

**FINE-SCALE VEGETATION MAP AND ACCURACY
ASSESSMENT OF THE WALKER RIDGE AREA, COLUSA
AND LAKE COUNTIES, CALIFORNIA**
Contract GS00F170GA - Order No. 140L1221F004



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ABSTRACT

U.S. Bureau of Land Management (BLM) has a goal to develop fine-scale vegetation maps for all the public lands it manages in California. To help meet this goal BLM contracted Aerial Information Systems, Inc. (AIS) to conduct vegetation classification development, fine-scale vegetation mapping, and accuracy assessment (AA) of approximately 22,061 acres within Colusa and Lake counties of California, under Contract GS00F170GA-Order No.140L1221F0044. AIS subcontracted the California Native Plant Society (CNPS) to conduct classification development work needed for this project, as well as AA field data collection. The California Department of Fish and Wildlife's (CDFW) Vegetation Classification and Mapping Program (VegCAMP) provided in-kind service to allocate AA sample sites and score the vegetation map using the AA data.

The study area, referred to as Walker Ridge or Molok Luyuk, which means Condor Ridge in the Native American Patwin language of the Yocha Dehe Wintun Nation, is located in the inner North Coast Ranges, east of Clear Lake and west of the town of Williams in the Sacramento Valley. This area has a large serpentinite outcrop that contains a high diversity of plants and plant communities, and is home to dozens of threatened and endangered (T&E) plants and animals.

The vegetation classification developed for the project follows Federal Geographic Data Committee (FGDC) and National Vegetation Classification Standards (NVCS). The classification is based on new and previous survey information and classification work. The map was produced applying heads-up digitizing techniques using a base of 2020 60-centimeter National Agricultural Imagery Program (NAIP) imagery (true-color and color infrared), in conjunction with ancillary data and imagery sources. Map polygons are assessed for Vegetation Type, Percent Cover, Exotics, Development Disturbance, and other attributes. The minimum mapping unit (MMU) is 1 acre. Exceptions were created for vegetation stands of special significance. In this mapping effort, riparian vegetation and wetland types were mapped to a 1/4-acre MMU. Polygons representing land use were mapped with a 1-acre MMU.

There were a total of 42 mapping classes composed of 30 alliances and alliance-level types such as Provisional Alliances, Semi-natural Alliances, and Mapping Units; and 5 Miscellaneous Classes relating to features such as agriculture, water, and urban disturbance; and 7 upper-level hierarchical types, such as Macrogroup and Group.

Field reconnaissance and accuracy assessment enhanced map quality. The overall accuracy assessment ratings for the final vegetation map was 89.7% overall fuzzy accuracy.

TABLE OF CONTENTS

ACKNOWLEDGMENTS	ii
ABSTRACT	iii
TABLE OF CONTENTS.....	iv
FIGURES	v
TABLES.....	v
APPENDICES.....	vi
CHAPTER 1: Introduction.....	1
1.1 The Mapping Program	1
1.2 The Study Area	1
1.2.1 Vegetation Summary	3
CHAPTER 2: Methodology	5
2.1 Overview	5
2.2 Project Materials	5
2.2.1 Computer Software/Hardware	5
2.2.2 Imagery.....	5
2.2.3 Ancillary Data.....	5
2.3 Floristic Classification.....	6
2.3.1 Data Collection for Classification	7
2.3.2 Classification Data & Vegetation Key, Descriptions.....	8
2.4 Mapping Classification	8
2.5 Field Reconnaissance.....	9
2.6 Photointerpretation Mapping Procedures.....	11
2.6.1 Photointerpretation Process.....	11
2.6.2 Mapping Process	12
2.6.3 Mapping Criteria	13
2.6.4 Quality Control	24
2.7 Accuracy Assessment.....	25
CHAPTER 3: Results.....	28
3.1 Floristic Classification.....	28
3.1.1 Classification Data Collection	28

3.1.2 Classification Data & Vegetation Key, Descriptions.....	28
3.2 Mapping	39
3.3 Accuracy Assessment.....	39
3.3.1 Accuracy Assessment Data Collection	39
3.3.2 Data Analysis.....	40
REFERENCES.....	43
GLOSSARY	46

FIGURES

Figure 1: Location of the Study Area.....	2
Figure 2: Location of Reconnaissance/Verification Observation Sites.....	10
Figure 3 Geographic Locations of New and Compiled Vegetation Classification Surveys Along and Adjacent to Walker Ridge (Molok Luyuk)	29
Figure 4: Map of the AA Survey Locations	40

TABLES

Table 1: Summary of Field Reconnaissance Trips.....	9
Table 2: Minimum Mapping Unit Size	15
Table 3: Map Classes for Exotics	18
Table 4: Map Classes for Roadedness Disturbance	20
Table 5: Map Classes for Development Disturbance	21
Table 6: Map Classes for Anthropogenically Altered Disturbance	22
Table 7: Accuracy Assessment Scoring Rules and Points	26
Table 8. Floristic Classification Alliance and Association List for Walker Ridge (Molok Luyuk).....	30
Table 9. User's and Producer's Accuracies by Map Class From the Initial Assessment.....	41

APPENDICES

Appendix A: Map Classification

A-1: Mapping Classification Hierarchy – 09/30/2023

A-2: Mapping Classification Numeric Short List – 09/30/2023

A-3: Mapping Classification Alphabetic Short List – 09/30/2023

Appendix B: Map Unit Descriptions 09/30/2023

Appendix C: Summaries of Acreage and Polygon Count by Map Unit

Appendix D: Field Forms for Vegetation Sampling and Accuracy Assessment

Appendix E: Vegetation Field Key for the Molok Luyuk (Walker Ridge) Map Area

Appendix F: Glossary

Appendix G: Floristic Vegetation Classification Hierarchy

Appendix H: Floristic Vegetation Descriptions of the Walker Ridge (Molok Luyuk) Unit

Appendix I: Contingency Table for the Walker Ridge (Molok Luyuk) Study Area 09/30/2023

CHAPTER 1: Introduction

1.1 The Mapping Program

U.S. Bureau of Land Management (BLM) has a goal to develop fine-scale vegetation maps for all the public lands it manages in California. To help meet this goal BLM contracted Aerial Information Systems, Inc. (AIS) to conduct vegetation classification development, fine-scale vegetation mapping, and accuracy assessment (AA) of approximately 22,061 acres within Colusa and Lake counties of California, under Contract GS00F170GA-Order No.140L1221F0044. The California Native Plant Society (CNPS), as a subcontractor to AIS, assisted in field reconnaissance efforts, and conducted the field data collection for the classification development and AA for this project. Vollmar Natural Lands Consulting (VNLC) was a subcontractor to CNPS to support their efforts on the project. The California Department of Fish and Wildlife (CDFW) contributed in-kind services including consultation during classification development, and conducting AA allocation and scoring for the project.

