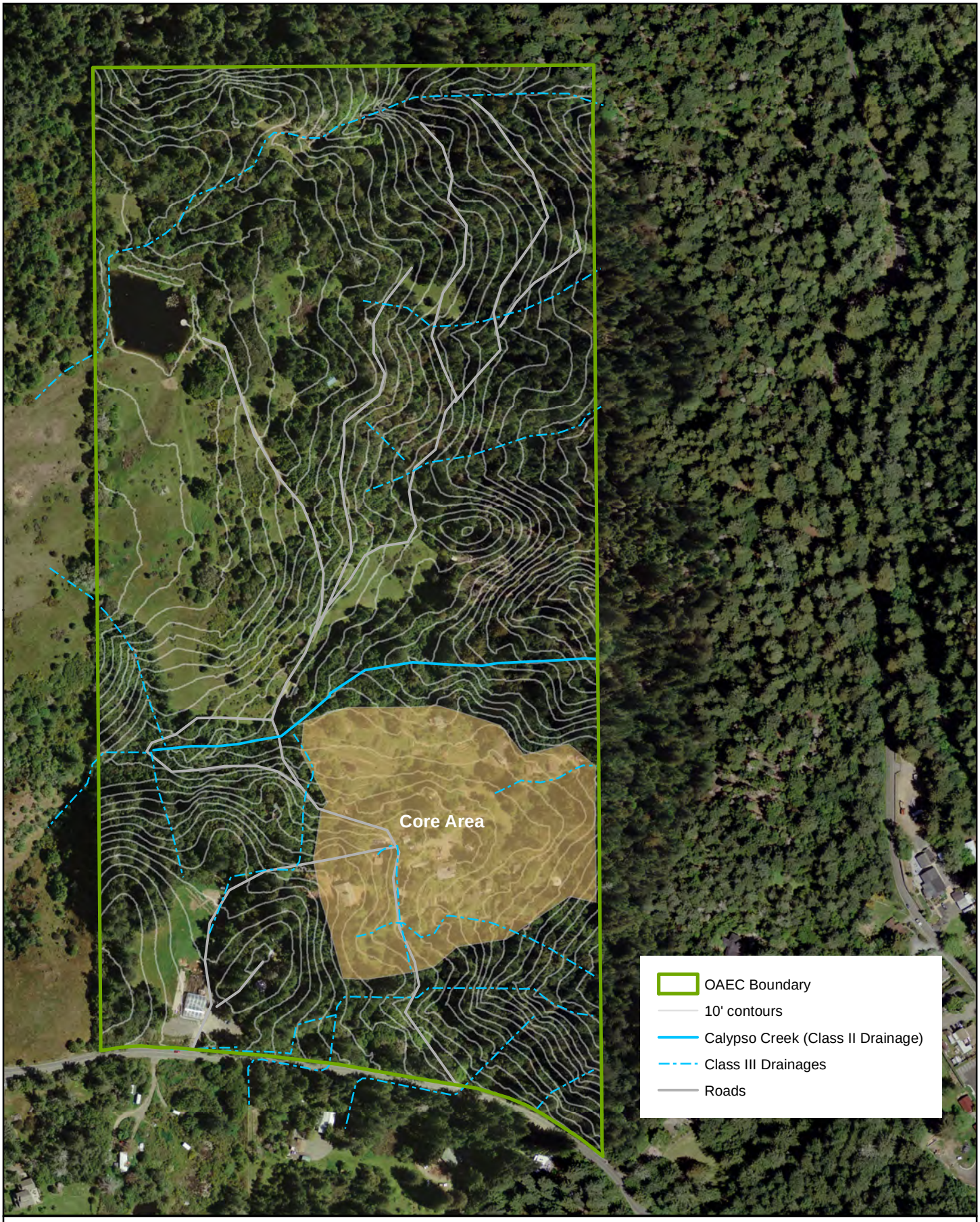

Figure 7.5 Core Area

0 125 250 500 Feet

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Sources
Aerial Imagery: ESRI

There is a zone between the Woods Yurt and Adam & Katy's that contains false lupine (*Thermopsis* sp.), a rhizomatous native that looks like lupine, which is being crowded out and needs tending.

Management Objectives & Strategies:

1. Prioritize fuel load reduction and defensible space surrounding core area and structures, and ingress / egress routes (see map)
2. Improve the fencing for containment of goats to maintain thinned understory
3. Continue organic gardening and facility maintenance

6.1.6. Drainages & Habitat Ponds

I. Calypso Creek

Calypso Creek (named by OAEC staff and not marked officially as such on maps) is OAEC's only Class II stream, due to the year-round presence of aquatic life. Calypso Creek runs from the west to the east, and feeds into Dutchbill Creek, a Coho salmon and steelhead trout bearing stream.

There is significant channel incision and bank failure along the upper reach of Calypso from where the water enters the property from the neighbors on the western boundary at Point T to Pond Road Culvert 1 (see Figure 8). The section of Calypso just upstream from Pond Road Culvert 1 at Point U has opportunities for reconnecting the flow with the inset flood plain for sediment retention and recharge. Just to the east of the culvert there is a year-round instream pool that is significantly utilized by wildlife. There are portions of the lower reach of the stream further to the east of the crossing at Points V and W also experiencing significant headcutting which need attention as well. There may be some opportunities for erosion mitigation although due to its larger scale and status as a Class II drainage would require substantial engineering and material.

Management Strategies & Objectives:

- Continue planting riparian species along the creek (see Section IV of Management Units)

II. Class III Drainages

All of the Class III drainages at OAEC run generally from the west to the east, draining into Dutchbill Creek. They have been managed over the last 20 years of OAEC's history for enhancing water quantity and quality through erosion control, groundwater recharge, and sediment reduction efforts.

Many of the Class III drainages require ongoing, small-scale brush-packing of gullies to

mitigate headcutting and erosion; these are marked on the Drainage & Ponds map as Points F through R.

The lower portion of Magic Rocks Drainage at Point S, just upstream of the eastern property line, shows significant points of incision and bank failure, at a scale not treatable with brush packing. It is highly inaccessible and treatments would likely be expensive and require engineering.

Management Strategies & Objectives:

- Enhance water quality and quantity through continued erosion control, groundwater recharge, and sediment reduction

III. Pond

The 6 acre-foot pond at OAEC located next to the Big Meadow near the top of the watershed was built in the days when the Farallones Institute managed the property. This fills with surface flow from the surrounding several acres of uplands.

Currently the pond edges contain several species of willow, a few younger coast live oaks, and along the lower water line you will find cattail and tule. The northern and western edges of the walkway around the pond are overtaken with watsonia, an invasive bulb from South Africa which is mowed annually before it sets seed. The invasive broom sedge (*Andropogon virginicus)* has established itself around the edge of the pond along the high water line; it is unlikely to be eradicated, as ongoing management has not reduced its population. It also does not seem to be expanding above the high water line and thus is not a high priority for management.

The pond provides crucial habitat for Western pond turtle (*Clemmys marmorata*), listed as a Species of Special Concern in California, as well as numerous other aquatic and amphibious species such as Pacific chorus frog. A barrier "fish fence" was built at the pond overflow to create a portion of the pond with water for Pacific chorus frogs to breed out of reach of the non-native bass which are very successful in the pond. An SOD oak has recently fallen on this barrier and the fish fence needs revamping. A potential option is to cut one branch of the oak in order to be able to restring the fence, and then leave the remainder of the oak in place as a deer browse barrier, and place cuttings of grey willow along the overflow. This will eventually provide a visual barrier for the fish fence as the big oak slowly decomposes over time.

The spillway is lined with concrete for the first bit, and then transitions to a deeply eroded streambed created by the spillway that abandoned the historic drainage flow. There is significant erosion in the lower portion of the spillway. To reduce headcutting, energy needs to be dissipated at the terminus of the spillway, and for the next 100 feet

or so channel bed stabilization is required. There is an opportunity to reconnect and backwater the old channel to use it as a sediment retention recharge area. At Point X, there are a series of cross-channel brush "beaver analog dams" that were installed in 2004 by a crew from Marin Conservation Corps with slash from thinning and limbing. To mitigate the incision (the actual headcut is further upstream), the height of the streamflow was raised to encourage backflow to the historic stream channel, which created a backwatered infiltration area. These brush check dams need to be rebuilt and improved down to the old haul road crossing at Point Y.

The next reach from Point Y to the Magic Rocks Meadow there is a series of headcuts, marked by Point Z, which need to be treated with placement of rocks to mitigate headcut migration and preserve open water for wildlife pools for drinking later into the season, a project which could potentially be supported with funding from EQIP and NRCS. There is a significant amount of slash to be generated by thinning and limbing below the pond which could contribute to gully packing efforts, and rock will need to be brought in for treating the lower portions of the drainage.

There is small-scale headcut mitigation needed for the two drainages that fill the pond where it hits the willows on the southwestern side of the fence. This can be accomplished with brush-packing from thinning the encroaching conifers along the western boundary.

<u>Management Objectives & Strategies:</u>

- Continue to maintain pond for agricultural water use and recreation
- Plant additional clusters of water-loving plants from high to low water, especially culturally significant plants such as elderberry, willow, dogwood, and tule, and manage these plants for cultural uses
- Improve pond turtle habitat in pond

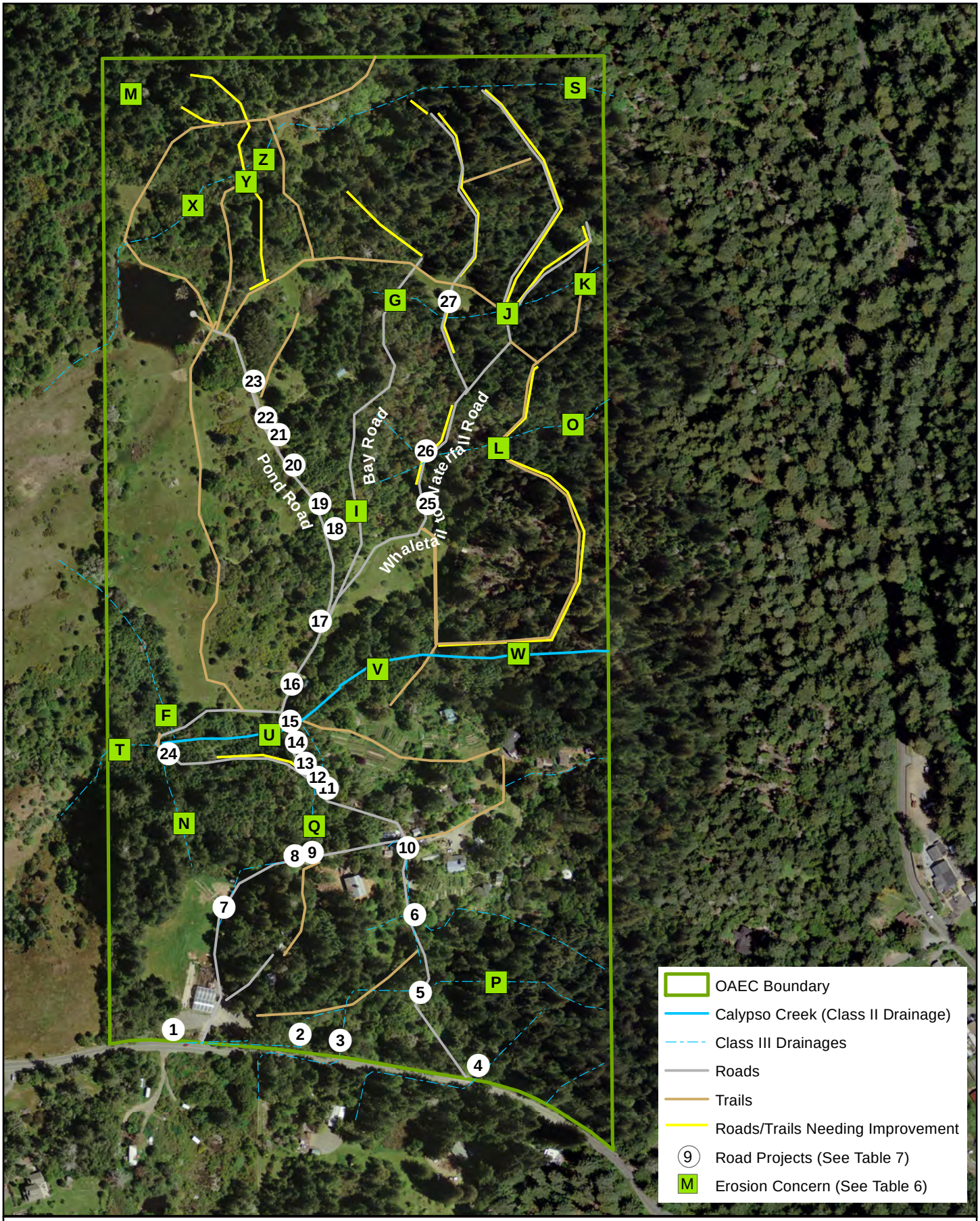

Figure 8. Roads and Drainages

0 125 250 500 Feet

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Sources
Aerial Imagery: ESRI

Table 6. Erosion Concerns and Projects

Map ID	Association	Feature	Action Items/Projects
T to U	Calypso Creek	Channel & floodplain	Reconnect to floodplain
V & W	Calypso Creek	Headcuts	Design headcut repair
F thru R	Class III drainages	Small headcuts	Brush check dams
S	Magic Rocks drainage	Incision, bank failure	Engineer repair? Inaccessible
Pond	Pond	Fish fence	Repair
Pond	Pond	Spillway	Energy dissipator, channel bed stabilization
X to Y	Creek below pond	Headcuts	Rock headcut stabilization
Z	Creek below pond	Headcuts	Rock headcut stabilization & brush packing
Pond	Upstream of pond	Headcuts	Brush check dams

Table 7. Summary of Road Projects

See Figure 8 for map.

Map ID	Association	Feature	Action items/projects
1	Coleman Valley Rd & Nursery Rd.	Runoff from C.V. Rd.	Additional plantings
2	Coleman Valley Rd & Pear Meadow	Runoff from C.V. Rd. & upper parking	Improve bio-swale
3	Coleman Valley Rd & Pear Meadow	18" County culvert	Energy dissipators
4	Coleman Valley Rd.	County culvert	Rock, brush, retention basin
5	Main driveway	Culvert	Annual maintenance
6	Main driveway	Culvert, ditch, sediment basin	maintain, expand infiltr ditch?
7	Nursery road	Culvert, sediment basin	Enhance basin
8	Nursery road	Rolling dip	Re-grade
9	Nursery road	Culvert	Annual maintenance
Q	Home Spring drainage	Headcuts below culvert	Brush packing
10	Pond Rd. /Garden view cabin	rolling dip	To be installed 2015
11	Pond Road	Culvert 1	Rock energy dissipator
12	Pond Road	critical dip	Re-grade
13	Pond Road	Insloped ditch	Annual maintenance
14	Pond Road	Rolling dip #1	Regrading/maintenance
15	Pond Road	Culvert 2	Rock energy dissipator at outlet
16	Pond Road	Rolling dip #2	Regrading/maintenance
17	Pond Road	Rolling dip #3	Regrading/maintenance
18	Pond Road	Rolling dip #4	Regrading/maintenance
19	Pond Road	Culvert 3	Sediment basin & rock sill

Map ID	Association	Feature	Action items/projects
20	Pond Road	Rolling dip #5	Annual maintenance
21	Pond Road	Through-cut	Needs a design solution
22	Pond Road	Rolling dip #6	Annual maintenance
23	Pond Road	Rolling dip #7	Annual maintenance
24	Calypso Loop	Sediment trap	Re-grade sediment trap
25, 26, 27	Whaletail-Waterfall Road	Wet crossings	Repair headcuts at wet crossings
Pond road general	Pond Road	Encroaching vegetation	Annual maintenance
Bay road general	Bay Road	Encroaching vegetation	Annual maintenance
Roads marked yellow	Plum Rock	Encroaching vegetation	Clear vegetation selectively
	Bay Road	Encroaching vegetation	Clear vegetation selectively
	Shooting Star Loop	Encroaching vegetation	Clear vegetation selectively
	Camp Meeker Trail	Trespass	Signage, fence
	Lower Loop Trail	Encroaching vegetation	Clear vegetation selectively
	Whaletail-Waterfall Road	Encroaching vegetation	Extend as foot trail

An extensive network of roads and trails provides access throughout OAEC for vehicle traffic foot travelers (see Figure 8). Additionally, the roads and trails are utilized by wildlife as corridors to movement around the property and adjacent lands. The majority of the roads are legacy ranch roads and logging haul roads and skid trails, in varying condition; Table 7 provides a summary of work that needs to be completed on the road system.

There are two access points to the property from Coleman Valley Road: the main driveway which leads to the core area, and the nursery parking lot entrance. There is parking at both locations, where staff, residents, and visitors park their vehicles during their stay. The additional ingress/egress offered by the second nursery entrance provides a continuous loop in the case of fire or other emergency, as it is connected to the core area parking via a driveway that passes by the barn.

The main access from the core area to the backcountry and the northern portion of the property is via the Pond Road, which is a well-maintained road, accessible for two wheel drive vehicles. It was improved as part of a Fish Friendly Roads demonstration project in 2006, with the installation of rolling dips and improved culverts to reduce erosion and sediment delivery to Dutchbill Creek. As part of a watershed-wide

sediment reduction strategy for Coho salmon and steelhead trout, OAEC was one of seven properties in the Dutchbill Creek watershed to receive grant funding. A Gold Ridge Resource Conservation District grant proposal was funded by the California Dept. of Fish & Wildlife, and inventory and implementation was completed by Gold Ridge RCD and Pacific Watershed Associates as per the Fish Friendly Roads protocol. The Pond Road is regularly used by tractor, truck, and foot to access the property for management work and recreation, and receives the most traffic.

Other than the Pond Road, all of the roads and trails at OAEC have suffered from fallen SOD trees that block the roads in varying degrees. There is continued and ongoing work to clear the roads, but there is much remaining work, and new trees fall and add to the challenge.

In addition, all of the Class III drainages are experiencing incision and headcutting, especially at the road crossings. Ongoing gully packing with slash has vastly improved the incisions, but all of the wet crossings need ongoing headcut mitigation work, especially in the lower reaches.

The following list outlines specific areas of the road and trail network that need work, as well as objectives and strategies.

6.1.7. Road Maintenance Objectives & Strategies

I. Coleman Valley Road

Coleman Valley Road runs along the southern boundary of OAEC, and discharges stormwater onto the property at several locations, causing significant erosion.