Work performed for this effort is based on the classification and mapping standards as outlined in the Survey of California Vegetation (SCV) Classification and Mapping Standards developed by the Vegetation Classification and Mapping Program (VegCAMP) (VegCAMP 2020). The mapping classification includes sparsely vegetated and non-vegetative classes, such as rock outcrops, water bodies, and land use that may not be part of the floristic classification.

Field reconnaissance was conducted by staff from AIS, accompanied by CNPS and/or VNLC staff. AIS photo interpreters then created a geographic information systems (GIS) geodatabase of vegetation map units representing Vegetation Types (vegetation alliances) and Percent Cover of different vegetative life forms. Map polygons were assessed for Exotics, Development Disturbance, and other attributes (see Appendix A). The minimum mapping unit (MMU) size for vegetation is 1 acre; exceptions are made for wetlands and riparian types, which are mapped to a 1/4-acre MMU. Land use polygons are mapped to a 1-acre MMU.

The geodatabase was produced using on-screen heads-up digitizing, with the data georeferenced to 2020 60-centimeter National Agricultural Imagery Program (NAIP) imagery. Ancillary data and imagery sources were used to supplement attribution. The geodatabase passed quality control procedures before being finalized. AA was conducted by CNPS and VegCAMP staff. Sample allocation sites for AA were created by VegCAMP for CNPS field crews to use during the field data collection. Once the field plot information was entered into a database, the point data was analyzed and scored by VegCAMP.

1.2 The Study Area

The Walker Ridge study area, also referred to as Molok Luyuk, which means Condor Ridge in the Native American Patwin language of the Yocha Dehe Wintun Nation, is an

approximately 22,061-acre portion of the northern Coast Ranges, east of Clear Lake and west of the town of Williams in the Sacramento Valley (**Figure 1**).

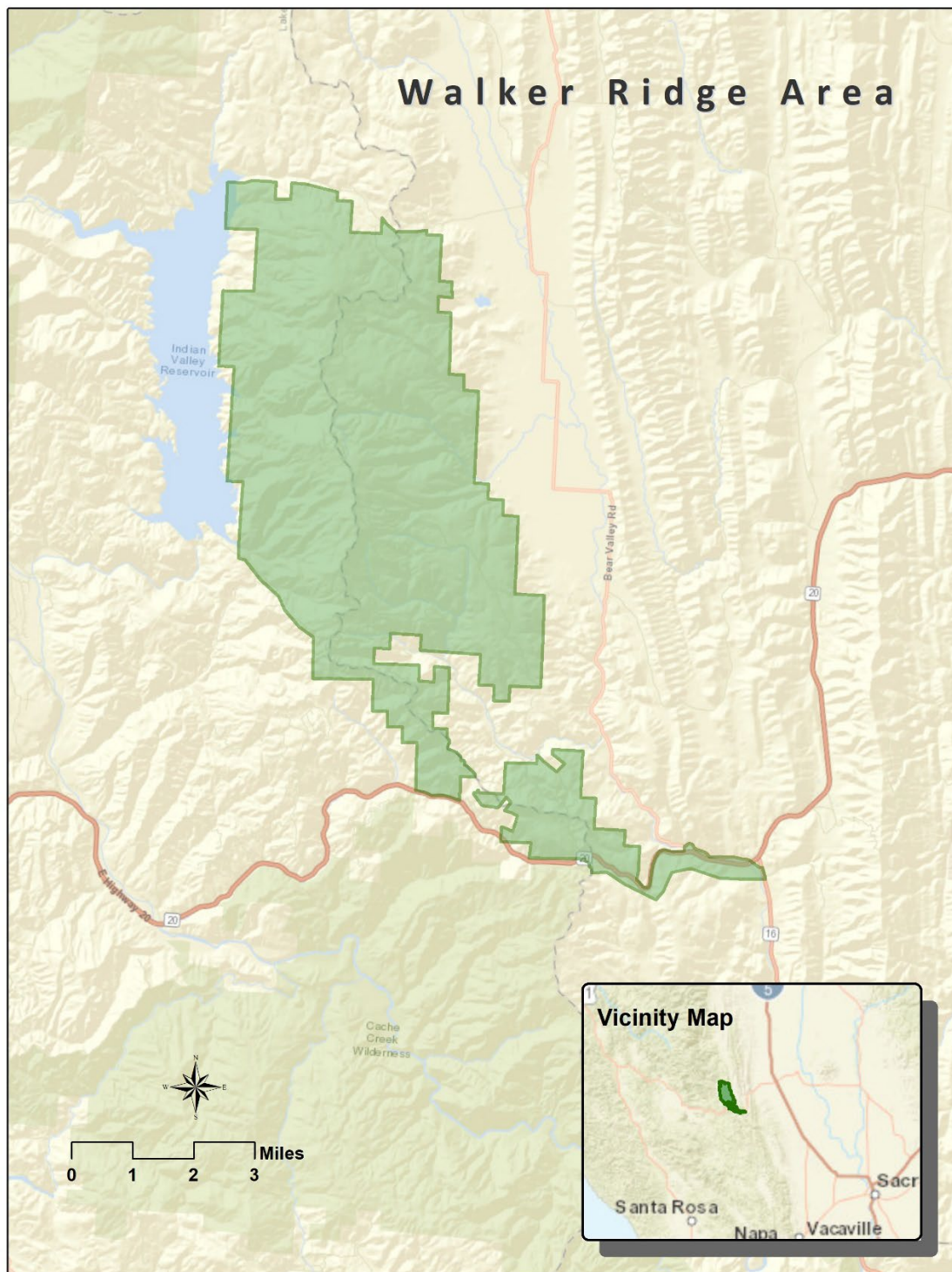


Figure 1: Location of the Study Area

The study area falls within the BLM Ukiah Field Office jurisdiction and is located at the border of Colusa and Lake counties. This area is proposed to be added to the Berryessa Snow Mountain National Monument and is a rugged section of Northern California's interior Coast Range. This region is a hotspot of biodiversity, largely due to the ultramafic geology of serpentinite rocks in the area and includes dozens of threatened and endangered (T&E) plants and animals and an incredible variation in vegetation patterns from alkali sinks and wetland springs to serpentine chaparral and cypress woodlands to oak and pine woodlands (Smith 2018). The mapping footprint has experienced four major fire events within the past 15 years, the Walker fire in 2008, Walker Wye fire in 2012, and the Pawnee and Ranch fires in 2018 (CalFire-FRAP 2022). This project was initiated to inform BLM's management activities, the identification and maintenance of habitat suitable for federally listed plant and animal species, and an increased understanding of ecosystem functions and processes within the Unit.

The outer boundary follows BLM ownership jurisdiction, with "island" inclusions of non-BLM land. Walker Ridge Road, which follows the Lake/Colusa County divide, basically bisects the study area. The study area is divided into two subareas, split by private property in the Wilbur Hot Springs/Sulphur Creek area.

The northern portion (approximately 19,851 acres) is flanked by Indian Valley Reservoir to the west and Bear Valley to the east. In some sections, the study area boundary reaches the reservoir edge and the valley floor, and in other areas the boundary is several hundred feet upslope. A portion of the study area, from the western edge above the reservoir, to just west of Walker Ridge Rd, is part of the Berryessa-Snow Mountain National Monument. The northern study area boundary approximately follows Bartlett Springs Rd (County Route 303) and Brim Rd, running east-west.