At Point 1 (Figure 8), there is runoff entering the property from Coleman Valley Road just above the nursery entrance. In fall of 2008, OAEC staff designed and installed a series of digitated ditches to retain sediment and recharge the groundwater, which were planted with native hedgerow plants in February of 2009. The hedgerow could be enhanced with more plantings, perhaps through a project with EQIP and NRCS. The overflow goes into a culvert under the nursery driveway and releases into the upper Pear Meadow.

At Point 2, in the western upper portion of Pear Meadow, the culvert was intentionally blocked to divert runoff into a hand-dug swale in the upper part of the meadow. The runoff from the upper nursery parking lot goes into the county ditch and is brought into pear meadow. The swale in this zone could be increased in size to handle the flow from large rainfall events and improve water retention.

At Point 3, there is an 18" country road culvert that discharges water from the adjacent parcels on the opposite (southern) side of Coleman Valley Road, with significant

acreage contributing to runoff. This causes significant headcutting and erosion in the lower Pear Meadow, leading into the Pool Spring along the Main Entry driveway, and is then conveyed by the Main Driveway culvert under the driveway. The waterflow in the Pool Spring Drainage below the Main Driveway culvert is significantly exacerbating the erosion of the channel below the driveway.

At Point 4 there is a county culvert which delivers significant volumes of high velocity water from Coleman Valley Road. Prior to OAEC's arrival, there were rocks placed below the culvert in an attempt to dissipate the flow. They have been relatively effective at stopping the erosion. A significant amount of the slash from the Shaded Fuel Break project in 2004 was systematically packed into this gully, and over the years there has been an attempt to create a large retention basin, though it appears to need a bigger fix. It is unclear whether or not additional brush packing will work, or if it needs rockwork, which could potentially be an NRCS project.

II. Main Driveway

The inboard drainage along the Main Driveway needs to be maintained and cleaned out ongoingly.

Main Driveway Culvert 1 can be found at Point 5. Where Main Driveway Culvert 2 discharges at Point 6, there is a short ditch that leads to either the sediment retention and recharge basin or the south garden pond (via a flow splitter), and needs to be expanded in size and depth. This will help mitigate the headcuts along the South Garden Drainage behind Dave and Kendall's house and Dougo's house.

III. Nursery Road

The road runoff from the Nursery Road is first intercepted in the upper "swedge" (a swale planted with a native hedgerow) in the lower portion of the Horse Pasture. Excess flow goes under the road through Nursery Road Culvert 1 (Point 7) into a large sediment basin on the east side of the road. Below the basin there is a wetland area with willow and Himalayan blackberry below, which could be enhanced by excavating a new retention/recharge basin in this zone, and planted with native riparian plantings.

The rolling dip at Point 8 between the two culverts along the Nursery Road drains to the northwest side of the road, and needs some reshaping and minor regarding to increase its effectiveness.

Nursery Road Culvert 2 at Point 9 was replaced as part of the Fish Friendly Road project and the outlets were graded. There has been significant planting of native plants on the inlet and outlet of the culvert, as it stays wet well into the dry season.

Below the Nursery Road along the Home Spring Drainage, the discharge from the Nursery Road Culvert 2 has created a series of headcuts in the upper portion near the

road, which have been mitigated by the installation of a wire-caged rock gabion in the late 1990s (Point Q). Ongoing brush packing is needed for channel incision mitigation along the entire drainage.

IV. Pond Road

The Pond Road starts at the parking lot near the new guest housing facilities. In summer of 2015 there will be a rolling dip installed above the Garden View cabin to shed water off of the road (Point 10). Just outside the Pond Road deer fence gate, there are a series of sediment basins for the Sedge Seep on the southwest side of the road. The outlet of Pond Road Culvert 1 (Point 11), which discharges to the North Garden Pond, needs improvement to dissipate the energy of the outflow, perhaps utilizing well-placed rock to manage the water as it flows into the North Garden Pond.

There is a critical dip (Point 12) just below the Pond Road Culvert 1 that needs to be reshaped with minor regrading to increase its effectiveness. It has been designated as a critical dip to manage a potential blockage and overflow event from Pond Road Culvert 1, and ensure that water flowing onto the road is discharged back towards the North Garden Pond instead of the steep throughcut towards Calypso Creek.

Between the critical dip and Rolling Dip 1 there is an insloped ditch (Point 13) which needs to be kept clean through ongoing maintenance to ensure the ditch continues to be effective in carrying water.

Lower along the road, at Rolling Dip 1 (Point 14) there has been substantial brush packing for sediment retention on the outlet side of the ditch due to mitigate sediment delivery to Calypso Creek.

Pond Road Culvert 2 (Point 15) that drains from the North Garden pond and daylights into the Calypso Pool just east of the road crossing needs to be rocked to reduce incision and headcutting.

Rolling Dip 2 (Point 16) needs minor regarding to enhance the outsloping to more effectively drain the road. Both Rolling Dips 2 and 3 (Point 17) need ongoing maintenance to ensure their ongoing functionality and encourage adequate sediment deposition on the discharge side of the dip, utilizing small-scale brush fascines and the planting of perennial native bunch grasses. Rolling Dip 4 (Point 18) needs similar maintenance, and is prime habitat for California fescue, which should be sown there after maintenance.

At Pond Road Culvert 3 (Point 19), due to the extended weepy nature of this location, the area is ideal to excavate a small sediment basin to hold water later into the spring for wildlife. A rock level sill on the berm wall sowed with native seeds needs to be built to handle the overflow.

Between Rolling Dips 5 (Point 20) and 6 (Point 21) there is a throughcut (Point 22) on Pond Road, which needs further analysis to come up with a plan to slow down or stop the process of throughcutting. Rolling Dips 5, 6 and 7 (Point 23) need ongoing maintenance as well.

For all stretches of this road, ongoing maintenance includes trimming overhanging branches and removing saplings from the roadbed. In addition, as the main access to the pond, the edges of the road on both sides are maintained as a priority for aesthetics, demonstration, and education value.

V. Bay Road

Bay Road runs north/south between the Pond Road and the Whaletail – Waterfall Road. It offers truck and tractor access to the middle portion of the property, and has been maintained fairly consistently to maintain access. Ongoing maintenance includes trimming overhanging branches and removing saplings from the roadbed.

VI. Whaletail Waterfall Road

The Whaletail – Waterfall road is the lowermost of the three roads that runs north/south. Substantial amounts of Douglas fir are encroaching on the roadbed, especially on northern section of this road, which needs improvement as it heads north past the meadow; there are multiple wet crossings with headcuts that need substantial work, likely accomplishable with brushpacking gullies from the slash generated by removing encroaching firs (see map Points C, D, and E). This road also requires ongoing maintenance of trimming overhanging branches and removing saplings from the roadbed.

VII. Yellow Roads

All of the road sections marked in yellow on the map are sections of the road that are currently impassable, but that could be opened up with some work, outlined as follows:

- **Plum Rock** – The section of the road that goes past Plum Rock, behind Magic Rocks and around to Pedicularis / Peppergrass zone needs clearing to be opened up and accessible. In the northern reaches of Plum Rock Road to NW Corner Road there are also downed trees; the roadbed in this area has both saplings and trunks, while the lower section only contains saplings and could be drivable by removing them.
- **Bay Road -** The northern leg of Bay Road past Sunrise that drops into the flat is currently impassable, and needs clearing of Douglas fir saplings to be drivable.
- **Shooting Star Loop –** The Pond Road that runs below the palapa and seating area needs light thinning to maintain access along the entire trail. It previously was used as tractor access and could be opened up again.
- **Camp Meeker Trail** – The Magic Rocks to Camp Meeker leg needs signage for

trespassing, and maybe run a wire across it to prohibit trespassers.

- **Lower Loop Trail-** The Lower Loop through the tanoak graveyard is barely passable and needs substantial clearing work to remove downed SOD trees and logs from the trail.
- **Calypso Loop** - On the road above Calypso there is a headcut associated with the creek coming down from the Corporate Yard; the road bed has been utilized as a sediment trap at Point 24, and needs more grading in order to remain effective.
- **Whaletail-Waterfall Road -** There is a section at the end of the road that could be extended as a foot trail for viewing the Magic Rocks Waterfall.

6.2. Property Boundaries, Trespass, Security

OAEC strives to manage the 80 acres within the context of the overall bioregion, watershed, and wildlife corridors, working closely with neighbors and community members to achieve shared land management goals. Neighboring the western boundary of the property is a homestead privately owned by two families, which includes founding members of the Farallones Institute. OAEC has collaborated with Global Student Exchange and neighbor Christopher Szecsey to co-manage the western boundary line, working together to remove encroaching conifers, protect regenerating hardwoods from herbivory, and planting native hedgerow plants to increase pollinator and bird forage. OAEC is bordered by St. Dorothy's Rest on the northern boundary, whose land managers are eager to collaborate with OAEC to achieve bioregional land management goals.

While neighborhood collaboration is prioritized, property line fencing, marking and patrolling is important to protect OAEC from liability issues, protect habitat from uncontrolled grazing by cattle, protect the area from firebrands, erosion-causing vehicular traffic, poaching, weed introduction – and so on. Most of the perimeter has old barbed wire fencing, however breaks in the fence due to trees or limbs falling were observed along the eastern and northern property lines. The two main entrances have livestock control – one with an electronically opening gate, and the other with a cattle guard.

Signage helps to inform and control public access. As a non-profit educational organization that hosts various programs and events open to the public, OAEC occasionally is open to the public. Visitors must attend either a public event (such as a plant sale or Chautauqua performance), or receive an invitation from a resident or staff person to enter the property.

6.3. Invasive Species Control

Table 3.2, the list of vegetation on the property, includes a number of exotic and invasive species. Control strategies are outlined in individual management unit sections above.

6.4. Disease & SOD

Since 1995, stands of coast live oak, black oak, and tanoak in California have died in alarming numbers to sudden oak death (SOD). Leaf symptoms are usually the first to appear with new growth drooping or turning yellow to brown. Leaf droop occurs on most or all of the crown rather than in a localized area. Other symptoms include dark sap oozing from trunks, bleeding cankers, attack by bark beetles, attack by a variety of fungi, and subsequent death of entire trees. The best source of new information is at the California Oak Mortality Task Force website, www.suddenoakdeath.org.

To reduce the fire hazard posed by standing dead and dying SOD trees, thinning dense patches of bay and tanoak, and lopping and scattering slash is recommended. See Appendix 1, "Standard Practices and Specifications" for more detail.

Four notable one-half to one acre patches within Unit IV (see Figure 9) were surveyed along the eastern property line. Some work has been done to clear the understory in one or two of these areas. Planting redwood seedlings to occupy the site in the long-run is recommended; several hundred were planted, with about a 20% survival rate. Redwood seedlings must be planted in the late fall or early winter with stock that is at least two years old to ensure success.

Table 8. GPS Locations of SOD Patches

Waypoint	GPS Coordinates	Plot #	Acres	Comments
163	N 38° 24.829' W122° 57.263'	18	0.75	SOD
164	N 38° 24.912' W122° 57.255'	19	1.25	SOD
	38.415966° -122.954186°	20	0.75	SOD Google interpolation
166	N 38° 25.075' W122° 57.249'	22.5	1.25	SOD

Disease in conifers on the property is limited. The fires that occurred in the early 1900s created wounds in residual redwood and sprouting redwood stumps that allowed for some pockets of rot to develop in the growing trees. This does not appear to be a widespread problem in the main redwood stand (Unit IV).

Some of the older Douglas fir in Unit V have some *Phellinus pini* or red ring rot. This is a small shelf fungus or conk that usually enters older or suppressed trees at broken branch scars. It spreads to other trees by wind-born spores. It can cause heart rot and can gradually spread within the tree. If the tree is harvested and milled for lumber, the rot is no longer viable and does not spread to uninfected wood. The fungus does not appear to be too prolific on the property; however one would expect it to spread from the larger trees to other Douglas fir in time.

6.5. Revegetation and Reforestation

Revegetation refers to planting a variety of native grass, forb, shrub and tree species for wildlife habitat enhancement, erosion control, water quality improvement, and aesthetic enjoyment. As a rule of thumb, in wildland areas, planting native species found naturally-occurring nearby and adapted to the general area is the accepted (and fundable) practice for habitat enhancement or restoration. Point Blue Conservation Science (pointblue.org) is continuing to develop a "climate-smart" spreadsheet for native plants that provide wildlife benefits throughout the year. This guide may expand our pallet of acceptable native revegetation species and is useful to ensure that insect and avian species have nectar, pollen, fruit and other plant amenities throughout periods of excessive rainfall, drought, heat or cold.

Reforestation refers primarily to planting of commercial species of trees. When a commercial timber harvest is made, the residual stand must have a legally required number of trees per acre – usually 300 seedlings. Larger trees that remain after harvest count as multiple seedlings. In areas of SOD, replacement of bay and tanoak with redwood seedlings may be appropriate as mentioned above. See Appendix 1, "Standard Practices and Specifications," for more detail.

6.6. Timber Stand Improvement

Timber stand improvement (TSI) refers to the thinning, pruning, and removal of disease and hazards in forested timber production areas prior to commercial harvest. Pre-commercial thinning is another term used. See Table 13 for specific areas. CALFIRE administers programs that help landowners with forest improvement practices. See the Available Assistance section of this report for more information. Thinning guidelines are outlined in the Fire Prevention and Fuel Management section of this report. See also the Timber Harvesting section.

6.7. Biomass Utilization and Carbon Sequestration

Portions of the property could be characterized as having a high amount of woody biomass –overly dense thickets of trees and/or shrubs, and dead or dying tanoaks

succumbing to the sudden oak death (SOD). These vegetation units can present a serious fuel load fire hazard. Reducing the density of the woody plants generates material that then needs to be treated by either lopping and scattering on the ground, splitting for firewood, chipping, strategically piled for wildlife habitat, used for the deliberate stuffing of headcut gullies to control erosion while reducing sedimentation and increasing groundwater recharge, layed in fascine like bundles as 'contour carbon catchments or other means.

The use of wood to produce electricity is an existing technology which has not reached a level of sustainability in our area. The cost of transporting the material to a cogeneration plant is prohibitive. The University of California has a woody biomass group that tracks the use of woody biomass for different purposes in the state.[11]

Biochar is a technology wherein wastewood is reduced to char in a reduced oxygen pyrolysis process. The resulting material is a valuable soil amendment and once buried, the carbon held in the char can remain trapped for hundreds to thousands of years creating an effective carbon sink.[12] A biochar retort could be stationed at OAEC to treat some of the forest thinnings. The resulting char could be spread on the land or sold as a soil amendment. However, the person-hours (cost) required to handle any significant amount of thinnings may exceed the short term capital returns. At a minimum, if slash piles are to be burned, the top-down, conservation burn technique should be employed. This is a biochar-producing technique wherein burn piles are constructed in a mostly vertical shape with approximately 50% air space between the wood pieces. Ignition is started at the top of the pile, thereby allowing the escaping gases to be consumed, which reduces air pollution by as much as 90% compared to conventional pile burning. Again, more time handling the wood is required than lop and scatter treatments.

Carbon sequestration generally refers to the ability of plants to sequester and store carbon in their tissue, acting as a sink for carbon dioxide and potentially slowing the accumulation of atmospheric carbon. Forests hold on to large amounts of atmospheric carbon. However a forest fire will release the stored carbon to the atmosphere. Thinning a dense stand for fire hazard reduction can therefore promote carbon sequestration. According to some reports, older trees (the ones remaining to grow after thinning) sequester more carbon than smaller ones – thus reinforcing the goal of promoting the development of old growth.

Recent studies are underway that indicate native perennial grasslands are a significant habitat for carbon sequestration.[13]

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[11] http://ucanr.org/Woodybiomass
[12] Judy Harwood, Mendocino County Woody Biomass Working Group. http://MendoFutures.org
[13] See www.marincarbonproject.org

6.8. Timber Harvesting, Conifer Stand Descriptions

When timber is harvested and sold, it is considered to be a commercial operation and is subject to regulation by the California Department of Forestry and Fire Protection (Cal Fire) and the Forest Practice Rules. Owners of harvested areas are required to submit a detailed timber harvest plan (THP) prepared by a Registered Professional Forester. See http://calfire.ca.gov/resource_mgt/downloads/CDFSROLE20057_05.pdf for more information on the THP process.

6.8.1. Exemptions

Certain exemptions to THP preparation are allowed. One must apply to CalFire for an exemption permit. Here are a few excerpts from section 1038 of the California forest practice act: "A person conducting timber operations under any exemption shall be limited to one year from the date of receipt by the Department, and shall comply with all operational provisions of the Forest Practice Act and District Forest Practice Rules applicable to 'Timber Harvest Plan,' 'THP,' and 'plan.'" THP exemptions are allowed for:

(a) Harvesting Christmas trees.

(b) Harvesting dead, dying or diseased trees of any size, fuelwood or split products in amounts less than 10% of the average volume per acre…

(c) The cutting or removal of trees in compliance with sections 4290 and 4291 which eliminates the vertical continuity of vegetative fuels and the horizontal continuity of tree crowns for the purpose of reducing flammable materials and maintaining a fuelbreak to reduce fire spread, duration, and intensity.

Only trees within one-hundred-fifty feet from any point of an approved and legally permitted structure that complies with the California Building Code may be harvested. On June 22, 2015, an emergency rulemaking action became effective to expand the distance to three hundred feet due to drought.

6.8.2. General Harvest Plan Guidelines

- All timber harvest plans, including exemptions, require an archaeological records check and survey. Similar requirements may apply to other projects that involve ground disturbance. Damage to sites may result in fines. CDF retains a regional archaeologist who may be available for on-site inspections. See list of contacts in section 6.8.2.
- Protect areas around watercourses and cultural sites by clear demarcation of 100-foot wide exclusion areas in which only small hand tools are allowed, heavy equipment is excluded, and monitoring is required during harvest operations
- Should cultural artifacts be discovered during the operation, work in the area must stop immediately. A qualified person trained in archaeology must then evaluate the site to help determine the significance and level of protection required

- Harvest the suppressed, deformed and unhealthy trees when feasible while leaving one to two snags per acre for wildlife
- Retain healthy trees for future cycles
- Maintain adequate canopy cover to protect soil and understory
- If larger openings develop in harvested areas, consider planting redwood and fir seedlings in the early winter months
- Calculate volume growth rates and harvest at or below the rate of growth

6.8.3. Harvesting Goals, and Silvicultural Methods

The over-all goal for the structure of the OAEC conifer forests is to promote the development of mixed-age stands with a discontinuous, multi-level canopy. Ideally old growth elements would be allowed to develop as well. Commercial harvesting is not a priority for the owners, however, periodic thinning of sizeable trees to be used for on-site projects may occur. Selection criteria should include not only what material is need for a project, but how the forest stand will fare with tree removal: regeneration, release, habitat, erosion, etc.