The lower portion (approximately 2210 acres) is south of the Wilbur Hot Springs property and roughly follows State Highway Route 20. The southeastern extent of the study area reaches State Highway Route 16. The Cache Creek Wilderness is just south of the study area.

1.2.1 Vegetation Summary

Trees - *Aesculus californica* (California Buckeye) is most commonly seen on mesic north-facing slopes in the mid to lower elevations of the study area, often mixing with *Quercus berberidifolia*. *Hesperocyparis macnabiana* (Macnab's Cypress) is most common on serpentine substrate in the mid to upper elevations of the study area. Macnab's Cypress can be observed ranging from small regenerating individuals in post-fire or dozer fire break settings to extensive mature stands. *Hesperocyparis sargentii* (Sargent Cypress) is limited to the very north end of the study area on the north face of a very steep canyon. *Pinus attenuata* (Knobcone Pine) can be found on serpentine substrates in the upper elevations of study area. *Pinus sabiniana* (Foothill Pine) occurs throughout the study area, but is uncommon as a dominant type. *Populus fremontii* (Fremont's Cottonwood) is very rare in the study, as are most riparian types. *Quercus chrysolepis* (Canyon Live Oak) can be found in upper elevation mesic draws and north

faces, often mixing with *Quercus wislizeni*. *Quercus douglasii* (Blue Oak) can be observed in grassy, woodland settings in the lower elevations. *Quercus wislizeni* tree (Interior Live Oak) is most commonly seen in the mid to upper elevations of the study area in mesic settings, does not like serpentine substrate, and can often mix with *Umbellularia californica* or *Aesculus californica* and some *Quercus berberidifolia* in mid elevations. *Umbellularia californica* (California Bay) is found in mesic to riparian areas in the study area.

Shrubs - *Adenostoma fasciculatum* (Chamise) is observed throughout, and is likely the most common shrub, in the study area. It forms dense stands and often is mixed with *Ceanothus cuneatus* or *Arctostaphylos viscida* at higher elevations. *Arctostaphylos viscida* (Whiteleaf manzanita) can be observed in the mid to upper elevations, often seen on or near ridgetops, and grows well on serpentine, often with *Quercus durata* or *Hesperocyparis macnabiana*. *Ceanothus cuneatus* (Wedgeleaf Ceanothus) increases in prevalence as the elevation ascends, and can often be found mixing with *Adenostoma fasciculatum*, from a minor component to dominant in cover. *Quercus berberidifolia* (Scrub Oak) occurs throughout study area off the serpentine substate. It is most common in the lower to mid elevations in mesic draws and north-facing slopes, often with *Aesculus californica*. *Quercus berberidifolia* shares a similar environment as *Quercus wislizeni*, but is typically lower in elevation, and *Quercus berberidifolia* is shorter in stature. *Quercus durata* (Leather Oak) is mostly limited to serpentine substrate and tends to be shorter in stature than *Quercus berberidifolia* and *Quercus wislizeni*. *Quercus durata* can mix with *Hesperocyparis sargentii* and/or *Arctostaphylos viscida*, and is usually shorter than the *Arctostaphylos viscida*. *Tamarix* spp. (Tamarisk) can occur along riparian areas in the lower elevations near State Highway Route 20.

Herbaceous: The study area is composed of upland grasslands comprised of native and non-native grasses and forbs. Moist meadows occur along drainages and on flats, both on and off the serpentine substrate. Non-native grasses and forbs are more prevalent off serpentine.

CHAPTER 2: Methodology

2.1 Overview

The mapping effort began with the compilation of a preliminary mapping classification based on the floristic classification developed by CNPS. The project team made up of experienced photo interpreters from AIS and field ecologists from CNPS and Vollmar, then conducted a field reconnaissance visit to prepare for the photointerpretation effort. Using GIS technology, the photo interpreters applied their knowledge and observations of California vegetation to create a map of vegetation types. Code values representing a suite of other attributes were assigned to the vegetation polygons. Several quality control and QA procedures were implemented prior to finalizing the geodatabase. A more detailed discussion of these methodology components follows.

2.2 Project Materials

2.2.1 Computer Software/Hardware

The mapping effort was conducted using Dell workstations with dual monitors. The extra monitor was helpful in viewing ancillary image sources and ground photos while the map was being created on the primary monitor. The maps were produced using Esri's ArcGIS software. The final map was delivered in ArcGIS 10.8.2 file geodatabase format.

2.2.2 Imagery

The digital orthophoto base for the vegetation mapping project was 60-centimeter 2020 NAIP imagery (true-color and color-infrared). Although other supplemental sources were used to aid in interpretation and attribute assignments, all delineations were based on the NAIP base imagery. Additional true-color digital imagery was available through ArcGIS online (variable dates depending on scale viewed), which the vegetation mappers were able to bring directly into their ArcMap sessions. The photo interpreters also referred to imagery available from the internet, such as Google Earth, Google Maps, and Bing Maps. Google Earth allowed for viewing imagery from various months of previous years, if available, which was helpful in assessing long-term trends and varying phenological appearances of the vegetation. The Google Maps and Bing Maps Street View options were sometimes used where available.

2.2.3 Ancillary Data

The distribution of vegetation on the landscape is influenced by a variety of environmental factors, such as geology, soils, topography, and fire history. Digital data sources addressing these factors helped the photo interpreters in the delineation of vegetation map units. Existing maps of vegetation were also a valuable reference. All of these data sources were georeferenced and viewed by the mappers within their ArcMap sessions.

The following sources, some of which were provided by partnering agencies, were used regularly throughout the mapping effort:

1. Provided by VNLC and CNPS for VNLC Walker Ridge Project Area, 2019
 - Vegetation Map (Detailed Map of Plant Communities)
 - CCH Points (California Consortium of Herbaria)
 - Rare Plants Points
 - Walker Ridge Reference Points
 - Walker Ridge Recon Points
 - Walker Ridge Springs
 - Roads
 - Walker Ridge CPAD
 - Walker Ridge Calveg
 - Walker Ridge Serpentine
 - Wetlands
 - FireFootprints UKIAH
2. California Geological Survey, Ultramafic or Ultrabasic Rock Units – Areas of Potential Naturally Occurring Asbestos (NOA).shapefile. Provided by CDFW
3. CalFIRE Fire Footprints – downloaded from <http://frap.cdf.ca.gov/data/fraggisdata-subset.php>
4. California State Geology Map – downloaded from <http://datagateway.nrcs.usda.gov>
5. Federal Lands – downloaded from <http://www.nationalatlas.gov/atlasftp.html>
6. Surface Management Area – provided by BLM
7. Walker Ridge Survey Classification Plots – provided by CNPS
8. USGS Digital Elevation Models (Contours) – via ArcGIS Online and <https://ngmdb.usgs.gov/>
9. USGS Geology Maps – downloaded from <https://ngmdb.usgs.gov/>
 - USGS I-1706 tif
 - USGS I-538 tif
 - USGS SIM-3395 tif
10. USGS Topo Maps Digital Raster Graphic – via ArcGIS Online
11. Wetlands CONUS BLM Areas – downloaded from <http://www.fws.gov/wetlands/Data/State-Downloads.html>

2.3 Floristic Classification

The floristic vegetation classification developed for the Walker Ridge study area is a means to organize and catalog the vegetation alliance, association, or plant community stands that occur within a given area.