Commercial thinning from time to time may be appropriate for many reasons: capture mortality of suppressed trees, allow more growing room for different age groups and diverse species, reduce the fire hazard, etc. A healthy forest has a diversity of age and size classes, and a variety of tree and understory species. This type of stand may not grow the maximum amount of timber, but will be less of a fire hazard and provide other watershed benefits. The degree to which a stand is thinned or opened up should also be balanced by the fact that the more sunlight that reaches the forest floor, the more the tanoak and bay will re-sprout in certain areas. Because of the Sudden Oak Disease Syndrome (SOD), we do not need the most susceptible trees (tanoak and bay) to increase in high fire hazard areas.

A hypothetical commercial scenario at OAEC would include the following:
In an active commercial forest with a conservative selective harvest regime, one would harvest just under the annual growth (2.2%) on a periodic basis. For example the 85-year-old forest (Unit IV, Figure 9) covers 19.3 acres (less the SOD acres - see Table 9 below). On a 10-year periodic harvest one could harvest slightly less than the volume grown over 10 years, for a realization of (2.2% x 10yrs x 19.3acres x 89,900 bd.ft. per acre) 381,714 board feet. In ten years' time, another 381,714 (or more but just less of the new growth) could be harvested and so on. To put this into perspective, the "average" tree in area IV is 25 inches in diameter, 130 feet tall, with a volume of 681 board feet. OAEC does not intend to manage the property this way at this time, but it is good to have an understanding of what reasonable limits are and what the neighbors with similar forests might be considering. As it is, some conveniently located trees may be utilized for use on the land, some trees left to develop old growth characteristics, and some thinning applied to maintain a healthy forest and a safe shaded fuel break

(see section 7.2 below). There is little likelihood that there would be harvesting more than the growth rate under current management. As management and personnel change over time, it would be good to identify which trees or areas are to be nurtured to become old growth and which could be harvested. Methodologies for guiding this process include:

- affix signage to some of the special trees to be saved
- identify no-cut areas on the Stewardship map
- follow "thinning from below" guidelines (See appendix)
- require that any plans to fell trees on the property be reviewed by an appointed individual with a thorough grasp of this Stewardship plan, community relations, and forest practices

6.8.4. Tree Stand Descriptions, Brief Recommendations

Table 9 and Figure 9, "Forest Units," describe the larger units of trees. The largest contiguous forested area is described as Unit IV along the eastern and northern property lines.

Unit I: Dominated by bay and live oak transitioning to Redwood overstory, this area has been treated for fuel load reduction in the past. Some bay and fir regeneration is present in a fairly open understory spotted with ferns. Slopes exceed 30% (vertical/horizontal) in some areas resulting in a moderate erosion hazard rating. Recommend continuing with follow-up and maintain a shaded fuel break here.

Unit II: A mix of Douglas fir and live oaks, this area along Coleman Valley Road has been opened up to reduce fuel loads and serves as a fuel break. **Slash has been placed on contour to help control erosion and increase infiltration as well as providing habitat.** A few residual dead trees (snags) serve as good wildlife habitat. A rich and diverse understory incudes false Solomon's seal, ferns, poison oak, snowberry, and hazelnut as well as a patch of willows. Areas of invasives include periwinkle (*Vinca major*) and Scotch broom. Little to no conifer or oak regeneration. Recommend continuation of invasive removal and fuel reduction.

Unit III: Prairie and chaparral habitats are described elsewhere in this report.

Unit IV: This is the forested area that could be actively managed. Management goals would need to be compatible with the overall goals for the property as described in Section 2. In addition to providing opportunities for biodiversity, sequestration, and habitat, a portion of this area could be managed as a shaded fuel break as described in **Section 7.2**. Reduction of SOD hazards in the 4 tan oak patches has already been mentioned above with a reference to the specifications in Appendix 1. Slash reduction and replanting with redwoods is recommended.

The average age of dominant and co-dominant redwoods in this unit is 80 years

measured at 4.5 feet (DBH). The average basal area per acre measured for Unit IV is 318 square feet. This is 78% of a fully-stocked stand of the age and site quality according to published timber tables. Extrapolating on this, the current standing volume in this unit is roughly 89,900 board feet per acre, for a total of 1,735,070 board feet over the entire 19.3 acres. The current annual growth rate is about 2.2%. See previous section for a hypothetical commercial harvest regime. The understory in most of the stand is generally open with little biodiversity or regeneration due to the dense canopy.

Unit V: Dominated by Douglas fir and a few old-growth fir trees. This area has been thinned and pruned in the past. Future thinning should remove trees with broken or forked top unless they make good habitat trees. Monitor the spread of *Phellinus pini* (section 6.4) and consider removing infected trees. The understory is fairly open with some bay regeneration, False Solomon's seal and a good duff cover on 45% northeast facing slope.

Unit VI: Mostly bay and coast live oak, this area includes riparian habitat along Calypso creek and on up to a dryer hardwood forest adjacent to chaparral and grassland/prairie habitats. Part of a rich habitat mosaic. Continue fuel management, erosion control and habitat enhancement here.

Unit VII: A mix of white oak and black oak with Douglas fir and patches of California fescue in the understory. Maintain the fence-line and trails for recreational enjoyment and habitat protection here.

Table 9. Forest Units, WHR, & Basal Area

Forest Unit Map ID	Dominant Soil	General Location	Management Unit Title	Terrain	Acres	Timber Site Index*	Erosion Hazard Potential	Avg. Total Basal Area/Ac.*	DBH Range, (Average)	Growth Rate Bd.Ft./ Ac/yr*	WHR*** Habitats
I	HkG	Southeast	SE Corner Fir & RW	680' - 800' elevation, 30% to 40% slope, NE aspect	6.2	DF = 126 RW = 110	Moderate	540	7 to 51" (31)		COW + RDW /4/D
II	LgE	South P/L middle	Pear Meadow Unit: Fir & Oak Fuel Break	800' - 880' elevation, 18% slope, NE aspect	1.8	DF=120	Low	210	6 to 28" (17.5)		DFR+ COW /6/D
IV	HnG	East Property Line	main stand mixed conifer	680'-760' elevation,18% to 40% slope, East aspect	19.3	RW 140 (III)	High	318	6 to 48" (25)	2.2% 1,978	RDW, (DFR,Bay) /5+6/D
						Trees/Acre range: 100 – 490			% of fully stocked**: 78%		
IV SOD	HnG	East P/L			4.5			98	12 to 23" (21)		Bay-Tan Oak/2/S
						4 Sudden Oak Patches					
V	RoG		Old growth Doug fir	800' - 880' elevation, 27% slope, NE aspect	5	DF=120	Low	572	2 to 40" (18)		DFR/6/D
VI	RoG		Mixed hardwood	760' - 800' elevation, 12% slope, East aspect	12.9		Low	200			COW/3/D
VII	HkF	NW Corner	Mixed Conifer	780' - 840' elevation, 12% slope, NE aspect	8.3	DF=120-140	Low	240	12 to 36" (20)		COW+ DFR/4/M

Total Acres: 58

*Based on light sampling. Basal Area = cross sectional area of an acre of trees at a height of 4.5 feet (DBH = diameter at breast height)

**As a percent of fully stocked stand: California Forestry Handbook and USDA Bulletin 796 (Linquist & Palley) Fully stocked stand for this site is 407 square feet per acre

***See section 5.5 for an explanation of Wildlife Habitat Relationship (WHR) classifications

Photo 1. Example of Unit IV, 311 sq.ft. basal area Redwood overstory

Photo 2. Example of SOD patch in Unit IV. Basal area 90 sq. ft. with numerous tan oak and bay saplings in the dead brush

Photo 3. Example of unit V, Douglas fir, 572 sq. ft. basal area

Figure 9. Forest Units

0 125 250 500 Feet

N

Sources
Aerial Imagery: ESRI

6.9. Erosion Control

The most fertile portion of the soil profile is in the top few inches, and it takes years to develop. Erosion control measures are implemented to keep valuable soil in place where it can grow vegetation while keeping topsoil out of watercourses where it can reduce water quality to the detriment of aquatic life and human water users. Roads, skid trails, and log landings are the main causes for erosion on the property. Timber harvesting and other management activities should utilize existing trails and avoid construction of new trails. Some of the old skid trails have established stands of perennial grasses – avoid bulldozing these during management operations if possible.

6.9.1. Water breaks

The erosion hazard rating (EHR) shown in Table 10 varies from moderate to extreme as the steepness of the slopes increases. Refer back to the soils section, Table 2 and Figure 5 for soils and area locations. According to the Forest Practice Rules, water breaks (waterbars or rolling dips) should be installed and or maintained on formal paths, skid trails, and dirt roads before the rainy season at the following intervals:

Table 10. Maximum Distance between Water Breaks

***Percent hill slope*:**	**≤ 10%**	**11–25%**	**26–50%**	**>50%**
Extreme EHR	100′	75′	50′	50′
High EHR	150′	100′	75′	50′
Moderate EHR	200′	150′	100′	75′
Low EHR	300′	200′	150′	100′

However, the above intervals are minimal at best. **RULE OF THUMB: INSTALL WATERBREAKS ON DIRT ROAD SURFACES EVERY 50 TO 75 FEET.**

Note that exact placement of water breaks should fit local conditions and direct water onto stable slopes or energy dissipaters (e.g., rock, slash). Water breaks, rolling dips, wet crossings, [14] or other water conveyance structures are required whenever roads cross natural drainages. All these erosion control facilities should be monitored and maintained just before and during the winter season to prevent plugging and subsequent by-pass erosion. Culverts on back roads are most susceptible to failure. A culvert must be properly sized for the watershed acreage, frequently cleaned of debris, and installed in a dip in the road with rock or vegetation cover so that when it does plug the overflow can occur with minimal erosion. When calculating a culvert size for

[14] See Appendix 1: Standards and Specifications.

permanent roads, the culvert should be able to convey flows calculated for the 100-year storm event. Table 7 shows the current inventory of road erosion control facilities.

6.9.2. Seed and Mulch

Once off the road, the first and foremost method of erosion control is to keep the soil in place using vegetation and/or mulch. Bare soil erodes at much higher rates than vegetated soil or soil with a thick layer of forest litter or duff.

Maintaining forest canopy cover and ground cover reduces the erodibility of the slopes and increases the forest soil permeability. Mulches of forest duff, slash, straw, even rock can be used in areas that are too shady to grow ground covers. Application rates are from 3,000 to 4,000 pounds of straw per acre – one to two inches deep (over 4 inches deep will smother seeds). **Only weed-free straw or on-site straw must be used: straw cut on the property or rice straw or certified weed-free wheat or barley.** The introduction of yellow star thistle or other aggressive weeds is highly likely if any other straw is used. The best plan is to mow grasses on the property and spread them on bare areas. However, avoid using grasses from overly weedy areas.

Typically a cheap exotic annual grass seed is often prescribed for erosion control. These mixes may have very short-term effectiveness compared to native perennials. However, they can be allelopathic – preventing the germination of native seeds – and can grow to a tall rank monoculture which becomes a fire hazard as well as poor habitat. The best choice for grass seed is to use collect what is on the property, as there are some exceptional stands of natives that may have genetically adapted to the site over time. If one must purchase commercial seed, there are vendors who can provide coastal ecotypes of native perennials.

In more open canopy areas, the following native perennial grass mix (see Table 11 below) can be used with a light mulch cover. This is a fairly fail-safe, all around native grass mix. Install in the fall as follows: If the soil surface is crusted or compacted, scarify by raking or tilling. Broadcast seed. Rake, drag, or roll in seed to obtain a good seed to soil contact being careful not to bury the seed deeper than 1/4". On sloping ground that is susceptible to erosion, apply a cover of rice straw at the rate of approximately 3,000 pounds per acre, or ½" deep layer of screened (not nitrified) certified compost, or use a Bionet®-type natural fiber erosion control blanket. If using straw, water it down, apply a tackifier, or punch it to prevent it from blowing away. To encourage establishment of natives where other invasive species are present, it is often necessary to mow volunteer annuals in the spring before seed heads form and pull any noxious volunteer weeds.

Table 11. Native Perennial Seed Mix Example

Latin Name	**Common Name**	**Percent of Mix**
Bromus carinatus	California brome	25%
Elymus glaucus	blue wildrye	25%
Festuca rubra (Molate)	Molate red fescue	25%
Stipa pulchra	Purple needlegrass	25%
Total	**1.2 pounds per 1,000 sq. ft.**	

The above seeding rate is for hand broadcasting. Lower rates are possible with mechanical applications. Adjust species mix as appropriate.

6.9.3. Gully Repair

An inexpensive effective fix for small gullies is the brush check dam and brush packing in gullies, starting at the headcut and then working our way down. This can utilize thinnings and prunings from the forest as well as live willow stakes in areas where sun reaches the forest floor, and must be installed following details provided in the Typical Specifications section in ***Appendix 1***. Brush checks can be used as energy dissipaters for small ditch relief culvert outlets. It is essential that these features be keyed into the banks properly and that there is a u-shaped weir opening large enough to accommodate flows.

7. Fuel Management

7.1. Fire Hazard Zones – Defensible Space

Areas of highest risk or likelihood of ignition sources are near the cabins (wood stoves, electric fires) and downhill of the eastern property line (above Occidental and Bohemian Highway). Fire moves fastest upslope, and upslope of the road in in Occidental is a dense stand of trees. A high fire hazard rating in these areas is based on a combination of risk (the likelihood of a fire starting) and fire severity (a function of fuels, slope, weather, and prevailing winds).

The following table lists the area between a building and wildlands where the vegetation must be modified to reduce flammability.[15]

Table 12. Recommended Defensible Space

	0 – 20% Slope	**21 – 40% Slope**	**40% + Slope**
Grass	30 feet	100 feet	100 feet
Shrubs	100 feet	200 feet	200 feet
Trees	30 feet	100 feet	200 feet

[15] From University of Nevada Cooperative Extension *Living With Fire: AGuide for the Homeowner* www.extension.unr.edu/FIRE/FrontPage.html

Vegetation modification may include mowing, watering, planting of low flammable plants, creating areas of discontinuity between vegetation. The following is from California Public Resource Code:

> **4291**. Any person that owns, leases, controls, operates, or maintains any building or structure in, upon, or adjoining any mountainous area or forest-covered lands, brush-covered lands, or grass-covered lands, or any land which is covered with flammable material, shall at all times do all of the following:
>
> (a) Maintain around and adjacent to such building or structure a firebreak made by removing and clearing away, for a distance of not less than **30 feet** on each side thereof or to the property line, whichever is nearer, all flammable vegetation or other combustible growth. This subdivision does not apply to single specimens of trees, ornamental shrubbery, or similar plants which are used as ground cover, if they do not form a means of rapidly transmitting fire from the native growth to any building or structure.
>
> (b) Maintain around and adjacent to any such building or structure additional fire protection or firebreak made by removing all brush, flammable vegetation, or combustible growth which is located from 30 feet to **100 feet** from such building or structure or to the property line, whichever is nearer, as may be required by the director if he finds that, because of extra hazardous conditions, a firebreak of only **30 feet** around such building or structure is not sufficient to provide reasonable fire safety. Grass and other vegetation located more than 30 feet from such building or structure and less than 18 inches in height above the ground may be maintained where necessary to stabilize the soil and prevent erosion.
>
> (c) Remove that portion of any tree which extends within **10 feet** of the outlet of any chimney or stovepipe.
>
> (d) Maintain any tree adjacent to or overhanging any building free of dead or dying wood.
>
> (e) Maintain the roof of any structure free of leaves, needles, or other dead vegetative growth.
>
> (f) Provide and maintain at all times a screen over the outlet of every chimney or stovepipe that is attached to any fireplace, stove, or other device that burns any solid or liquid fuel. The screen shall be constructed of nonflammable material with openings of not more than one-half inch in size.
>
> (g) Except as provided in Section 18930 of the Health and Safety **Code**, the director may adopt regulations exempting structures with exteriors constructed entirely of nonflammable materials, or conditioned upon the contents and composition of same, he may vary the requirements respecting the removing or clearing away of flammable vegetation or other combustible growth with respect to the area surrounding said structures.
>
> No such exemption or variance shall apply unless and until the occupant

thereof, or if there be no occupant, then the owner thereof, files with the department, in such form as the director shall prescribe, a written consent to the inspection of the interior and contents of such structure to ascertain whether the provisions hereof and the regulations adopted hereunder are complied with at all times.

4291.1. (a) Notwithstanding Section 4021, a violation of Section **4291** is an infraction punishable by a fine of not less than one hundred dollars ($100), nor more than five hundred dollars ($500. If a person is convicted of a second violation of Section **4291** within five years, that person shall be punished by a fine of not less than two hundred fifty dollars ($250), nor more than five hundred dollars ($500). If a person is convicted of a third violation of Section **4291** within five years, that person is guilty of a misdemeanor and shall be punished by a fine of not less than five hundred dollars ($500). If a person is convicted of a third violation of Section **4291** within five years, the department may perform or contract for the performance of work necessary to comply with Section **4291** and may bill the person convicted for the costs incurred, in which case the person convicted, upon payment of those costs, shall not be required to pay the fine. If a person convicted of a violation of Section **4291** is granted probation, the court shall impose as a term or condition of probation, in addition to any other term or condition of probation, that the person pay at least the minimum fine prescribed in this section.

(b) If a person convicted of a violation of Section **4291** produces in court verification prior to imposition of a fine by the court, that the condition resulting in the citation no longer exists, the court may reduce the fine imposed for the violation of Section **4291** to fifty dollars ($50).

7.2. Firebreaks and Fuel Breaks

Firebreaks are areas of bare soil or pavement that do not burn. Fuel breaks are areas where vegetation is maintained in such a way as to slow the spread of fire, eliminate ladder fuels (dead branches and brush from ground level to the forest canopy), and allow access to fire fighters. The key firebreaks for the property are the main access road and trails. Creating additional bare soil firebreaks is not recommended for the following reasons: bare soil is an invitation for erosion and weed establishment (such as broom), and it is aesthetically unappealing. For a firebreak to be more effective, they should be augmented by creating adjacent fuel breaks 50 feet wide in the flattest areas and 200 feet wide in the steepest areas.

7.2.1. Hardwood –Conifer Dominated Fuel Breaks

In the Very High Fire Hazard areas along the eastern property line (Unit IV, Table 9) and along Coleman Valley Road (Southern property line), hardwoods and conifers can be thinned and pruned to create a shaded fuel break. Some of this area has already been

treated, however maintaining a fuel break approximately 75 feet wide is an on-going activity. Prune limbs up 10 to 15 feet from the ground. On smaller trees, be careful to leave 30% of the tree length with live foliage.

Concentrate on thinning out the dead and diseased trees and trees with 25% or less live crown. Also redwood sprouts with poor attachment to the original stump should be favored for removal. Where tanoak or bay sprouts emerge from one stump, thin to one or two trees or remove the entire clump depending on spacing and canopy cover. Average spacing between trees should be 21 feet or more - or leave about an 85% canopy cover. The average basal area per acre in this area is 318, so another guideline is to reduce the basal area by no more than 25% leaving 240 square feet per acre. Opening up the canopy too much may encourage excessive understory growth which can then carry a ground fire. Native species to be favored as leave trees: healthy redwood, Douglas fir, live oaks, and madrone. Aesthetics may dictate how the cut materials are handled. Most of the logs and slash can be left lopped close to the ground (no higher than 12 inches) to decay and provide wildlife habitat. Some slash can be used in brush check dams and brush wattles (see erosion section). The bulk of the material cut in the fuel breaks within 30 to 50 feet on either side of a road should be removed, chipped, or burned. Spreading chip mulch should be restricted only to areas where there is no native ground cover such as the native perennial grasses, ferns, or flowers. When removing diseased trees, ***be sure to remove infected materials away from nearby susceptible trees as soon as possible.*** Sudden Oak Death spores are spread by water, so thinning tanoak and bay during wet weather should be avoided. On the other hand one must be careful not to operate in times of dangerous fire weather.

Thinning the dense stands of trees may require more than one entry to ensure that the residual trees adjust to the increased exposure to wind and sunlight. See additional thinning and pruning guidelines in the Technical Specifications section of the Appendix.

7.2.2. Grass Dominated Fuel Break

Grassy areas within Very High Fire Hazard areas (along roads) should be maintained by mowing or grazing. Parking areas should be mowed if visitors are expected. However, mowing in the spring may impact some nesting birds as well as snakes. Either start mowing early before nesting, thereby preventing nesting, or delay mowing in the spring and flush out animals immediately prior to mowing. Mowing of native perennial bunch grasses should be kept high enough (3 to 4 inches) so as not to damage the growing crowns. Mowing of weedy species can be timed before seed set to reduce seed production.

7.3. Other Fire-Safety Considerations

- Maintain water storage and fire hydrants. This should be a top priority.
- Clean wood stove chimneys on a regular basis and maintain spark screens at the

top of the stack.

- All internal combustion driven equipment used in forest, brush-covered lands must have functioning spark arrestors: chainsaws, lawnmowers, weedeaters, etc.
- Do not operate equipment in fire hazard areas when the Fire Department fire weather danger rating is high.
- When using equipment that could ignite vegetation – such as grinders, torches, or welding equipment – clear away flammable materials within a 10-foot wide area around the operation.
- Keep fire-fighting tools (pointed shovel, McCleod, Pulaski, etc.) and extinguishers handy. There should be a fire tool cache in an obvious location near the road and kitchen area. Vehicles traveling into the property should be equipped with a shovel and fire extinguishers.
- Visitors must park in designated areas that have been cleared.
- Keep escape routes open when burning.
- Burn slash piles only with a permit from CDF when conditions are safe: wind less than 10 mph, high humidity and fuel moisture mid-winter, early spring.
- Burning is prohibited from May 1 until the end of CDF's declared fire season.
- When burning in areas of continuous flammable vegetation or duff, clear a firebreak to mineral soil around burn piles.

8. Emergency Preparedness

Fire, earthquakes, medical emergencies are situations which can be moderated by advance planning. This includes knowing and maintaining escape routes and safe gathering places, emergency contact lists, a list of medical facilities and also having emergency supplies on hand.

Visit http://sonomacounty.ca.gov/FES/Emergency-Management/Emergency-Preparedness/ for information on survival kits, disaster communications, and more.

http://www.sonoma-county.org/eservice/FIRE.htm#top

Fire Response Plan

If a fire is spotted on the property or nearby, the first course of action is to ring the kitchen bell repeatedly to alarm the community, and whoever spotted the fire will call 911 from the nearest land line or cell phone and report the property location: **15290 Coleman Valley Rd, Occidental CA 95465**. The community will gather in the core area turn around to strategize on how people can support the suppression effort and evacuate as needed. If the fire is small, it may be possible for people on the land to attack it with a McCleod, fire hose or water pump backpack. (See "Tool Cache" below.)

However, fires can be unpredictable, and one must start with a plan for evacuation and a known escape route. Should escape from fire be necessary, the main escape route is via Coleman Valley Rd towards the town of Occidental. An additional exit gate from the core area parking lot exists for evacuation of vehicles from the upper parking lot.

The California Department of Forestry and Fire Protection maintains the Occidental station located on Graton Road. The nearest trauma center is in Santa Rosa and can service this area by helicopter. The big meadow is an ideal location for helicopter landing. Helicopters once used the pond to bucket out water to dowse out a fire approaching our land that was ignited by the neighbors.

Other Emergency Preparedness
In case of power outages, the land is set up with generator backup at the main utility hub to power the main kitchen, some of the residences, the main office, the barn, the guest housing. Two 40,000 gallon tanks provide backup water storage for the community's domestic water usage.

8.1. Infrastructure, Transport Network, Fire Hydrants, Water Storage & Tool Cache

8.1.1. Infrastructure

The ten acre Core Area within the deer fence houses the vast majority of the structures, including housing for 25 residents, offices for the OAEC, a common kitchen and dining room, guest housing, a bathhouse, a barn and woodshop, and several outbuildings. The core area is the prime area of protection in the case of fire to protect the lives and homes of residents. There are a few outbuildings located throughout the backcountry.

One run of high tension 4000 volt power comes in from Coleman Valley to the meeting room where it hits the transformer. There is also a transformer at the nursery entrance gate where it comes in at 220v by the greenhouse. There are three electrical panel shutoffs: at Solar Suburbia, the meeting room, and the knoll near the nursery entrance where the water tanks are between the barn and the nursery.

8.1.2. Transport Network

There is an extensive road system throughout the property that can be accessed by vehicles (see Figure 10). The only roads that are fully accessible by truck are the Main entrance driveway, the Nursery Road, Pond Road and Bay Road; the rest are not maintained fully for vehicle passage, though access may be gained with minimal grading and brush/tree removal.

8.1.3. Water & Fire Hydrants

The water sources at OAEC are twofold: the agricultural water is provided by a 6 acre-foot pond which is pumped with a solar pump to a priming tank. The mainline is

siphoned and is 80-100 feet in elevation above the core area buildings, which then gravity feeds from the tank down to the Core Area. The potable water is provided by a well which pumps into two 40,000 gallon tanks on the top of the knoll between the barn and nursery. The potable tanks are nearly the same elevation as the pond. There is also a 10,000 gallon redwood storage tank at the barn with dedicated to a 4" hydrant located near the handicapped parking stall by the Bamboo guest house. In the case of a fire, the pond is accessible by small fire truck via the Pond Road, and by helicopter for drafting water (which has been utilized in the past). See Figure 10.

The potable water shutoffs are at the water tanks, the barn, and the main water hub where the double check valve is located. The double check valve allows potable water to enter the pond water system to provide better pressure relative to demand in case of fire hose usage. The agricultural water shutoff is at the main hub manifold at the North Garden.

8.1.4. Tool Cache

A fire-tool cache is located in the Wildlands tool area in the northwest corner of the barn. It contains one McCleod, at least one Pulaski, several sturdy pointed shovels, a chainsaw with fuel and safety gear, backpack water pumps, and hose lay. Additional shovels, picks, and other garden tools which may be useful are located across from the bathhouse, on the back side of the bicycle shop.

The local fire department and CalFire have been notified as to the water storage capacity and location via the Fire Response Plan in the previous section.

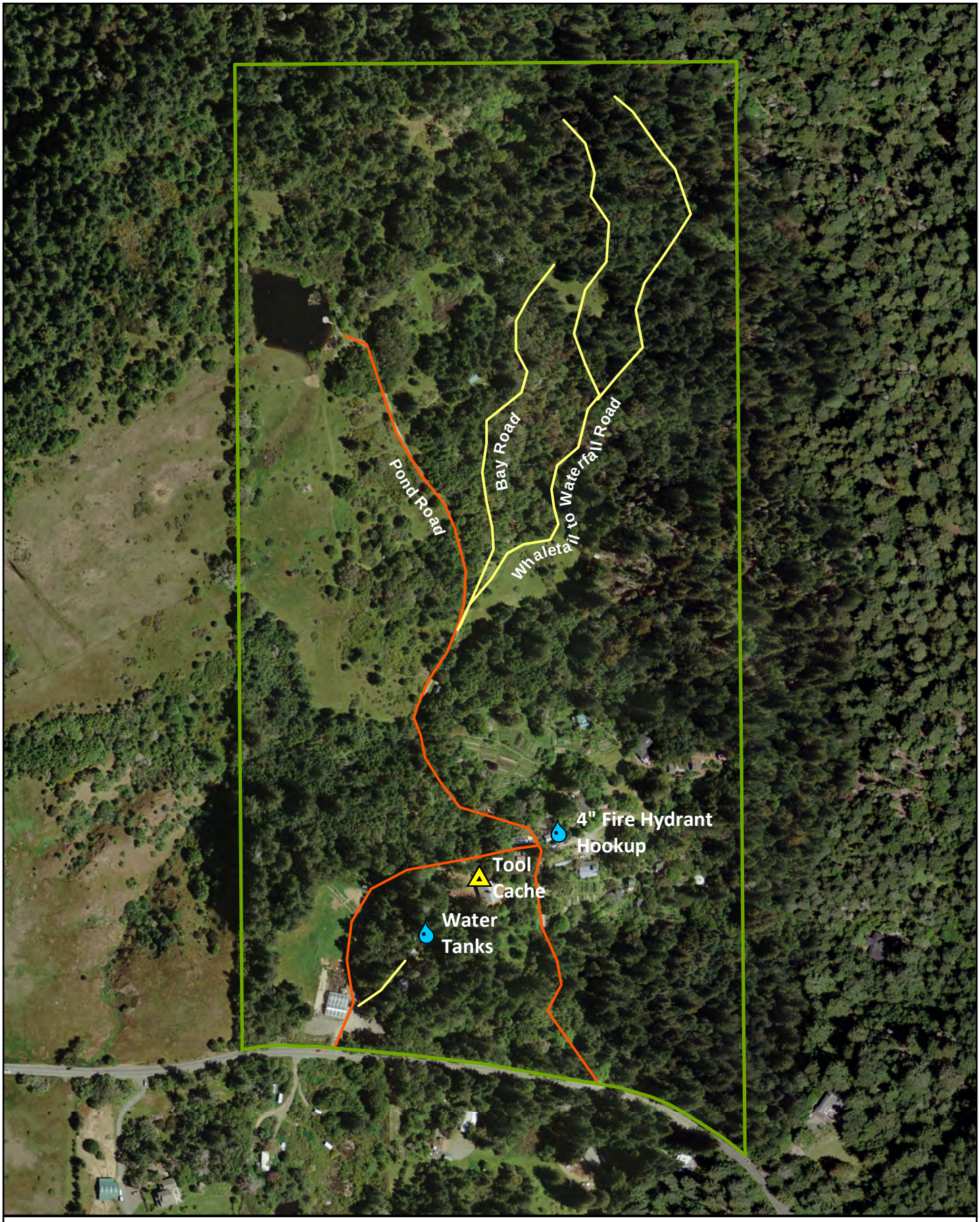

Figure 10. Emergency Map - Roads & Infrastructure

0 125 250 500 Feet

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Sources
Aerial Imagery: ESRI

9. Visitor Information

OAEC is open to the public through volunteer days, courses, special events, plant sales, and tours; it is not open for drop-in visitors. Garden volunteer days happen weekly on Wednesdays, from 10am – 5pm, every week except for the Wednesday before Thanksgiving week, Christmas, and New Year's. Dates for courses, special events, plant sales and tours are listed online; please visit www.oaec.org for the most updated event calendar and to find out more about visiting.

10. Project Descriptions, Schedule & Cost

Table 13. Projects

Project Description	Location	Acres	Schedule & Notes	CFIP CAP x90%	Est. Cost	Cost to OAEC
CFIP/EQIP				Grant-share		
RPF supervision		9		$855	$2,000	$1,145
Pre-commercial thinning	Area IV	1	Do not schedule during high fire hazard weather. 2015 N 38° 25.089′ W122° 57.291′	$360	$1,000	$640
Release Fuel break & SOD clean up	Area IV	4.5	**Schedule 2015** SOD pockets along eastern fenceline, 75 feet wide ++	$1,620	$3,500	$1,800
Pruning	Area IV	1	N 38° 24.732' W122° 57.252′	$248	$500	$253
Follow-up on previous fuel reduction projects	Area I & IV	2	**Schedule in 2020?** Along Occidental Road and east fenceline	$540	$1500	$960
Site prep for planting						
Trees & planting	Area IV	2	Schedule October 15 – January 31 2015 SOD areas along eastern property line	$432	$600	$168
Tree shelters						
Land Conservation: erosion control Wildlife/Fisheries projects			**Schedule during periods of no rainfall** Dutch bill creek sediment source reduction			
Fencing & Hedgerow material for enhancing grazing program						

Project Description	Location	Acres	Schedule & Notes	CFIP CAP x90%	Est. Cost	Cost to OAEC
Other						
Fencing			Repair perimeter fencing		$1000	
			Install livestock cross fencing for grassland management		10,000	
Prescribed fire			Schedule during permissible burn times when ecologically appropriate depending on goals			
Low-impact recreation: trails						
Weed control			French broom			
Emergency preparedness						
Phone Lists						
Maps						
1st aid & survival Kits						
Fire Extinguishers						
Fire tool caches						
TOTALS				**$4,055**	**$20,100**	**$5,406**

11. Sources of Assistance, Contacts, References

11.1. Public Assistance

- Occidental Volunteer Fire Dept. 3800 Bohemian Hwy, (707) 874-3800
- Cal Fire, California Department of Forestry and Fire Protection. Cost share programs: **Jill Butler**, 135 Ridgeway Ave., Santa Rosa, CA 95401. (707) 576-2360.
- NRCS, Natural Resource Conservation Service, 1301 Redwood Way, Suite 170, Petaluma, CA 94954. (707) 794-1242. Advice and cost share programs, soil information, erosion control and engineering advice.
- CDFW, California Department of Fish and Wildlife. Region 3 office: 7329 Silverado Trail, Napa, CA, 94558 (707) 944-5500. Fisheries and wildlife habitat enhancement, species protection.
- UCCE, University of California Cooperative Extension. 579 Low Gap Road, Ukiah, CA 95482. (707) 463-4495. Forestry and agriculture information, field workshops.
- Archaeology: Northwest Information Center, Dept. of Anthropology, Sonoma State University, Rohnert Park, CA 94928. (707) 664-2494. Records search.
- California Geological Survey (formerly CDMG), c/o CDF: Dave Longstreth 135 Ridgeway Ave., Santa Rosa, CA 95401. (707) 576-2987
- California Geological Survey (formerly CDMG), c/o George Saucedo, Senior Geologist, (415) 904-7726 gsaucedo@consrv.ca.gov

11.2. Private Land Management Contacts

- Appleton, Harold: Registered Professional Forester. Bodega Bay. (707) 875-3976 haroldappleton@comcast.net
- Erickson, Rolfe: Geology professor, Sonoma State. 664-2334

11.3. References & Bibliography

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APPENDICES

1. Standards and Specifications
    a. Thinning, Slash Disposal, Pruning
    b. Wildlife-friendly Fencing
    c. Water Bar
    d. Rolling Dip
    e. Brush Check
    f. Tree Planting
2. Parcel Map, Deed, Zoning, Easements
    a. Parcel Map
    b. Grant Deed
    c. Zoning
    d. Conservation Easement
3. Tax and Business Management
    a. Current Property Tax Status
    b. Income Tax
    c. Estate Tax
    d. Recordkeeping
4. Summary of Permits Required for Work in Creeks and Rivers in California
5. California Natural Diversity Database Report

APPENDIX 1: STANDARDS AND SPECIFICATIONS

Appendix 1.a. Thinning, Slash Disposal, Pruning

Practice: SOD removal and pre-commercial thinning
Objective-method-standards: Reduce standing dead fuel load and fuel ladder. Standing dead oaks will be felled unless suitable for wildlife habitat, not on a ridge (fire hazard), and no closer than 25 feet to other trees or trails (safety hazard). Dense patches of conifer pole-size (up to 12-inches DBH) in the treatment areas shall be thinned to a spacing of approximately 16 to 20 feet apart, leaving the healthiest trees in place. Work to be performed outside of high fire danger days or precipitation days.
Slash treatment: Material shall be lopped and scattered to a height of no more than 18 inches off the ground.
Mitigation measures: Surface erosion shall be minimized by distribution of slash. On steep slopes, lay slash on contour. All work is to be performed by workers with light equipment, i.e. chainsaws, hand saws, loppers. No heavy equipment is needed.

Practice: Pre-commercial thinning – dense fir, redwood
Objective-method-standards: Thinning from below to reduce dead and dying conifers, improve growth rate on crop trees, and reduce ladder fuels. Dense patches of conifer pole-size (up to 12-inches DBH) in the treatment areas shall be thinned to a spacing of approximately 16 to 20 feet apart, leaving the healthiest trees in place. Leave 85% canopy cover to provide adequate understory shading. Sample areas of trees to be removed will be marked with yellow spray paint by RPF. Work is to be performed outside of high fire danger days or precipitation days.
Slash treatment: Material shall be lopped and scattered to a height of no more than 18 inches off the ground. Downed materials within 50 feet of the road shall be removed and/or chipped (see ***follow-up practice)***.
Mitigation measures: Surface erosion shall be minimized by distribution of slash. On steep slopes, lay slash on contour. All work is to be performed by workers with light equipment, i.e. chainsaws, hand saws, loppers. No heavy equipment is needed.

Other Thinning Guidelines (courtesy The Wildlands Conservancy, Jenner Headlands Preserve, Shaded Fuel Break Pilot Project Workshop, November 1, 2014.)