The floristic classification is derived from, and is represented by, the classification plot information collected through a limited amount of point data surveyed in and/or extrapolated from an area. The floristic vegetation classification and corresponding descriptions and keys are developed from a multi-step process through the

collaboration of CDFW, CNPS, NatureServe, and other partners, and is based on the hierarchical National Vegetation Classification Standard (NVCS) and the state Manual of California Vegetation (per Sawyer et al. 2009).

2.3.1 Data Collection for Classification

Vegetation classification surveys were collected by CNPS along with partners of VNLC and other volunteers, in which they used the CNPS-CDFW Combined Vegetation Rapid Assessment and Relevé protocol (see <https://www.cnps.org/plant-science/field-protocols-guidelines> for copies of the form and protocol). Protocols comply with state and national standards as defined by the Survey of California Vegetation (SCV; VegCAMP 2020) and the revised U.S. National Vegetation Classification (USNVC 2023).

An informal sample allocation guided data collection for classification by visually stratifying sample points in ArcGIS Online across environmental gradients (e.g., soil type, fire perimeters) within the project boundary. An opportunistic sampling approach was also used, based on recognizing repeating patterns across the region while in the field. Existing GIS layers such as geology and supplemental data points were reviewed; including rare plant occurrences noted in the California Natural Diversity Database (CNDDB), plant specimen locations from the California Consortium of Herbaria (CCH), and observations exported from CalFlora (<https://www.calflora.org/>). Sampling was timed to coincide with peak phenology to obtain adequate cover values and reliable plant taxa identification. An attempt was made to spread the samples geographically across the study area and across the vegetation types to represent both rare and common types. Access to sites was factored into the sampling, including lands where permissions were granted and areas within approximately 500 meters of roads and trails to maximize efficiency in the field.

Each survey location was digitally photographed and marked using a GPS device to produce a map of the surveyed data points. Field Maps and Survey123 Applications were used to record data including plant species composition, structure, site impacts, and environmental setting. Percent cover of plant species was visually estimated both individually and by vegetation strata (tree, shrub, herbaceous). Reconnaissance surveys, consisting of GPS locations and notes on vegetation type and species cover, were also collected to increase the number of observations of vegetation types occurring in the area, to determine the edge of stands, and to mark transitions between one vegetation type and another.

In addition to the data collected in 2022, CNPS compiled other available vegetation sampling data from the region upon contacting partners for information, which included BLM Assessment and Inventory and Monitoring (AIM) surveys. The vegetation data was reviewed for quality and accuracy, and the compiled data was archived into a standardized MS Access database.

2.3.2 Classification Data & Vegetation Key, Descriptions

Due to the relatively small study area and a larger Northern California Coast regional project currently underway, formal classification analysis was not run with the field data. Funding for this project allowed us to collect one to a few replicates within each vegetation type in the small project footprint, and a region-wide classification will be completed by the California Department of Fish & Wildlife (CDFW) in 2024. Thus, each field survey was assigned to an alliance and an association (or to the finest hierarchical level of the classification) based on existing membership rules established in greater Bay area vegetation classification & mapping projects (Buck-Diaz et al. 2021, Sikes et al. 2023) and the northern and southern Sierra Nevada foothills (Klein et al. 2007, Reyes et al. 2022). Upon assigning classification names, CNPS and CDFW ecologists reviewed the classification types to evaluate and vet any additions or changes to ensure compliance with our state Manual of California Vegetation (Sawyer et al. 2009) and the US National Vegetation Classification (FGDC 2008, Jennings et al. 2009).

CNPS developed a comprehensive field key (Appendix E) to vegetation types organized first by stratum (e.g., tree, shrub, herb), habitat, and finally NVC name; association was the finest level identified. This key has provided users with the ability to assess vegetation types while in the field when performing accuracy assessment or while photo interpreting and delineating polygons. They also wrote detailed vegetation descriptions for each alliance and association sampled (Appendix H), including sample size, summarized environmental data, cover by lifeform, and a stand table summarizing plant species composition, percent constancy and abundance values for species in the type. Species names were recorded via an ArcGIS Online application of Survey123 and associated survey database, in which the names are archived with the PLANTS Database (USDA NRCS 2023) as the standard for nomenclature (both botanical names and accompanying codes) for this classification effort. Taxa that could not be found in the PLANTS Database were assigned custom codes based on the Jepson eFlora (Jepson Flora Project 2023).

2.4 Mapping Classification

Mapping of the vegetation using the floristic classification may be limited by the constraints of the aerial imagery (color limitations and resolution), the MMU size for the project, or the complexity of the stands on the ground and their relationships with one another. Therefore, a mapping classification is developed to outline and catalog mappable vegetation types. The mapping classification contains vegetation types, as well as what are called Mapping Units. Mapping Units are units that are not included in the floristic vegetation classification, such as sand, rock, mud, or approved units composed of multiple individual types that are not mappable due to constraints, such as MMU, but consistently occur together on the ground as ecologically related complexes (the latter being a rare exception). The mapping classification also includes additional attributes outside of the vegetation type, such as percent cover of conifer trees, hardwood trees, shrubs, and herbaceous vegetation; disturbance attributes, and others (See Appendix A).

As AIS mapping proceeded, potential changes to the mapping classification and/or key were brought to the attention of both CNPS and VegCAMP staff for possible floristic classification revision or key clarification.

2.5 Field Reconnaissance

Field reconnaissance/verification visits serve multiple functions. First, they enable photo interpreters to relate the vegetation on the ground at each observation site to the signatures on the aerial imagery. Second, is to answer questions regarding vegetation assemblages that arise during the photointerpretation process and to check the mapping and attribution prior to delivering the data for AA. In addition, with guidance from ecologists in the field, the photo interpreters become familiar with the flora, vegetation assemblages, and local ecology of the study area. At the same time, ecologists test the floristic key and gain understanding from the photo interpreters' perspective about assessing vegetation through the framework of map creation.

In September 2022 and March 2023, AIS conducted two field reconnaissance/verification trips to the study area. The trips are summarized in **Table 1**.

Table 1: Summary of Field Reconnaissance Trips

Trip No.	Dates	Staff from:	Location
1	September 19-23, 2022	AIS/CNPS/Vollmar	Entire Walker Ridge Study Area
2	March 19-23, 2023	AIS/CNPS	Entire Walker Ridge Study Area

Field crews from AIS collected over 300 reconnaissance/verification observations as shown in **Figure 2**.