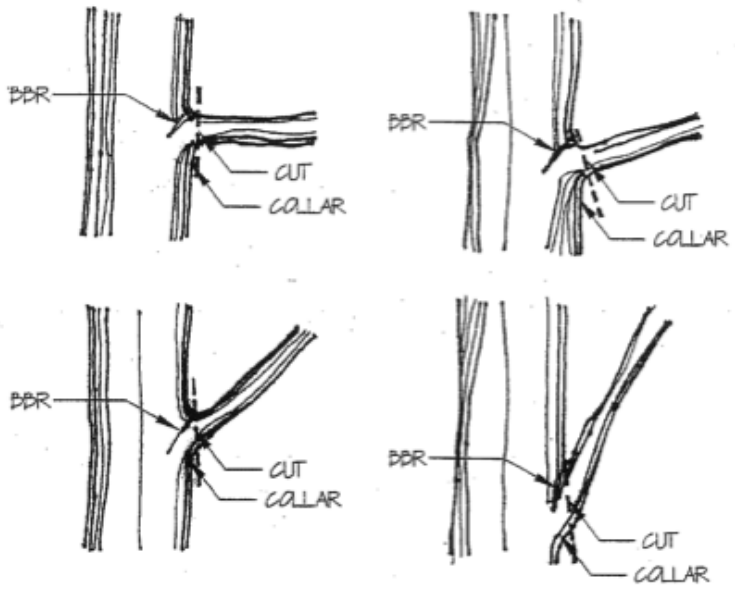
- Remove the worst quality tree over spacing and species preferences.
- Attempt to retain all dominant conifers.
- Cut all trees with expected mortality or negative volume growth in the next 10 years.
- Remove bay trees overtopping live oak and tanoak to reduce the spread of Sudden Oak Death.
- Favor vertical stems vs. leaning stems.
- Favor single stems vs. trees with common base.

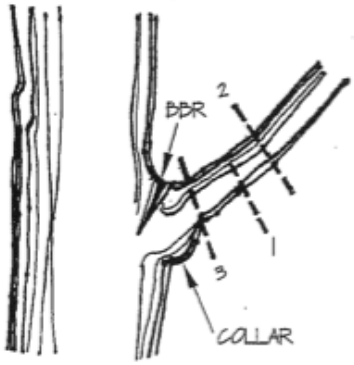
- Pairs of trees with joined stems: cut both or leave both.
- Leave all trees >24".
- Where aggregated retention exists (clumps of trees), increase spacing around clump.
- Retain all snags that contain active wildlife nests or active wildlife signs (feeding, whitewash, etc.).
- Retain snags greater than 12" that are not within their height of the nearest seasonal road or on a ridgetop.
- Attempt to retain a minimum of 2 snags per acre, where available.

Practice: Follow-up slash disposal
Objective-method-standards: Reduce fuels generated from thinning within 50 feet of the roads. Slash shall be pulled to chipping locations along the road. Chips may be spread evenly through the understory especially in steeper bare-ground areas or piled to be used for other projects (such as trails). Work to be performed outside of high fire danger days. Work to be completed within 6 months of slash creation.
Mitigation measures: Surface erosion shall be minimized by distribution of chips in steep and bare areas. All work is to be performed by workers with light equipment. Truck and chipper to remain on road. No heavy equipment is needed.

Practice: Pruning
Objective-method-standards: Reduce fuel ladder and improve timber quality by pruning trees to a height of at least 10 feet. See attached pruning "Techniques" sheet. Up to 150 trees per acre to be pruned. Work to be performed outside of high fire danger days or precipitation days.
Slash treatment: Material shall be lopped and scattered to a height of no more than 18 inches off the ground.
Mitigation measures: Surface erosion shall be minimized by distribution of slash. All work is to be performed by workers with light equipment, i.e. chainsaws, hand saws, loppers. No heavy equipment is needed. Damage to trees shall be minimized by following attached pruning guidelines.

WHEN REMOVING LARGE LIMBS, MAKE THE FINAL CUT (DASHED LINE) JUST OUTSIDE THE BRANCH BARK RIDGE (BBR) AND THE OUTER PORTION OF THE COLLAR.





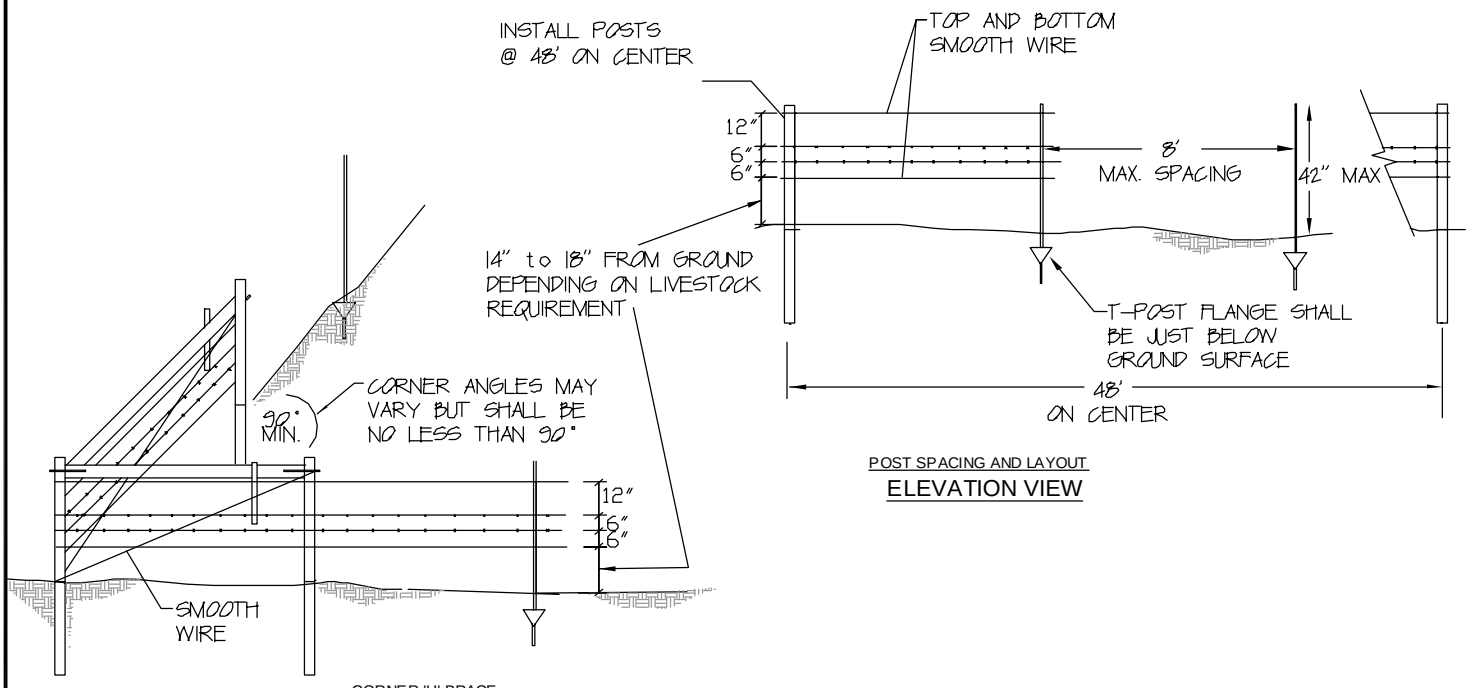
REMOVE A LARGE LIMB BY MAKING THREE CUTS. MAKE THE FIRST CUT ON THE BOTTOM OF THE LIMB ABOUT 12 INCHES FROM BRANCH ATTACHMENT AND 1/3 THROUGH LIMB. MAKE THE SECOND CUT ON THE TOP ABOUT 1 INCH FROM THE UNDER CUT. THEN, MAKE THE FINAL CUT JUST OUTSIDE THE BBR AND THE OUTER PORTION OF THE COLLAR.

Prunuske Chatham, Inc.
400 Morris St., Ste. G
Sebastopol, CA 95472

DATE: APRIL 1999
SCALE: NTS
CHECKED BY: HA
DRAFTED BY: MH/DP
DESIGNED BY: MH

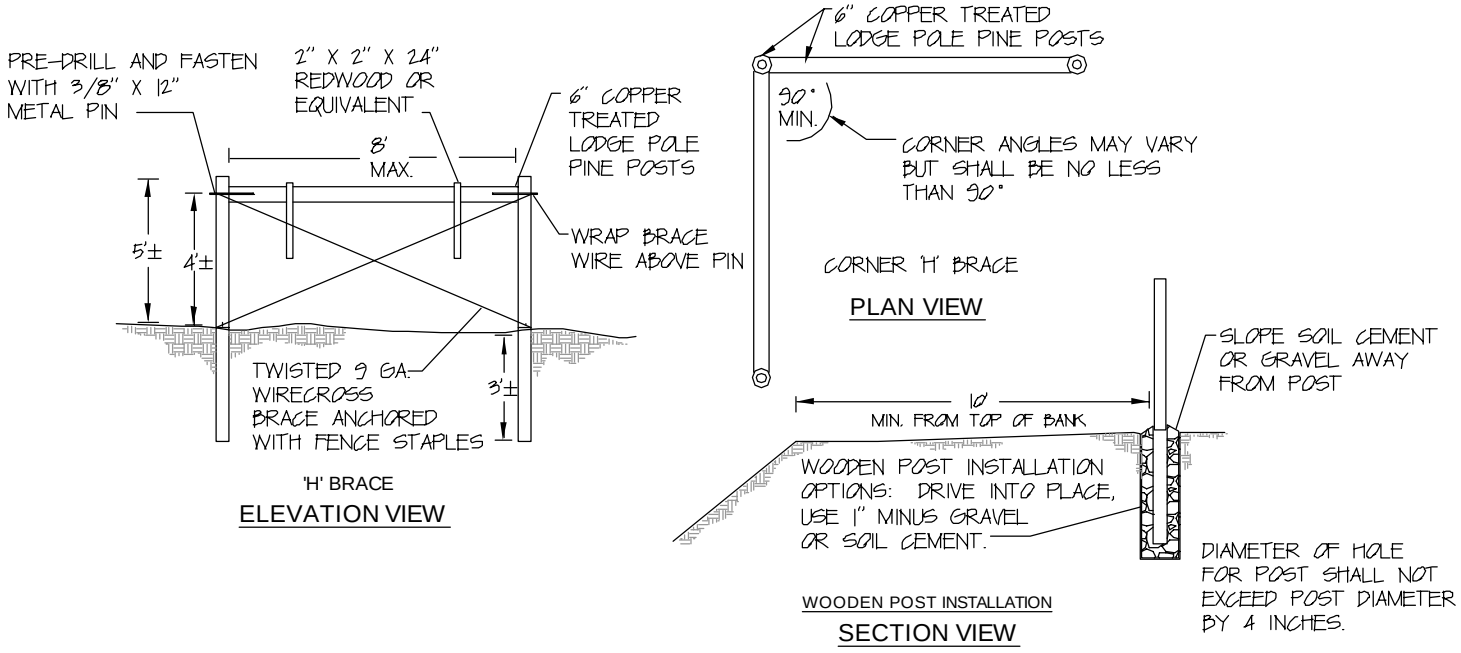
TECHNIQUES FOR MAKING THE PRUNING CUT

SHEET



POST SPACING AND LAYOUT
ELEVATION VIEW

CORNER 'H' BRACE
ELEVATION VIEW



'H' BRACE
ELEVATION VIEW

CORNER 'H' BRACE
PLAN VIEW

WOODEN POST INSTALLATION
SECTION VIEW

WILDLIFE-FRIENDLY BARBED WIRE FENCING DETAILS

BW
-

NTS

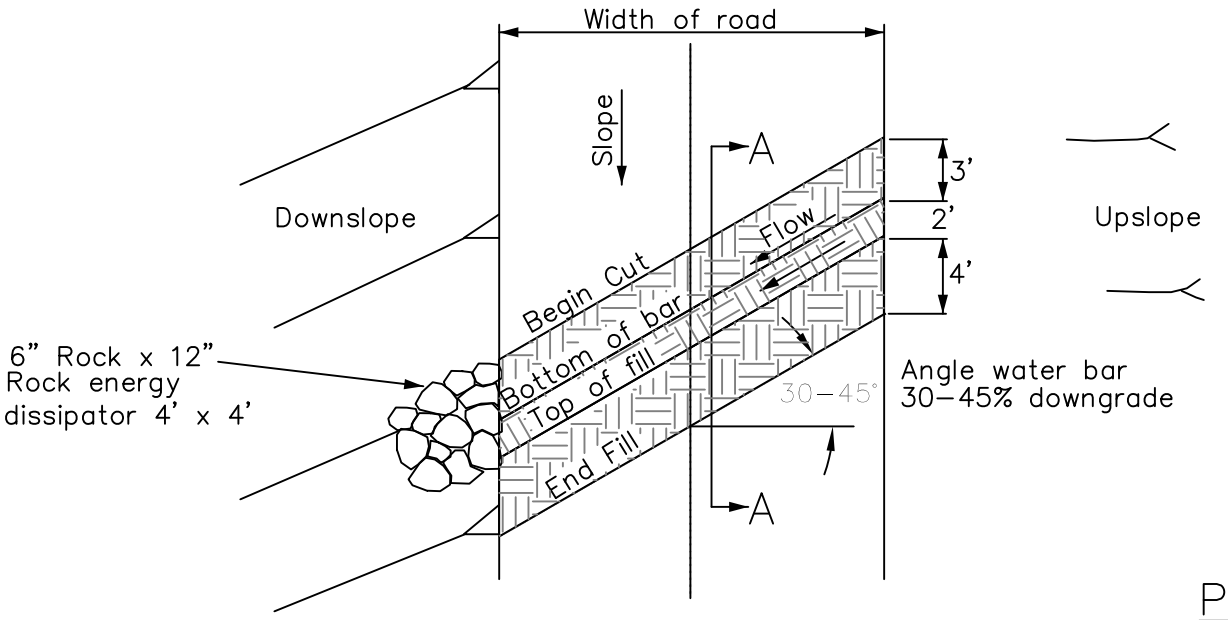
PRUNUSKE CHATHAM, INC.

400 MORRIS ST, SUITE G
SEBASTOPOL, CA 95472
(707) 824-4600

PREPARED FOR:

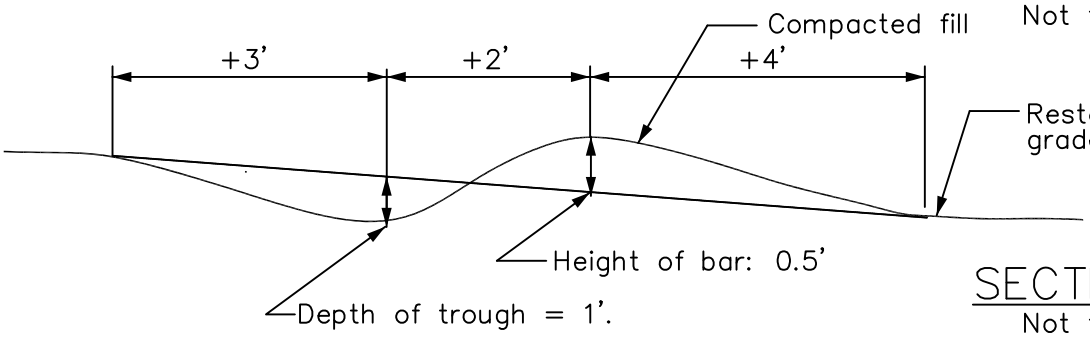
WATER BAR DETAIL

Not to scale



PLAN VIEW

Not to scale



SECTION AA

Not to scale

NOTE: Increase bar height and depth with increased road gradient.

MAXIMUM DISTANCE BETWEEN WATERBREAKS

Estimated Hazard Rating.	Road Gradient 0–10%	11–25%	26–50%	> 50%
	Feet	Feet	Feet	Feet
Extreme	100	75	50	50
High	150	100	75	50
Moderate	200	150	100	75
Low	300	200	150	100

NOTE: Chart to be used for placement of additional waterbars.

PRUNUSKE CHATHAM, INC.
400 MORRIS ST, SUITE G
SEBASTOPOL, CA 95472
(707) 824-4600

DATE: 2.23.2015
SCALE: NTS
DESIGNED BY: HA
DRAFTED BY: ___
CHECKED BY: HA

PREPARED FOR:

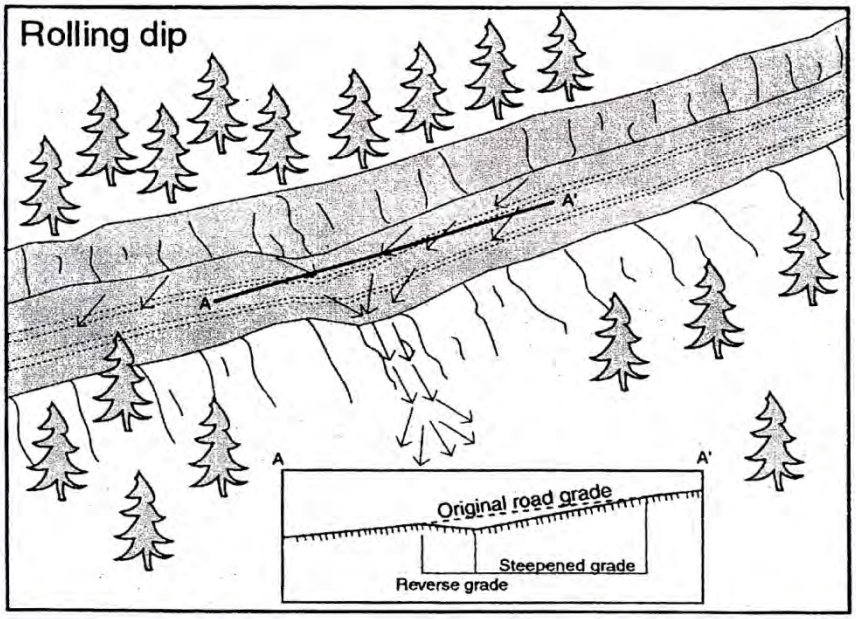
WATER BAR

FIGURE 1 OF 1

Appendix 1.d. Rolling Dip

Table of Rolling Dip Dimensions				
Road grade %	**Upslope approach (distance from up-road start of rolling dip to trough) (ft)**	**Reverse grade (distance from trough to crest)**	**Depth below average road grade at discharge end of trough (ft)**	**Depth below average road grade at upslope end of trough (ft)**
<6	55	15-20	0.9	0.3
8	65	15-20	1.0	0.2
10	75	15-20	1.1	.01
12	85	20-25	1.2	.01
>12	100	20-25	1.3	.01

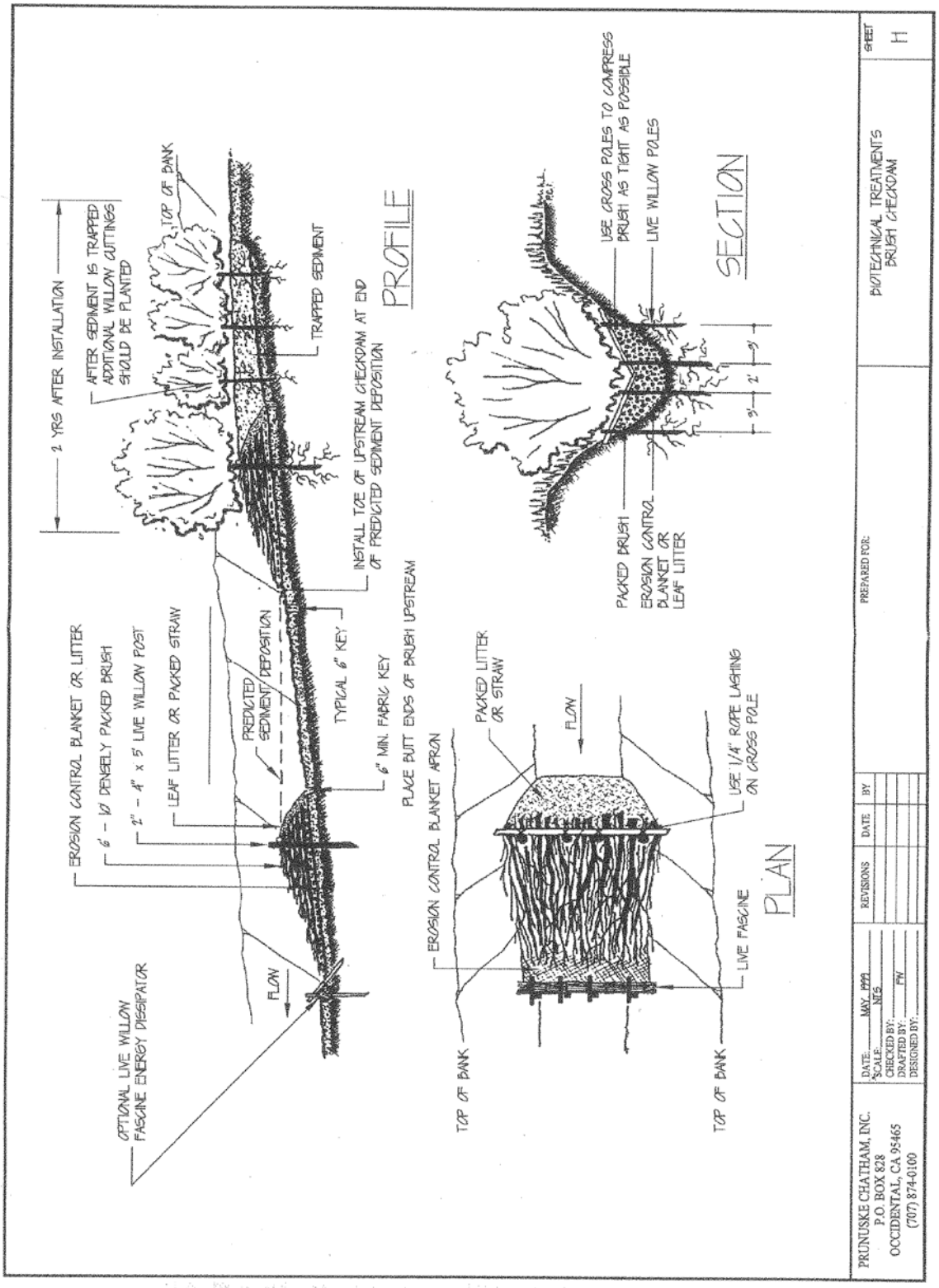
Table X-7. Table of rolling dip dimensions.



Note: Rolling dips must drain the road surface and be driveable for the expected traffic.

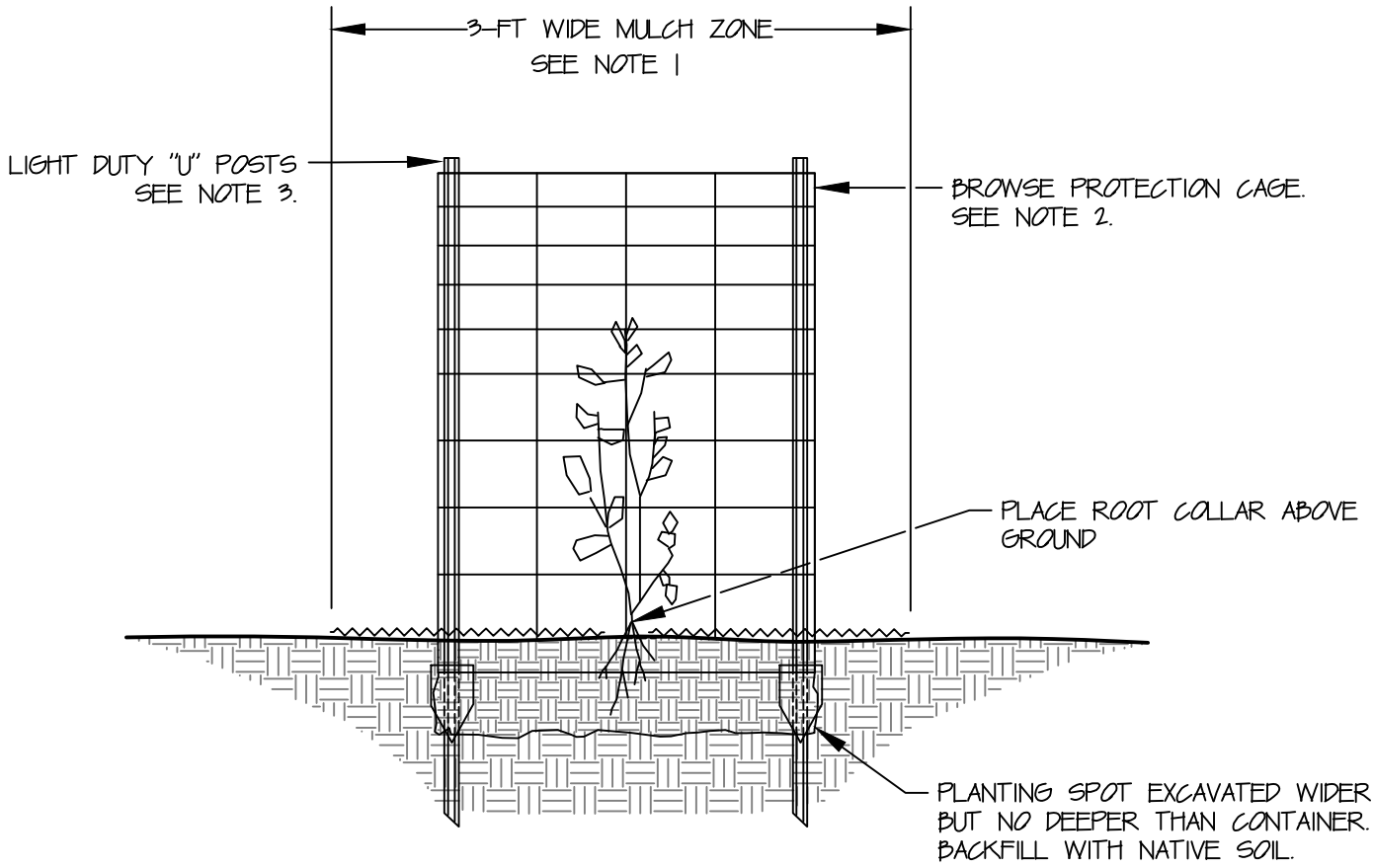
Figure X-20. Specifications and use of rolling dips to reduce ditch erosion and surface runoff.

Appendix 1.e. Brush Check Dam



SMALL CAGE OPTION:

- Cylinder: 36-inches tall, 3/4-inch mesh, 20-guage gopher wire
- Posts: 4-foot tall, 1/2-inch diameter bamboo



NOTES:

1. ADD COARSE ORGANIC MULCH MATERIAL INSTALLED ON TOP OF CARDBOARD MAT APPROVED BY REVEGETATION SPECIALIST. KEEP MULCH 1 TO 2-INCHES AWAY FROM STEM OF PLANT. MULCH DEPTH SHOULD BE 2 TO 3-INCHES.

2. BROWSE PROTECTION CAGE IS A 2-FOOT DIAMETER (OR LARGER) CAGE, FIVE+ FEET TALL. OPTIONAL: INSTALL CAGE 1 TO 2-INCHES INTO THE GROUND ALONG WITH THE CONTAINER PLANT BEFORE MULCHING. CAGE MATERIAL IS 2X2-INCH MESH, 16 GAUGE WELDED WIRE HARDWARE CLOTH. CAGES ARE PLACED ONLY ON SPECIES DESIGNATED IN THE REVEGETATION PLAN. SECURE WITH 2 "U" POSTS.

3. WHERE CATTLE MAY BE PRESENT, USE 3 HEAVY-DUTY TEE POSTS AND HEAVIER GAUGE WIRE.

PRUNUSKE CHATHAM, INC.
400 MORRIS ST. SUITE G
SEBASTOPOL, CA. 95472
(707) 824-4600

PREPARED FOR:

REV. 9/25/14 HCA
10/11/15 HCA

TYPICAL
TREE & SHRUB PLANTING DETAIL
WITH CAGE & MULCH

[AutoCAD file name: G:\ACAD STD DWGS\PLANTING DETAILS\TreeCageMulch.dwg]

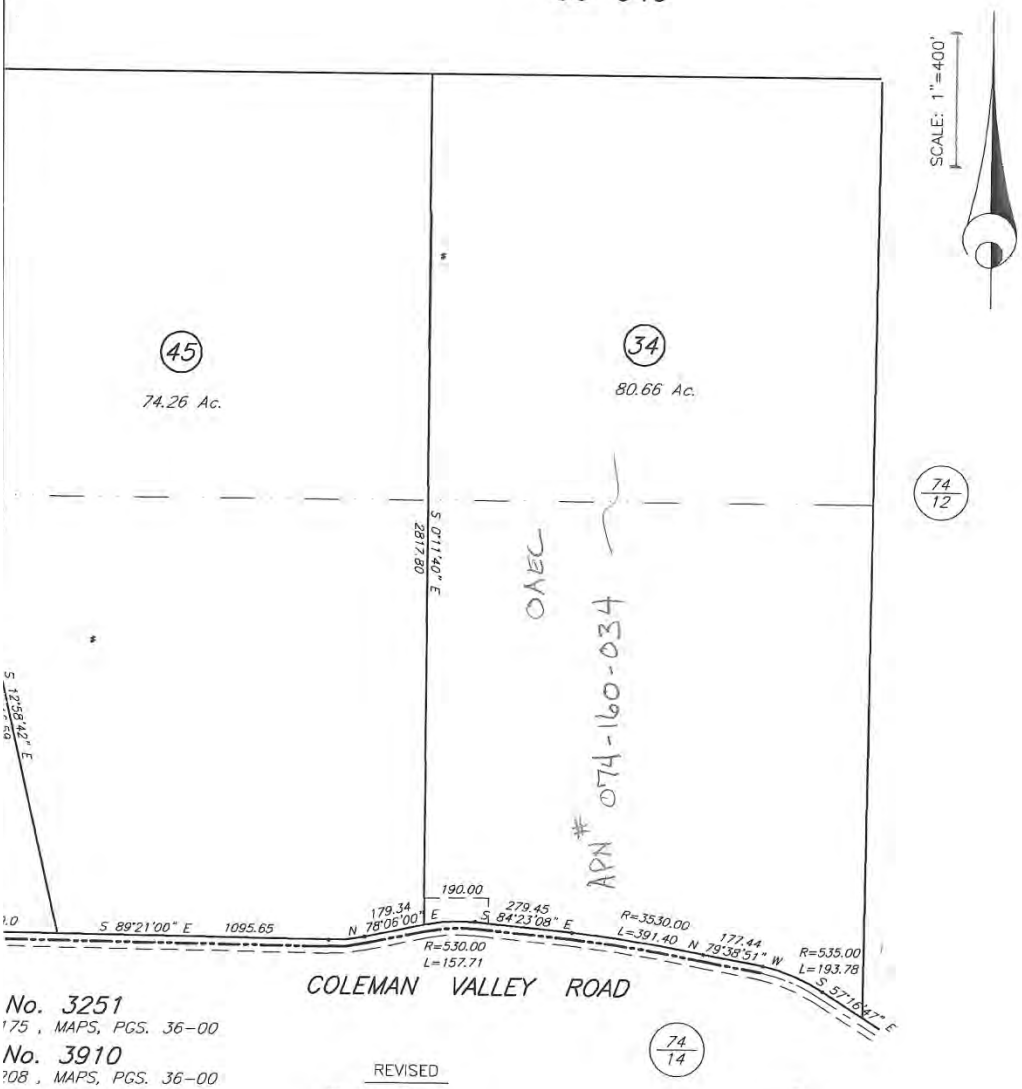
Schedule revegetation and reforestation projects for the dormant season, October 15 through the end of January. Tree planting locations shall be the specified distance from each planting spot and existing trees – usually 12 feet apart. Do not plant directly under the canopy of existing trees. Planting spots shall be cleared (scalped) to bare mineral soil in a 3'x3' area. Planting hole shall be no deeper than the root mass but 2 to 3 times as wide. No J-rooting of roots at the bottom of the hole. Backfill only with native soil, no organic debris or amendments. Firmly pack in the backfill and water-in the plant if no rain is forecast. 2-3 inches of organic mulch is optional for the scalped area and shall be kept a minimum of 2-inches away from the stem of the tree. Install browse protection on susceptible species where herbivores are expected. Periodically inspect trees in the first and second spring and early summer to mitigate for weeds, browsing, and drought. Container and bare-root plants shall be healthy and well-formed and have a minimum stem diameter at the root crown of 3/8-inch with a root to shoot ratio from 1:1 to 1:1.5. Two-year old stock is preferred. Don't plant sick, deformed, scarred, rotten, small, junk.

APPENDIX 2: PARCEL MAP, DEEDS, AND ZONING

PARCEL MAP

TAX RATE AREA
96–039
96–040

74–16



No. 3251
175 , MAPS, PGS. 36–00

No. 3910
208 , MAPS, PGS. 36–00

No. 4086
211 , MAPS, PGS. 32–00

No. 4960
138 , MAPS, PGS. 13–14

REVISED
09–22–86=48
02–29–88=49–PA
03–31–94=51–LF

Assessor's Map Bk. 074, Pg. 16
Sonoma County, Calif. (ACAD)

KEY 5–5–11 KB

Order No.
Escrow No. 190876TE
Loan No.

WHEN RECORDED MAIL TO:

Sowing Circle, LLC
15290 Coleman Valley Road
Occidental, CA 95465

1999157367
OFFICIAL RECORDS OF
SONOMA COUNTY
BERNICE A. PETERSON

FIRST AMERICAN TITLE CO.
12/29/1999 08:00 DEED
RECORDING FEE: 23.00
3

DOCUMENTARY TRANSFER TAX $ -0-

SPACE ABOVE THIS LINE FOR RECORDER'S USE

____Computed on the consideration or value of property conveyed; OR
____ Computed on the consideration or value less liens or encumbrances remaining at time of sale.

As declared by the undersigned Grantor
Signature of Declarant or Agent determining tax - Firm Name

GRANT DEED

074-160-034
Transfer from partnership to LLC. All member remain the same and hold the same portions.

Continuing partnership R & T 11925

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

Sowing Circle, a California general partnership

hereby GRANT(S) to

Sowing Circle, LLC, a California limited liability company

the real property in the City of **Unincorporated Area**
County of **Sonoma**, State of California, described as

SEE LEGAL DESCRIPTION ATTACHED HERETO AND MADE A PART HEREOF

Dated December 27, 1999

Sowing Circle,
a California general partnership

By: David R. Henson, Partner

STATE OF CALIFORNIA }
COUNTY OF Sonoma } ss

On December 27, 1999 before me, T.C. Escher,
personally appeared David R. Henson,
personally known to me (or proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s) or the entity upon behalf of which the person(s) acted, executed the instrument.
WITNESS my hand and official seal.

Signature T.C. Escher

T.C. ESCHER
COMM. #1099535
NOTARY PUBLIC - CALIFORNIA
SONOMA COUNTY
My Comm. Expires June 2, 2000

(This area for official notarial seal)

MAIL TAX STATEMENTS TO:

SAME AS ABOVE

1002-SM (1/94)

PARCEL ONE:

The Southeast quarter of the southwest quarter of Section 27, Township 7 North, Range 10 West, M.D.M., and the Northeast quarter of the Northwest quarter of Section 34, Township 7 North, Range 10 West, M.D.M.

Excepting therefrom the following:

Commencing at the northwest corner of the southeast quarter of the northwest quarter of Section 34, Township 7 North, Range 10 West; thence East 190 feet; thence North 150 feet; thence West 190 feet; thence South 150 feet to the place of commencement.

PARCEL TWO:

Commencing at the northeast corner of the southeast quarter of the northwest quarter of Section 34, Township 7 North, Range 10 West, M.D.M.; thence South along the quarter Section line to the northeasterly line of the County Road; thence Northwesterly along the Northeasterly side of the said road to the South line of the Northeast quarter of the Northwest quarter of said Section; thence Easterly to the place of commencement.

Excepting from said tract that portion thereof included within the 40 foot strip conveyed by John White, et al, to County of Sonoma, for road purposes, by deed dated March 10, 1886 and recorded June 15, 1886 in Liber 101 of Deeds, page 233, Sonoma County Records.

PARCEL THREE;

Being a portion of the 150 feet by 190 feet parcel of land situated in Section 34, Township 7 North, Range 10 West, M.D.B. & M., which was conveyed by Annie Francheschi to Louis S. Beedle by deed recorded December 16, 1919 in Liber 379 of Deeds, page 246, Sonoma County Records, and being more particularly described as follows:

Commencing at a 1/2" iron pipe monument marking the northwest 1/16 corner of said Section 34; thence along the westerly line of said 150 feet by 190 feet parcel of land, North 0 degrees 11' 40" West, 69.95 feet to a point in the northerly line of the Coleman Valley Road, the point of beginning of the parcel to be herein described; thence continuing along said Westerly line

continued...

North 0 degrees 11' 40" West, 80.05 feet to the Northwesterly corner of said 150 feet by 190 feet parcel; thence along the Northerly line thereof, North 89 degrees 37' East, 190.0 feet; thence along the easterly line thereof, South 0 degrees 11' 40" East, 75.2 feet to a point in the northerly line of the Coleman Valley Road; thence along said Northerly line North 85 degrees 14' West, 39.53 feet to a 1/2" iron pipe monument; thence along a curve to the left with a radius of 520 feet, through an angle of 16 degrees 40' a distance of 151.25 feet to a 1/2" iron pipe monument; thence South 78 degrees 06' West, 0.15 feet to the point of beginning.