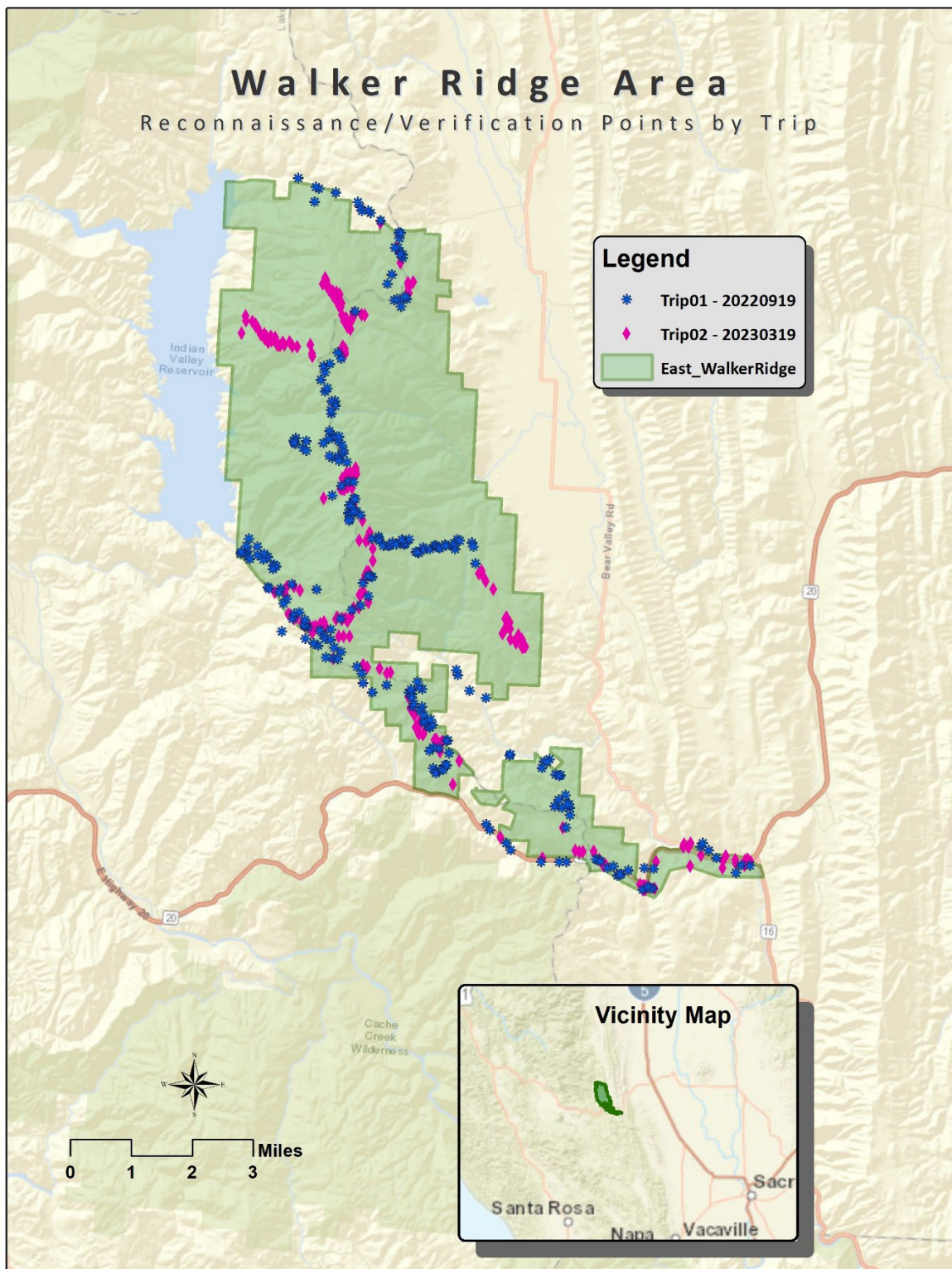


Figure 2: Location of Reconnaissance/Verification Observation Sites

Prior to each trip, AIS staff reviewed imagery on-screen to identify and select potential reconnaissance sites in close proximity to roads. Sites were selected to represent different vegetation types and percent cover, as well as variations in geography, landform, and abiotic factors such as percent slope, aspect, shape of the slope, and elevation. Multiple sites were chosen to provide alternatives in case one or more sites proved inaccessible. Field routes were planned to maximize the number of vegetation types and ecological settings visited while taking into consideration time constraints and accessibility.

The field crew used the Collector application for ArcGIS on Apple computer tablets to facilitate navigation and data collection. The vegetation database imagery, roads, and any other pertinent ancillary data were loaded onto the tablet prior to the field trip.

During reconnaissance/verification, crew members recorded each location visited on the tablet and logged pertinent information into the Collector app. They traversed the study area in a 4WD vehicle and stopped at the preselected sites. Areas encountered in transit between initially selected sites, and areas of noteworthy or unusual significance, were sometimes added in the field as observation points. Also, observation points were frequently taken to mark the transition between vegetation types, with the intent of helping photo interpreters determine the edges of stands. A single observation point may have contained information about two or more stands. It was also possible for a given stand to be assessed in multiple places. Some stands of vegetation were remotely observed at a distance with the aid of binoculars.

At many observation points, the crew took digital color ground photos. The corresponding field point, and other pertinent information were recorded and available for reference during the mapping effort. The field data and ground photos were essential for correlating conditions seen on the aerial imagery to conditions on the ground.

2.6 Photointerpretation Mapping Procedures

There are two distinct aspects of the photointerpretation mapping process. In what can be called the “photointerpretation process,” the photo interpreter applies his or her understanding of photo signature and knowledge of the geographic characteristics of ground features to formulate a reasoned decision about how to represent a feature and what to call it. The “mapping process” involves the creation of the digital geodatabase through the use of computer hardware and software. In other words, the mapping process captures for subsequent users a permanent record of the results of the photointerpretation process. Both aspects happen simultaneously as a map is created.

2.6.1 Photointerpretation Process

Photointerpretation is the process of identifying map units based on their photo signature. All land cover features have a photo signature. These signatures are defined by the color, texture, tone, size, and pattern exhibited on the aerial imagery. By observing the context and extent of the photo signatures associated with specific land

cover types, the photo interpreter is able to identify and delineate the boundaries between plant communities or signature units.

It should be noted that vegetation stature, as well as the scale and resolution of the aerial imagery, determine the visibility of individual plants, and the degree to which they can be photo interpreted. Trees and shrubs are usually visible as individuals on high-resolution digital imagery. However, grasses (other than bunch grass clumps) are rarely seen as individual plants.

Environmental factors, such as elevation, slope, and aspect, also play an important part in the photointerpretation decision-making process. Knowledge of these factors, and how plant communities respond to them, guides a photo interpreter in choosing from among alliances with similar photo signatures. Beyond this, such knowledge enables vegetation mappers to create biogeographical models of expected vegetation communities where the vegetation types are indistinct on the imagery. This ecological approach produces a more accurate product than would be created by relying solely on extracting information from the imagery, which is subject to variations in clarity, temporal age, and resolution.