Description is based on survey and calculations by G. S. Abbott, L. S. 2297 and all monuments set are visibly tagged.

Also excepting from Parcel One, Two and Three above, all that portion conveyed to the County of Sonoma, by deed dated December 30, 1969, and recorded January 15, 1970, in Book 2440 Official records, page 85, Serial No. L-48977, Sonoma County Records.

A. P. No.: 074-160-34

Zoning: LEA B6 100 Combining District SR

LEA Land Extensive Agriculture District
To enhance and protect lands best suited for permanent agricultural use and capable of relatively low production per acre of land; and to implement the provisions of the Land Extensive Agriculture land use category of the General Plan and the policies of the Agricultural Resources Element.
B6 Combining District
The adopted zoning maps shall specify the maximum permitted density, determined by gross acreage for all residential uses. Minimum front, side and rear yard requirements and the minimum parcel or lot size, if not otherwise specified, shall conform to the base district with which the B6 district is combined unless specifically approved otherwise by the planning commission.

SR Scenic Resources Combining District
Purpose: to preserve the visual character and scenic resources of lands in the county and to implement the provisions of Sections 2.1, 2.2 and 2.3 of the general plan open space element.

D. Grantors intend that the organic and chemical-free farming practices which have characterized the management and operation of the Gardens shall be preserved and maintained by the continuation of exclusively organic agricultural practices as defined by the Certifying Agent, or, alternately that the Gardens shall be allowed to lie fallow, and that the Gardens shall remain free of any construction of any buildings or other structures.

E. Grantors further intend, as owners of the Property, to convey to the Trust the right to preserve and protect the chemical-free and organic nature of the Gardens, and toward this end Grantors shall maintain continuous and uninterrupted certification and annual inspection and monitoring of their agricultural practices by the Certifying Agent. Grantors shall provide evidence of such certification to the Trust on an annual basis. Alternately, Grantors may allow the Gardens to lie fallow and uncultivated as unused land. It is the intent of Grantors that chemical-free, organic agricultural uses, and prohibition of the construction of buildings or other structures within the Gardens, shall continue in perpetuity.

F. The Trust is a publicly supported, tax-exempt nonprofit organization, qualified under Section 501(c)(3) and 170(h) of the Internal Revenue Code, whose primary purpose is the preservation, protection, or enhancement of land in its natural, scenic, historical, agricultural, forested, and/or open space condition.

G. The Trust agrees by accepting this grant to honor the intentions of Grantors stated herein and to preserve and protect in perpetuity the conservation and organic agricultural values of the Gardens for the benefit of this generation and generations to come.

H. To effectuate the intention of the parties, Grantors intend to give to the Trust a perpetual agricultural easement in gross over the Gardens, to create certain restrictive covenants and equitable servitudes for the benefit of the Trust in gross which will bind and run with the Property, and to extinguish irrevocably and perpetually the right to construct buildings or other structures or to apply chemical-dependent agricultural practices within the Gardens.

AGREEMENT:

1. Grant of Easement. In consideration of the above and the mutual covenants, terms, conditions, and restrictions contained herein, and pursuant to the laws of the State of California and in particular Sections 815, et seq. of the California Civil Code, Grantors hereby voluntarily grant and convey to the Trust an agricultural easement in perpetuity over the Gardens of the nature and character and to the extent hereinafter set forth ("Easement").

2. Declaration of Restrictions. The Grantors herby declare that the Gardens shall be held, transferred, sold, conveyed, leased, occupied, and used subject to all of the restrictions, covenants, easements, equitable servitudes, and affirmative obligations set forth in this Easement.

3. Purpose. It is the purpose of this Easement to assure that the Gardens will be retained forever in its chemical-free and organic condition and to prevent any use of the Gardens which violates the certification program of the Certifying Agent. Grantors intend that this easement will confine the use of the Gardens to the cultivation of any combination of plants or trees in a non-toxic manner (without the use of synthetic chemicals) through practices to be certified as in compliance with the standards of the Certifying Agent. All costs of periodic certification by the Certifying Agent shall be borne by the Grantor.

4. Rights of the Trust. To accomplish the purpose of this Easement the following rights are expressly conveyed to the Trust by Grantors:

(a) To preserve and protect the organic agricultural values of the Gardens; and
(b) To enter upon the Gardens at reasonable times in order to monitor Grantors' compliance with and otherwise enforce the terms of this Easement, provided that such entry shall be upon prior reasonable notice to Grantors, and the Trust shall not unreasonably interfere with Grantors' use and quiet enjoyment of the Gardens; and
(c) To enjoin any inconsistent activity or use of the Gardens; and
(d) Grantors shall make available to the Trust all documentation and correspondence with the Certifying Agent relating to the periodic certification of the Gardens.

5. Prohibited Uses and Obligations of Grantee. Any activity on or use of the Gardens inconsistent with the purpose of this Easement is prohibited. Without limiting the generality of the foregoing, the following activities and uses are expressly prohibited:

(a) Direct or indirect application or broadcast spraying of any form of chemical pesticides, fungicides, rodenticides, fertilizers, or other toxic materials; and
(b) Construction of any buildings or structures within the established boundaries of the Gardens; and
(c) Any activity on or near the Gardens which could jeopardize organic certification of the Gardens as defined by the Certifying Agent.

6. Reserved Rights. Grantors reserve to themselves, and to their personal representatives, heirs, successors, and assigns, all rights accruing from their ownership of the Gardens, including the right to engage in or permit or invite tenants and others to engage in all uses of the Gardens that are not

expressly prohibited herein or are not inconsistent with the purpose of this Easement, provided all applicable governmental approvals and permits are properly obtained. Without limiting the foregoing, the following rights are expressly reserved:

(a) To engage in agricultural uses of the Gardens as permitted herein in accordance with sound and generally accepted organic agricultural practices for the production of food, fiber and plant material; and
(b) To prohibit entry upon the Gardens by unauthorized persons; and
(c) To maintain, construct and improve water systems, fences, and gates, provided that the location of perimeter fences around the Gardens is not altered; and
(d) To continue the use of the Gardens for all purposes not inconsistent with this Easement.

7. Request by Grantors for Approval of the Trust. Prior to undertaking any action which requires the Trust's approval, or which might have an adverse impact on the conservation and agricultural values this Easement is intended to protect, Grantors shall solicit the approval of the Trust. Grantors shall submit a written description of the proposed action portraying the nature, scope, design, location, timetable, and any other material aspect of the proposed activity in sufficient detail to permit the Trust to make an informed judgment as to its consistency with the purpose of this Easement.

7.1 Approval Criteria. The Trust's approval shall be based upon compliance with the provisions of this Easement, the capability of the proposed action to preserve and enhance the agricultural and conservation values protected by this Easement, the manner in which the proposed action is to be carried out, the likely effect of the proposed action upon the agricultural and conservation values of the Gardens, and on any other basis, including purely aesthetic conditions, which the Trust shall reasonably determine to be in furtherance of the purpose of this Easement. Approval or disapproval shall be within the sole discretion of the Trust and may be granted upon conditions which tend to further the purpose of this Easement.

7.2 Approval Process. The Trust shall grant or withhold its approval in writing within sixty (60) calendar days of the receipt of Grantors' written request, provided Grantors' request was submitted in a form acceptable to the Trust as provided in paragraph 7. Upon the completion of any such action on the Gardens, the Trust shall inspect the Gardens and, if the action was performed in accordance with the terms of this Easement and the approval issued by the Trust hereunder, issue a certificate to that effect, dated at the time of inspection. In the event of a clearly-defined emergency situation which requires expeditious remedial action and prompt approval by the Trust, the Trust shall grant or withhold its approval in writing within ten (10) calendar days of the receipt of Grantors' written request, provided Grantors' request was submitted in a form acceptable to the Trust as provided in

paragraph 7. The Trust shall be fully reimbursed for all costs, including but not limited to reasonable professional fees of surveyors, attorneys, consultants and accountants, incurred in servicing Grantors' request.

7.3 Arbitration. If a dispute arises between the parties concerning the consistency of any proposed use or activity by or on behalf of Grantors with the purpose of this Easement, either party may refer the dispute to arbitration by request made in writing upon the other, and Grantors agree not to proceed with the use or activity pending resolution of the dispute. Within thirty (30) days of the receipt of such a request, the parties shall select a single arbitrator to hear the matter. If the parties are unable to agree on the selection of a single arbitrator, then each party shall name one arbitrator and the two arbitrators thus selected shall select a third arbitrator; provided, however, if either party fails to select an arbitrator, or if the two arbitrators fail to select a third arbitrator within fourteen (14) days after the appointment of the second arbitrator, then in each such instance a proper court, on petition of a party, shall appoint the second or third arbitrator or both, as the case may be, in accordance with §1280, et seq. of the California Code of Civil Procedures or any successor statute then in effect. The matter shall be settled in accordance with said statute, and a judgment of the arbitration award may be entered in any court having jurisdiction thereof. The prevailing party shall be entitled, in addition to such other relief as may be granted, to a reasonable sum as and for all its costs and expenses related to such arbitration, including, without limitation, the fees and expenses of the arbitrator(s) and attorneys' fees, which shall be determined by the arbitrator(s) and any court of competent jurisdiction that may be called upon to enforce or review the award.

8. Compliance & Enforcement:
The Trust's Remedies. If the Trust determines that Grantors are in violation of the terms of this Easement or that a violation is threatened, the Trust shall give written notice to Grantors of such violation and demand corrective action sufficient to cure the violation and, where the violation involves injury to the organic agricultural uses of the Gardens, resulting from any use or activity inconsistent with the purpose of this Easement, to restore the portion of the Gardens so injured. If Grantors fail to cure the violation within thirty (30) days after the receipt of notice thereof from the Trust, or under circumstances where the violation cannot reasonably be cured within the thirty (30) day period, fail to begin curing such violation within the thirty (30) day period and fail to continue diligently to cure such violation until finally cured, the Trust may bring action at law or in equity in a court of competent jurisdiction to enforce the terms of this Easement, to recover any damages to which it may be entitled for violation of the terms of this Easement or injury to any conservation values protected by this Easement, including damages for the loss of agricultural values, and to require the restoration of the Gardens to the condition that existed prior to such injury. Without limiting Grantors' liability therefor, the Trust, in its sole discretion, may apply damages recovered to the cost of undertaking any corrective action

on the Gardens. If the Trust determines that circumstances require immediate action to prevent or mitigate ruinous or potentially irreparable damage to the chemical-free agricultural values of the Gardens, the Trust may pursue its remedies under this paragraph without prior notice to Grantors or without waiting for the period provided for cure to expire. The Trust will make reasonable effort to inform Grantors of such proposed action, if reasonably possible under the circumstances. The Trust's rights under this paragraph apply equally in the event of either actual or threatened violations of the terms of this Easement. Grantors and the Trust expressly agree that the Gardens, by virtue of their chemical-free nature, are unique and that the violation of this Easement and any ensuing harm or alteration of the Gardens will result in damages which are irremediable and not subject to quantification. In the event that all other incremental remedies identified herein have been exhausted by the Trust, Grantors agree that the Trust's remedies at law for any violation of the terms of this Easement are inadequate and that the Trust shall be entitled to the injunctive relief described in this paragraph, both prohibitive and mandatory, in addition to such other relief to which the Trust may be entitled, including specific performance of the terms of this Easement. The Trust's remedies described in this paragraph shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity.

8.1 Costs of Enforcement. Any costs incurred by the Trust in enforcing the terms of this Easement against Grantors, including, without limitation, costs of suit and reasonable attorneys' fees, and any costs of restoration necessitated by Grantors' violation of any terms of this Easement shall be borne by Grantors. If Grantors prevail in any action (brought either by or against the Trust) to enforce the terms of this Easement, Grantors' costs of suit, including, without limitation, reasonable attorneys' fees, shall be borne by the Trust.

8.2 Discretion of the Trust. Enforcement of the terms of this Easement shall be at the discretion of the Trust, and any forbearance by the Trust to exercise its rights under this Easement in the event of any breach of any term of this Easement by Grantors shall not be deemed or construed to be a waiver by the Trust of such term or of any subsequent breach of the same or any other term of this Easement or of any of the Trust's rights under this Easement. No delay or omission by the Trust in the exercise of any right or remedy upon any breach by Grantors shall impair such right or remedy or be construed as a waiver.

9. Public Access. No right of access by the general public to any portion of the Property or the Gardens is conveyed by this Easement.

10. Costs & Liabilities. Grantors retain all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Gardens, including the maintenance of adequate comprehensive general liability insurance coverage.

10.1 Taxes. Grantors shall pay before delinquency all taxes, assessments, fees, and charges of whatever description levied on or assessed against the Gardens by competent authority (collectively "taxes"), including any taxes imposed upon, or incurred as a result of, this Easement, and shall furnish the Trust with satisfactory evidence of payment upon request.

10.2 Hold Harmless. Grantors shall hold harmless, indemnify, and defend the Trust and its members, directors, officers, employees, agents, and contractors and the heirs, personal representatives, successors, and assigns of each of them (collectively "Indemnified Parties") from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action, claims, demands, or judgments, including, without limitation, reasonable attorneys' fees, arising from or in any way connected with: (1) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Property, regardless of cause, unless due solely to the negligence of any of the Indemnified Parties; (2) the obligations specified in paragraphs 10 and 10.1; and (3) the existence or administration of this Easement.

11. Extinguishment. If circumstances arise in the future such as render this Easement impossible to enforce, through the discontinuation of an organic certification program by an appropriate Certifying Agent as determined by the Trust, the Trust reserves the right to terminate or extinguish, unilateraly, its responsibility to enforce this Easement.

12. Amendment. If circumstances arise under which an amendment to or modification of this Easement would be appropriate, Grantors and the Trust may jointly amend this Easement; provided that no amendment or modification shall be allowed that will adversely affect the qualification of this Easement or the status of the Trust under any applicable laws, including Sec. 815, et seq., of the California Civil Code or Section 170(h) of the Internal Revenue Code of 1954, as amended, and any such amendment or modification shall be consistent with the purpose of this Easement, and shall not affect its perpetual duration. Any such amendment or modification shall be in recordable form and recorded in the official records of Sonoma County, California.

13. Assignment. This Easement is transferable by the Trust, but the Trust may assign its rights and obligations under this Easement only to an organization that is a qualified organization at the time of transfer under Section 170(h) of the Internal Revenue Code of 1954, as amended (or any successor provisions then applicable), and the applicable regulations promulgated thereunder, and authorized to acquire and hold conservation easements under California statute (or any successor provision then applicable). As a condition of such transfer, the Trust shall require that the

conservation purposes that this grant is intended to advance continue to be carried out.

14. Subsequent Transfers. Grantors agree to incorporate the terms of this Easement in any deed or other legal instrument by which they transfer or divest themselves of any interest in all or a portion of the Gardens, including, without limitation, a leasehold interest. Grantors further agree to give written notice to the Trust of the transfer of any such interest at least ten (10) days prior to the date of such transfer. The failure of Grantors to perform any act required by this paragraph shall not impair the validity of this Easement or limit its enforceability in any way.

15. Estoppel Certificates. Upon request by Grantors, the Trust shall within thirty (30) days execute and deliver to Grantors any document, including an estoppel certificate, which certifies Grantors' compliance with any obligation of Grantors contained in this Easement and otherwise evidences the status of this Easement as may be reasonably requested by Grantors.

16. Notices. Any notice, demand, request, consent, approval, or communication that either party desires or is required to give to the other shall be in writing and either served personally or sent by first class mail, postage prepaid, addressed as follows:

To Grantors:	To the Trust:
Dave Henson	The Sonoma Land Trust
15290 Coleman Valley Road	908 College Avenue
Occidental, CA 95465	Santa Rosa, CA 95404

or to such other address as either party from time to time shall designate by written notice to the other.

17. Recordation. The Trust shall record this instrument in timely fashion in the official records of Sonoma County, California and may re-record it at any time as may be required to preserve its rights in this Easement.

18. General Provisions.

(a) Controlling Law. The interpretation and performance of this Easement shall be governed by the laws of the State of California.
(b) Liberal Construction. Any general rule of construction to the contrary notwithstanding, this Easement shall be liberally construed in favor of the grant to effect the purpose of this Easement and the policy and purpose of Section 815, et seq., of the California Civil Code. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purpose of this Easement that would render the provision valid shall be favored over any interpretation that would render it invalid.

(c) Severability. If any provision of this Easement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Easement, or the application of such provision to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

(d) Entire Agreement. This instrument sets forth the entire agreement of the parties with respect to the Easement and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Easement, all of which are merged herein. No alteration or variation of this instrument shall be valid or binding unless contained in an amendment or modification that complies with paragraph 12, Amendment.

(e) No Forfeiture. Nothing contained herein will result in a forfeiture or reversion of Grantors' title in any respect.

(f) Joint Obligation. The obligations imposed by this Easement upon Grantors shall be joint and several.

(g) Successors. The covenants, terms, conditions, and restrictions of this Easement shall be binding upon, and inure to the benefit of, the parties hereto and their respective personal representatives, heirs, successors, and assigns and shall continue as a servitude running in perpetuity with the Gardens.

(h) Termination of Rights & Obligations. A party's rights and obligations under this Easement terminate upon transfer of the party's interest in the Easement or the Gardens, except the liability for acts or omissions occuring prior to transfer shall survive transfer.

(i) Captions. The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon construction or interpretation.

(j) Counterparts. The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

TO HAVE AND TO HOLD unto the Trust, its successors and assigns, forever.

WITNESS the following signatures.

Dated: July 28, 1994

GRANTORS:

by _____
Dave Henson, Occidental Arts & Ecology Center

THE TRUST: THE SONOMA LAND TRUST

by Richard Charter
Richard Charter, Executive Director

Exhibit "A"

The land referred to in this Report is situated in the State of California, County of Sonoma, Unincorporated Area and is described as follows:

PARCEL ONE:

The Southeast quarter of the southwest quarter of Section 27, Township 7 North, Range 10 West, M.D.M., and the Northeast quarter of the Northwest quarter of Section 34, Township 7 North, Range 10 West, M.D.M.

Excepting therefrom the following:

Commencing at the northwest corner of the southeast quarter of the northwest quarter of Section 34, Township 7 North, Range 10 West; thence East 190 feet; thence North 150 feet; thence West 190 feet; thence South 150 feet to the place of commencement.

PARCEL TWO:

Commencing at the northeast corner of the southeast quarter of the northwest quarter of Section 34, Township 7 North, Range 10 West, M.D.M.; thence South along the quarter Section line to the northeasterly line of the County Road; thence Northwesterly along the Northeasterly side of the said road to the South line of the Northeast quarter of the Northwest quarter of said Section; thence Easterly to the place of commencement.

Excepting from said tract that portion thereof included within the 40 foot strip conveyed by John White, et al, to County of Sonoma, for road purposes, by deed dated March 10, 1886 and recorded June 15, 1886 in Liber 101 of Deeds, page 233, Sonoma County Records.

PARCEL THREE:

Being a portion of the 150 feet by 190 feet parcel of land situated in Section 34, Township 7 North, Range 10 West, M.D.B. & M., which was conveyed by Annie Francheschi to Louis S. Beedle by deed recorded December 16, 1919 in Liber 379 of Deeds, page 246, Sonoma County Records, and being more particularly described as follows:

Commencing at a 1/2" iron pipe monument marking the northwest 1/16 corner of said Section 34; thence along the westerly line of said 150 feet by 190 feet parcel of land, North 0 degrees 11' 40" West, 69.95 feet to a point in the northerly line of the Coleman Valley Road, the point of beginning of the parcel to be herein described; thence continuing along said Westerly line North 0 degrees 11' 40" West, 80.05 feet to the Northwesterly corner of said 150 feet by 190 feet parcel; thence along the Northerly line thereof, North 89 degrees 37' East, 190.0 feet; thence along the easterly line thereof, South 0 degrees 11' 40" East, 75.2 feet to a point in the northerly line of the Coleman Valley Road; thence along said Northerly line North 85 degrees 14' West, 39.53 feet to a 1/2" iron pipe monument; thence along a curve to

continued...

the left with a radius of 520 feet, through an angle of 16 degrees 40' a distance of 151.25 feet to a 1/2" iron pipe monument; thence South 78 degrees 06' West, 0.15 feet to the point of beginning.

Description is based on survey and calculations by G. S. Abbott, L. S. 2297 and all monuments set are visibly tagged.

Also excepting from Parcel One, Two and Three above, all that portion conveyed to the County of Sonoma, by deed dated December 30, 1969, and recorded January 15, 1970, in Book 2440 Official records, page 85, Serial No. L-48977, Sonoma County Records.

A. P. No.: 074-160-34

Incorporated by reference, Exhibit B shall include aerial photographs and a survey of the Gardens conducted by a licensed surveyor, to be kept on file at the offices of the Sonoma Land Trust.

Occidental Arts and Ecology Center
Mother Gardens Conservation Easement Areas

Boundaries are approximate only.
County of Sonoma Enterprise
GIS Database Oct. 05.
AirPhoto USA 2007. SLT 6_08.

0 125 250 500 Feet

N

SONOMA LAND TRUST

APPENDIX 3: TAX AND BUSINESS MANAGEMENT

This section includes a series of statements related to tax and business management that should be included in plans.

Property tax – The land is owned by Sowing Circle LLC, who is responsible for the property taxes; OAEC leases the land from Sowing Circle. The only property tax exemption received is a homeowners property tax credit for Sowing Circle members from the County of Sonoma for cooperative housing. Landowners should be aware of any program rules and regulations related to property taxes.

Income tax – Timber harvest and other revenue generating activities generally produce a federal and state income tax liability. Tax credits may be available for some management activities. OAEC is a non-profit 501(c)3 organization that does not pay income tax. Sowing Circle issues K1s schedule to all of the partners.

Estate tax – Good estate planning can help to lessen tax liability when passing land to heirs; landowners should seek good planning and tax advice.

Record keeping – Good record keeping can help landowners manage their assets, increase their revenues, and minimize their tax liability. Sowing Circle

Land Use – The land is zoned LEA B6 100 Combining District SR (see Appendix 2).

APPENDIX 4: SUMMARY OF PERMITS REQUIRED FOR WORK IN CREEKS AND RIVERS IN CALIFORNIA 2015

PRUNUSKE CHATHAM, INC.

Work in creeks and rivers in California is regulated by many public agencies, including the U.S. Army Corps of Engineers (Corps) under §404 of the federal Clean Water Act (CWA), the Regional Water Quality Control Boards (RWQCB) under federal CWA §401 and the state's Porter-Cologne Act, the California Department of Fish and Wildlife (CDFW) under §1600 et seq. of the Fish & Game Code, and the local city or county where the project will take place (e.g., grading, zoning, building, encroachment permits). Work in the Coastal Zone requires a Coastal Development Permit, and actions that may affect San Francisco Bay and some of its tributaries are regulated by the Bay Conservation and Development Commission (BCDC). Construction projects involving an acre or more must comply with the National Pollutant Discharge Elimination System (NPDES). If water is to be diverted or impounded from a surface or underground stream or other body of water, a permit or registration may be needed from the State Water Resources Control Board, Division of Water Rights (California Water Code §1200, et seq.). Dams may require written approval from the California Department of Water Resources, Division of Safety of Dams (California Water Code §6000, et seq.).

U.S. Army Corps of Engineers §404 Nationwide and Individual Permits

The Corps regulates discharges of dredged or fill material into any channel that is a "water of the U.S." or its tributary or that has real or potential interstate commerce value. A channel is defined as a watercourse that has a bed and bank with an ordinary high water mark (OHWM). Functionally, the Corps regulates nearly all creeks and rivers. Nationwide Permits (NWPs) have been developed to allow projects that meet specific criteria and that do not result in adverse environmental effects; other projects that do not meet the criteria for a NWP must apply for an Individual Permit. In California, Corps offices are located in San Francisco, Sacramento, and Los Angeles. Napa, Sonoma, Mendocino and Marin counties are in the Corps' San Francisco District; its homepage is http://www.spn.usace.army.mil/.

Regional Water Quality Control Board §401 Certifications

Under §401 of the federal Clean Water Act, the Corps is required to meet state water quality regulations prior to granting a §404 permit for work in a creek or river. In California, this is accomplished by application to the local RWQCB for certification that

the requirements have been met. There is a filing fee for this application, and the RWQCB may impose conditions to ensure that the project does not result in negative environmental impacts. Watersheds that drain into the ocean north of Walker Creek are in the North Coast district; its homepage is http://www.swrcb.ca.gov/rwqcb1/. Watersheds that drain into San Francisco Bay and Tomales Bay are in the San Francisco Bay district; its homepage is http://www.swrcb.ca.gov/rwqcb2/.

The Corps has jurisdiction over all perennial and intermittent streams and over ephemeral streams that have a discernible bed and bank and ordinary high water mark (OHWM). District Engineers use their judgment on a case-by-case basis to determine whether an OHWM is present. Ephemeral streams are defined as having flowing water only during, and for a short duration after, precipitation events; they are located above the water table year-round.The ordinary high water mark is described as the elevation delineating the highest water level that has been2 maintained for a sufficient period of time to leave evidence on the landscape.

Regional Water Quality Control Board Waste Discharge Requirements

When a project involves work in a stream that is not subject to regulation under §404 of the federal Clean Water Act, the project may require issuance, or a waiver, of Waste Discharge Requirements (WDRs) under the state's clean water act, known as the Porter Cologne Act. The application form is the same as for the §401 Certification. Consult the district's homepage for further information.

California Department of Fish and Wildlife §1602 Lake and Streambed Alteration Agreement

Under §1600 et seq. of the California Fish and Game Code, CDFW has jurisdiction over any activity in a creek or river in which there is at any time an existing fish or wildlife resource or from which such resources derive benefit. Projects affecting or potentially affecting such resources must obtain an agreement from CDFW, which usually imposes conditions to protect the environment.
See https://www.wildlife.ca.gov/Conservation/LSA for application, instructions, and current filing fees.

County and City Regulations

Projects that involve excavation in a creek generally require a grading or similar permit from the local county or city. In addition, placement of a bridge typically requires a building permit. Many local jurisdictions have special set backs and zoning permit regulations that may also apply. In Marin County, the Stormwater Pollution Prevention Program is an informative and user-friendly place to begin http://mcstoppp.org/. Information about permits in Sonoma County can be found on the PRMD website at

http://sonomacounty.ca.gov/Permit-and-Resource-Management/.

San Francisco Bay Conservation and Development Commission (BCDC)

BCDC regulates actions that may affect the San Francisco Bay; these include grading, construction, remodeling or repair of a structure, subdivision of property, substantial change in use of a property, dredging, placement of solid material, building or repair of docks, pile-supported or cantilevered structures, disposal of material, and mooring a vessel for a long period in the bay. BCDC jurisdiction consists of all of San Francisco Bay and includes lands within the first 100 feet inland from the shoreline, as well as certain tributaries that flow into the bay. It also takes in salt ponds, duck hunting preserves, game refuges, and other managed wetlands diked off from the bay. http://www.bcdc.ca.gov/.

State Water Resources Control Board (SWRCB), Division of Water Quality

Compliance with the National Pollutant Discharge Elimination System (NPDES) of the federal Clean Water Act requires a General Permit for storm water discharges associated with construction activities. For all construction projects disturbing an area greater than one acre, a Notice of Intent (NOI) with a fee must be filed with the SWRCB. Each NOI requires a Storm Water Pollution Prevention Plan (SWPPP) be developed and implemented that specifies Best Management Practices (BMPs) to prevent construction pollutants from entering waters of the state. Additional information and the application can be found at:
http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml.

Beginning June 30, 2015, *any* project that will disturb soil must develop an Erosion and Sediment Control Plan and submit it to the local permitting agency for approval in order to receive a building or grading permit. Large projects (i.e., ≥1 acre of disturbed soil) can submit their SWPPP to fulfill this new requirement.

State Water Resources Control Board, Division of Water Rights

If water from a surface or underground stream or other body of water is taken for storage or direct use on non-riparian land, a registration or permit must be obtained from the State Water Resources Control Board, Division of Water Rights (California Water Code §1200 et seq.).

Registration of Small Domestic Use or Livestock Stockpond Appropriation

For direct diversion of not more than 4,500 gallons or storage of not more than 10 acre-feet per annum, a Registration of Small Domestic Use or Registration of Livestock Stockpond Appropriation application form may be used. These registrations must be

renewed every 5 years. The lawn or garden irrigation area under a Small Domestic Use registration must be 0.5 acres or less.

Application to Appropriate Water by Permit

For direct diversion of more than 4,500 gallons, storage of more than 10 acre-feet per annum, or irrigation of more than 0.5 acres, an Application to Appropriate Water by Permit must be used. The Water Right Application fee varies, and there is an additional Water Right Filing Fee to CDFG. Other costs include preparation of environmental documents required by the California Environmental Quality Act (CEQA) and a water availability document.
Forms and application information are found at:
http://www.waterboards.ca.gov/waterrights/.

California Department of Water Resources, Division of Safety of Dams

Construction or enlargement of dams that are 25 feet or more in height that store more than 15 acre- feet of water and/or dams that store 50 acre-feet or more of water that are more than 6 feet high require written approval of the plans and specifications by the California Department of Water Resources, Division of Safety of Dams, P.O. Box 942836, Sacramento, CA 94236-0001 (California Water Code §6000, et seq.).

Other Regulations

The above agencies are required to comply with other regulations, including, but not limited to, the California Environmental Protection Act (CEQA), the National Environmental Policy Act (NEPA), the state and federal Endangered Species Acts (ESA), the Historic Preservation Act, the Migratory Bird Treaty Act (MBTA), and the Coastal Zone Management Act. Typically, compliance also involves consultation with the U.S. Fish and Wildlife Service (USFWS), the Native American Heritage Commission, and the Office of Historic Preservation (OPR) through its California Historical Resources Information System (CHRIS). NOAA Fisheries must be consulted when listed anadromous fish are potentially present.

Other Useful Websites
CEQA: http://resources.ca.gov/ceqa/stat/; http://resources.ca.gov/ceqa/guidelines/.
See Guidelines' Appendices for forms and timeline.
NEPA Regulations: http://www.epa.gov/compliance/nepa/index.html.
NOAA Fisheries ESA Program: http://www.noaa.gov/fisheries.html.
USFWS ESA Program: http://endangered.fws.gov/index.html.
California Natural Diversity Data Base:http://www.dfg.ca.gov/biogeodata/cnddb/.
Native American Heritage Commission (NAHC): http://www.nahc.ca.gov.
Office of Historic Preservation (OHP): http://www.ohp.parks.ca.gov/.

California Historical Resources Information System (CHRIS): link is on OHP page.

Disclaimer

This material is provided for informational purposes only. Before taking any action that could have legal or other important consequences, speak with a qualified professional who can provide guidance that considers your own unique circumstances.

Prunuske Chatham, Inc., 2015

APPENDIX 5: CALIFORNIA NATURAL DIVERSITY DATABASE REPORT

Selected Elements by Common Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad is (Camp Meeker (3812248) or Duncans Mills (3812341))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
American badger *Taxidea taxus*	AMAJF04010	None	None	G5	S4	SSC
Baker's larkspur *Delphinium bakeri*	PDRAN0B050	Endangered	Endangered	G1	S1	1B.1
Baker's manzanita *Arctostaphylos bakeri ssp. bakeri*	PDERI04221	None	Rare	G2T2	S2	1B.1
bank swallow *Riparia riparia*	ABPAU08010	None	Threatened	G5	S2S3	
Blasdale's bent grass *Agrostis blasdalei*	PMPOA04060	None	None	G2	S2	1B.2
bluff wallflower *Erysimum concinnum*	PDBRA160E3	None	None	G3	S3	1B.2
bristly sedge *Carex comosa*	PMCYP032Y0	None	None	G5	S2	2B.1
California freshwater shrimp *Syncaris pacifica*	ICMAL27010	Endangered	Endangered	G1	S1	
California red-legged frog *Rana draytonii*	AAABH01022	Threatened	None	G2G3	S2S3	SSC
Coastal and Valley Freshwater Marsh *Coastal and Valley Freshwater Marsh*	CTT52410CA	None	None	G3	S2.1	
coastal bluff morning-glory *Calystegia purpurata ssp. saxicola*	PDCON040D2	None	None	G4T2T3	S2S3	1B.2
Coastal Brackish Marsh *Coastal Brackish Marsh*	CTT52200CA	None	None	G2	S2.1	
Coastal Terrace Prairie *Coastal Terrace Prairie*	CTT41100CA	None	None	G2	S2.1	
Crystal Springs lessingia *Lessingia arachnoidea*	PDAST5S0C0	None	None	G1	S1	1B.2
foothill yellow-legged frog *Rana boylii*	AAABH01050	None	None	G3	S2S3	SSC
fragrant fritillary *Fritillaria liliacea*	PMLIL0V0C0	None	None	G2	S2	1B.2
golden larkspur *Delphinium luteum*	PDRAN0B0Z0	Endangered	Rare	G1	S1	1B.1
great blue heron *Ardea herodias*	ABNGA04010	None	None	G5	S4	
Greene's narrow-leaved daisy *Erigeron greenei*	PDAST3M5G0	None	None	G2	S2	1B.2
hoary bat *Lasiurus cinereus*	AMACC05030	None	None	G5	S4?	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
holly-leaved ceanothus *Ceanothus purpureus*	PDRHA04160	None	None	G2	S2	1B.2
long-beard lichen *Usnea longissima*	NLLEC5P420	None	None	G4	S4.2	
longfin smelt *Spirinchus thaleichthys*	AFCHB03010	Candidate	Threatened	G5	S1	SSC
monarch butterfly *Danaus plexippus*	IILEPP2010	None	None	G5	S3	
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	IILEPJ608C	Endangered	None	G5T1	S1	
Napa false indigo *Amorpha californica var. napensis*	PDFAB08012	None	None	G4T2	S2	1B.2
North Coast semaphore grass *Pleuropogon hooverianus*	PMPOA4Y070	None	Threatened	G2	S2	1B.1
osprey *Pandion haliaetus*	ABNKC01010	None	None	G5	S3	WL
Pacific gilia *Gilia capitata ssp. pacifica*	PDPLM040B6	None	None	G5T3T4	S2.2?	1B.2
pallid bat *Antrozous pallidus*	AMACC10010	None	None	G5	S3	SSC
Pennell's bird's-beak *Cordylanthus tenuis ssp. capillaris*	PDSCR0J0S2	Endangered	Rare	G4G5T1	S1	1B.2
perennial goldfields *Lasthenia californica ssp. macrantha*	PDAST5L0C5	None	None	G3T2	S2.2	1B.2
Point Reyes checkerbloom *Sidalcea calycosa ssp. rhizomata*	PDMAL11012	None	None	G5T2	S2.2	1B.2
purple-stemmed checkerbloom *Sidalcea malviflora ssp. purpurea*	PDMAL110FL	None	None	G5T2	S2.2	1B.2
rhinoceros auklet *Cerorhinca monocerata*	ABNNN11010	None	None	G5	S3	WL
Rincon Ridge ceanothus *Ceanothus confusus*	PDRHA04220	None	None	G1	S1	1B.1
Rincon Ridge manzanita *Arctostaphylos stanfordiana ssp. decumbens*	PDERI041G4	None	None	G3T1	S1	1B.1
saline clover *Trifolium hydrophilum*	PDFAB400R5	None	None	G2	S2	1B.2
Sebastopol meadowfoam *Limnanthes vinculans*	PDLIM02090	Endangered	Endangered	G1	S1	1B.1
short-leaved evax *Hesperevax sparsiflora var. brevifolia*	PDASTE5011	None	None	G4T2T3	S2S3	1B.2
showy rancheria clover *Trifolium amoenum*	PDFAB40040	Endangered	None	G1	S1	1B.1

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Sonoma alopecurus *Alopecurus aequalis var. sonomensis*	PMPOA07012	Endangered	None	G5T1Q	S1	1B.1
Sonoma tree vole *Arborimus pomo*	AMAFF23030	None	None	G3	S3	SSC
steelhead - central California coast DPS *Oncorhynchus mykiss irideus*	AFCHA0209G	Threatened	None	G5T2Q	S2	
swamp harebell *Campanula californica*	PDCAM02060	None	None	G3	S3	1B.2
thin-lobed horkelia *Horkelia tenuiloba*	PDROS0W0E0	None	None	G2	S2.2	1B.2
Tidestrom's lupine *Lupinus tidestromii*	PDFAB2B3Y0	Endangered	Endangered	G1	S1	1B.1
tufted puffin *Fratercula cirrhata*	ABNNN12010	None	None	G5	S2	SSC
western pond turtle *Emys marmorata*	ARAAD02030	None	None	G3G4	S3	SSC
western red bat *Lasiurus blossevillii*	AMACC05060	None	None	G5	S3?	SSC

Record Count: 50

Northern spotted owl
Strix occidentalis caurina
Federally threatened, California species of special concern