Ancillary data sources (see Section 2.2.3) and field reconnaissance data are used to complement the imagery and assist the mapper in the photointerpretation and attribute code assignment process. For example, classification plot point data contains the coordinate location of the plot, as well as miscellaneous data related to the species composition and cover within the stand, abiotic and ecological information, and other site history, such as fire information.

The detailed descriptions of each vegetation type found in Appendix B include numerous examples of the types of information the photo interpreters incorporate into their understanding of the biogeographical models. To give some examples, one shrub alliance may favor rocky slopes, while another is found at the perimeters of dry lakes. Some alliances flourish on disturbed sites, while others cannot tolerate the cool temperatures at higher elevations. And, some alliances are ubiquitous because they tolerate a variety of settings and conditions.

The descriptions also synthesize the information found in the floristic key, such as membership rules relating the relative percent cover of various plant species in the alliance. Alliance names may not be a good representation of stand composition or dominance. In some instances, an alliance may be named for an indicator species, which may have a lower percent cover than other species present in the stand. Thus, both environmental setting and rules regarding relative cover factor into the intelligent delineation of vegetation polygons.

2.6.2 Mapping Process

Just as the use of mental models by experienced photo interpreters contributed to the production of a high-quality vegetation map, the use of tried-and-true mapping procedures allowed for the map to be produced in a highly efficient manner. For

example, the study area was divided into production modules, which expedited project work flow by enabling several staff members to work on the mapping effort simultaneously.

Each vegetation mapper brought one of the modules into their ArcMap session. Using an on-screen heads-up digitizing method, the photo interpreters had at their disposal a suite of standard and custom ArcMap tools to facilitate the creation of polygons. The photo interpreters generally viewed the imagery at scales ranging from below 1:1000 to 1:3000. They used variations in signature to draft boundaries separating areas of different vegetation types and/or distinct categories of percent cover of several stature levels. To assist in boundary placement and coding decisions, photo interpreters also referenced supplemental imagery, vegetation field data, and other data, such as elevation contours and fire history. These sources were displayed in the ArcMap sessions as needed.

Photo interpreters assigned each polygon the appropriate attribute code string: Vegetation Type (MapUnit), five different Percent Cover types, Exotics, Roadedness Disturbance, Development Disturbance, Anthropogenically Altered Disturbance, Land Use, and Method ID. The map classification is presented in Appendix A.

A custom coding menu enabled values to be assigned efficiently, minimizing the possibilities for entry errors. The codes themselves were entered as numeric values, which are easier to input and manipulate than alphanumeric codes or drop-down menus. Numeric code values also allow for the hierarchical grouping of like vegetation communities, reminding the mapper, at a glance, which alliances are found in a particular hierarchical grouping. Once the geodatabase neared completion, the actual vegetation type names were correlated to their numeric value and added to the geodatabase.

As the individual modules were completed, they were edge-matched and checked for invalid codes and topology errors. The database was subject to further processing, checks, and review by a senior staff member before being delivered to VegCAMP for AA allocation, prior to AA field data collection by CNPS. Quality control procedures implemented during the mapping effort and before final delivery of the data improved the consistency and accuracy of the overall database. Quality control and AA will be discussed in greater detail in later sections of this report.

2.6.3 Mapping Criteria

Although reference sources, photointerpretation training, knowledge of vegetation communities, as well as the use of appropriate GIS tools, help to create a quality vegetation map, without the establishment and refinement of mapping criteria, a given vegetation map could contain a number of discrepancies, as different staff members can approach the task with different assumptions and styles. Mapping guidelines and rules (mapping criteria), including exceptions, special situations, and minimum feature sizes, are discussed and then disseminated to all staff members before the mapping effort. Further discussions and refinements to the mapping criteria continues as needed

while the mapping progresses and new situations arise. This creates a clear and consistent product. Establishing criteria also makes the mapping process more efficient, as individual photo interpreters do not have to pause too long to consider how best to capture the more common occurrences of ambiguous situations that are confronted.

The specific criteria for each attribute type are discussed below under the appropriate heading.

2.6.3.1 Vegetation Type (MapUnit)

AIS was contracted to map to the Alliance level. The final map contains 42 types that were mapped, composed of 30 alliances and alliance-level types such as provisional alliances, semi-natural alliances, and Mapping Units; and 5 Miscellaneous Classes relating to features such as water, and post-burn and urban disturbance; and 7 upper-level hierarchical types, such as Macrogroup and Group. When the photo interpreter could not confidently classify a polygon at the alliance level, the polygon was assigned a broader upper-level code. This was most common with herbaceous communities, whose differences at the alliance level are often not readily discernible on imagery. Each vegetation type is described in Appendix B; the map classification is presented in Appendix A; and summary tables of polygon counts and acreage by MapUnit code are presented in Appendix C.

2.6.3.1.1 Minimum Mapping Unit Size Considerations

Minimum polygon size is an important consideration when creating and viewing a vegetation geodatabase. The choice of an MMU is influenced by the clarity of the imagery, the purpose of the data, and time and budget constraints. MMU can vary for different categories of features being mapped.

The map classification presented in Appendix A indicates the MMU for each map unit class. In this project, the MMU for upland vegetation is 1 acre. This encompasses the majority of the stands mapped. Exceptions were created for vegetation stands of special significance. In this mapping effort, riparian vegetation and wetland types were mapped to a 1/4-acre MMU. Polygons representing land use were also mapped with a 1-acre MMU.

In addition to establishing MMU size, guidelines were formulated for the minimum mapping width (MMW) of a map polygon, which for the project was approximately 100 feet. The rule of thumb was to make the minimum width roughly half the width of a square MMU box. This guideline did not preclude the creation of polygons where a small section fell below the minimum width, as long as the greater portion of the polygon met the stated criteria in order to capture the continuity of linear types, such as riparian or wetland units. Percent cover MMU considerations are discussed in Section 2.6.3.2.

A summary of the minimum mapping units for this mapping effort is presented in **Table 2**.

Table 2: Minimum Mapping Unit Size

Mapped Features	Minimum Mapping Unit
Riparian vegetation; wetlands	1/4 acre
Water bodies, perennial streams and lakes/ponds, dammed ephemeral ponds	1/4 acre
Land Use/built-up, agriculture, water impoundment features, rock outcrops	1 acre
Upland vegetation	1 acre

Because of the establishment of MMU sizes, further guidelines are needed for aggregation of stands that are below MMU. In general, similar life forms are aggregated together: tree-dominated types are aggregated with other tree-dominated types, shrub types with other shrub types, and herbaceous types with other herbaceous vegetation types. However, if possible, wetland vegetation types are not aggregated with upland types, even if they are in the same life form. Another guideline is that a unit below MMU is aggregated with the vegetation type that completely surrounds it. Finally, if a unit that is below MMU is the same life form as two adjacent larger stands, and the adjacent stand types are very dissimilar in environment, the unit may be aggregated with the more similar adjacent type.

2.6.3.1.2 Miscellaneous Classes

Miscellaneous classes include types that are not covered by the floristic classification. In order to have a comprehensive vegetation map, these types need to be accounted for in the mapping classification. Miscellaneous classification categories include types such as agriculture, urban/disturbance, and water features.

The relationship between vegetation and land use is sometimes complicated because of the possibility of natural vegetation and land use occurring on the same extent of land. For planning purposes, it is important to represent both the natural vegetation extent as well as the urban/land use component. For instance, in a dense forest setting, residential areas with houses are often in the understory of the trees. The geodatabase was created to allow for dual coding of both the natural vegetation and overlapping land use component. The geodatabase handles this situation by having a separate Land Use attribute field (see Section 2.6.3.8). Without the ability to dual code a polygon the photo interpreter would have to choose between calling out a vegetation type or a land use for a given area, one or the other would be lost in areas where the two overlap. Dual coding takes affect when assigning the MapUnit code value for polygons when the natural vegetation overstory reaches approximately 10% or greater where it overlaps with land use. For example, in a situation where there is a residence and its associated land use (greater than 1 acre in size) in a blue oak woodland, the polygon would be coded as the *Quercus douglasii* Alliance – a vegetation type (if the tree cover reaches approximately

10%) – but in the Land Use layer, the same polygon would be coded as having an urban component.

In areas where the natural vegetation overstory did not reach 10% cover (therefore dual coding was not involved), code values were correlated between the MapUnit code assignment for Miscellaneous Classes and the Land Use attribute field code values. A polygon that had a Miscellaneous Class code value Built-up & Urban Disturbance, Agriculture, or Water in the MapUnit field, was automatically populated with a corresponding land use code value in the Land Use layer.

Agriculture includes woody agriculture and non-woody row and field crops. An important consideration in mapping agriculture is deciding whether a plot of land that was farmed in the past should still be considered as active agriculture. A currently inactive plot of agricultural land may have been abandoned permanently, or it may just be in a fallow phase before farming resumes. To handle the uncertainty in such cases, a decision was made to review image sets covering the five years prior to the base imagery date. If the imagery showed that the land had been actively farmed in any of those years, then it was mapped as agriculture.

Areas of non-agricultural human activity were categorized as either the generic Built-up & Urban Disturbance (all built-up land use activities), or Areas of Little or No Vegetation (non-built-up clearings).

Water was mapped with an MMU of 1/4 acre. Distinctions were made between perennial stream channels, small earthen-dammed lakes and ponds, and other undifferentiated water features.

It should be noted that percent cover was not evaluated for most of the Miscellaneous Classes. A description of each of the Miscellaneous Classes can be found in Appendix B.

2.6.3.2 Percent Cover

Percent cover, also referred to as “density,” is a quantitative estimate of the aerial extent of the living plants for each vegetation strata within a stand. Cover is the primary metric used to quantify the importance or abundance of a life form and/or species.

Vegetative cover for a given polygon is assigned for woody vegetation (conifer, hardwood, shrubs) as a whole integer. Herbaceous vegetation is attributed to the following range categories:

- 1 = None or Not Observable, <2%
- 2 = >2-10%
- 3 = >10-40%
- 4 = >40%
- 999 = Not Applicable/Not Assessed

Photo interpreters formed separate polygons when there were changes in cover within the same vegetation type or mapping unit as long as the cover differences were

consistent and visually significant, minimally greater than 3-5 percent difference. The MMU for overstory cover breaks within the same upland vegetation types was typically three times the size of the applicable MMU. If the primary difference between mappable stands of upland vegetation is the result of a cover break in the understory, emergent vegetation, or a cover break in the difference between the conifer and the hardwood component of the tree layer, then the MMU is typically at least five times the applicable MMU.

The photo interpreters considered the coverage pattern of each life form before assigning a cover code to the polygon. To ensure consistency, it was helpful to compare percent cover values of polygons with clumped and unevenly distributed vegetation to those of similar-sized polygons with an even distribution of plant cover.

Photo interpreters assessed the total cover of vegetation by considering the cover of the different life forms visible on the imagery, including nonvegetated areas. The total percent cover of trees, shrubs, herbaceous and nonvegetated areas must add up to 100 percent. The cover percentages for each life form were then assigned to each corresponding attribute field for each polygon.

2.6.3.2.1 Percent Cover Mapping Considerations

It is important to note that the photo interpreters could only accurately quantify the vegetation that is visible on the aerial imagery. Therefore, “bird’s eye” total cover was mapped, meaning that the cover of understory strata that were obscured by overstory strata was not included. For this reason, total cover for shrubs and herbaceous plants may be underestimated if their extent was hidden under the crowns of overstory trees and/or shrubs, and may differ from assessments done on the ground by field crews.

Where the cover of a particular life form is very sparse, it can be difficult to determine between a cover class “0” (None or Not Observable) and “1” or “2” percent. The photo interpreters looked for the consistent presence of very sparse vegetative cover throughout a polygon before assigning it a cover class of “1” or higher.

Where overstory cover exceeds 40 percent, such as closed canopy forest, dense riparian, or shrub stands, it was considered too dense to give a reliable estimate of lower tier canopy or understory percent cover. In these situations, the code assigned for percent cover for the understory life forms would be “Not Applicable/Not Assessed.” This same criterion is used in Statewide mapping efforts.

The date that the base aerial photography mission was flown influences the percent cover assigned to vegetation types. Subsequent field verification and AA must take into consideration the following factors that can cause apparent discrepancies between the percent cover evident on the imagery and percent cover seen in the field:

- Seasonality - The percent cover of most plants is variable due to their annual growth cycle. Depending on whether the aerial imagery was taken during the wet season or the dry season, a mapped unit could show a different percent cover on the aerial imagery than is observed during an on-site visit at a different time of

the year. Differences in leafiness (cold deciduous, drought deciduous) can affect plant cover determination. Leaf-on conditions obscure the understory. Imagery of leaf-off conditions would allow photointerpretation of the understory, but make it difficult to identify the overstory species since there is no foliage present.

- Annual variability - The environmental conditions at the time of the imagery (wet vs. drought years, flooding, etc.) may contrast with the conditions seen during on-site field visits thus resulting in differences of the percent cover assigned to a polygon in the field versus those assigned during photointerpretation.
- Dead vegetation – When vegetation is dead, it is not counted in the cover class analysis; however, vegetation in a stressed phenology state is included in the cover class density. Determining the difference between dead and stressed vegetation solely through photointerpretation is difficult, so field information reflecting the conditions on the ground is used when possible. Where dead vegetation is so dense as to obscure the understory vegetation, then the understory vegetation cover class is coded as “Not Applicable/Not Assessed.”

2.6.3.3 Exotics

Photo interpreters assigned each existing polygon a code reflecting the level of impact by exotic invasive species such as *Bromus diandrus* grass. Polygons were not created or split because of differences in the presence of exotics. **Table 3**, adapted from *2013 California Desert Vegetation Map and Accuracy Assessment in Support of the Desert Renewable Energy Conservation Plan* (VegCAMP 2013) presents the map classes for Exotics.

Table 3: Map Classes for Exotics

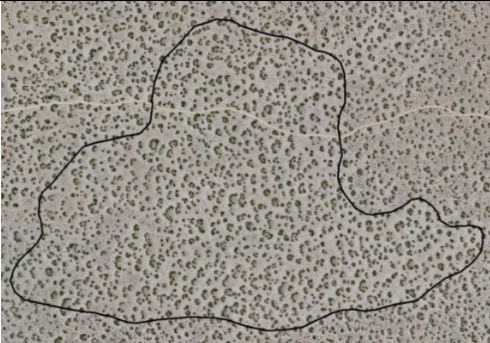


Code	Range	Discussion
0	None Visible	Sparse herbaceous vegetation with a minimal to low relative cover of exotic species; based on field data, no evidence of exotics in sampling, no evidence of exotics on imagery and based on modeling, assumed not present or not regular in the stand.
1	Low: Patches of exotics visible, but cover not significant (relative cover to total <33%)	Sparse to moderate cover of herbaceous vegetation with a low to moderately high relative cover of exotic species. Patches of exotics are visible, but cover is not significant.
2	Moderate: Exotics (particularly herbaceous) significant and cover may exceed dominant vegetation strata (relative cover <66%)	Exotics are significant and cover may exceed the dominant vegetation strata. Areas of higher disturbance are likely to be in this category.

Code	Range	Discussion
3	High: Stand characterized by exotics (vegetation type is “exotic”) (relative cover >66%)	This is reserved primarily for alliance-level calls which are defined by exotics; stands are characterized by exotic vegetation (as defined by the map unit). Examples of this are stands of <i>Bromus diandrus</i> .
9	Not Applicable/Not Assigned	Exotics are not applicable when the VegCode is 9300, 9800, 9803

2.6.3.4 Roadedness Disturbance

Roadedness Disturbance is defined as the level of impact in a polygon by paved and unpaved roads, off highway vehicle (OHV) trails, railroads, berms, and covered aqueducts. Impact is defined by the proportion of any polygon that is contiguously without these features, as shown in **Table 4**. The table is adapted from VegCAMP (2013). Roads following polygon boundaries were not included in the assessment. Each existing vegetation polygon was assigned a Roadedness Disturbance class. Polygons were not created or split because of differences in roadedness.

Table 4: Map Classes for Roadedness Disturbance

Code	Range	Example
0	None Visible	
1	Low: at least 2/3 (67% to 100%) of the vegetation polygon area is roadless	
2	Moderate: between 1/3 and 2/3 (33% to 66%) of the vegetation polygon is intersected by roads of any kind	
3	High: less than 1/3 (<33%) of the vegetation polygon lacks roads of any kind	
9	Not Applicable/Not Assigned	Roadedness is not applicable when the VegCode is 9200, 9300, 9800, 9803

The Roadedness Disturbance code reflects the combination of the expanse of roads in the polygon and the roads' effect on the contiguous space that has no roads – that is, where the roads fall within the polygon. This definition of roadedness has the advantage of helping to identify roadless areas, but the disadvantage of being scale independent. For example, any polygon with a road more or less bisecting it will be assigned a code of Moderate, regardless of size. This means that a very large polygon with a “Moderate” Roadedness Disturbance code might still contain an extensive roadless area.

2.6.3.5 Development Disturbance

Development Disturbance accounts for the level of impact by structures and settlements that are smaller than the MMU criteria for land use. Structures may include buildings, tanks, trailers, metal electrical towers, communication towers, and utility and mining structures. This attribute includes paved parking lots and collapsed structures. Note that it also includes debris such as junked vehicles, major trash dumping, etc., the removal of which could result in a vegetation stand that could be in very good to pristine ecological condition. Disturbance that does not involve these types of features is accounted for in Anthropogenically Altered Disturbance. Polygons were not created or split because of differences in Development Disturbance, but existing vegetation polygons were assigned a Development Disturbance class. **Table 5**, adapted from VegCAMP (2013), presents the map classes for Development Disturbance.

Table 5: Map Classes for Development Disturbance

Code	Range	Discussion
0	None Visible	There are no noticeable junk piles, isolated homes, structures, etc. within the polygon.
1	Low: less than 2% of polygon affected	Junk piles, structures, cement pads, etc. are inconsistently distributed at very low density.
2	Moderate: between 2% to 5% of the polygon affected	Multiple examples of dispersed junk, buildings, or other structures, etc. are visible throughout the polygon. There may be a dense concentration of development within a single or few parts of the vegetation polygon.
3	High: more than 5% of polygon affected	Multiple examples are evenly distributed in a vegetated polygon; However, mines or open pits, coded as 9300, may be assigned a Development Disturbance code of 0, 1, 2, or 3 depending on the amount of structures or debris present in the polygon. Urban areas under trees included.
4	Built-up	Typically meets the 1-acre threshold to map a “Built-up and Urban Disturbance” (9300) polygon.
9	Not Applicable/Not Assigned	Development Disturbance is not applicable when the VegCode is 9200, 9800, 9803

2.6.3.6 Anthropogenically Altered Disturbance

This indicates the level of impact on vegetation through tillage, scraping, mining, etc. Disturbance from structures, pavement, or debris is not included here but is addressed in Development Disturbance. Anthropogenically Altered Disturbance captures past disturbances in the landscape that are still visible through their impact on vegetation, but do not have enough of an impact to change the vegetation type or percent cover range. For example, striations from former cultivation may be present on parcels of land that have not been under agriculture for decades. Anthropogenically Altered Disturbance is typically bounded by a straight-line feature such as a fenceline or road, implying man-induced activity. Not included are small clearings caused by OHV traffic at road intersections, fire effects, and powerline tower pedestal clearings.

Polygons were not created or split because of differences in anthropogenically altered disturbance, but existing vegetation polygons were assigned one of the classes presented in **Table 6**, which was adapted from VegCAMP (2013).

Table 6: Map Classes for Anthropogenically Altered Disturbance

Code	Range	Discussion
0	None Visible	No ghost lines of tilling, differential effects of enclosure/exclosure fencing, effects of grazing/browsing, etc. are visible.
1	Low: Less than 33% of polygon is affected and/or impact is seen but does not affect vegetation cover or type	Less than 1/3 of a vegetation polygon has visible evidence of clearing, prior agricultural activity or other effects.
2	Moderate: Between 33% to 66% of polygon is affected	A vegetation polygon has more than 1/3 but less than 2/3 visible effects of clearing, prior agricultural or other effects.
3	High: More than 66% of polygon affected	A vegetation polygon has more than 2/3 visible effects of clearing, prior agricultural or other effects.
9	Not Applicable/Not Assigned	Anthropogenic alteration is not applicable when the VegCode is 9800.

2.6.3.7 Method ID

This attribute was used to indicate how the VegCode coding decision was reached for a polygon by identifying what type of field data (if any) was used to support the vegetation type assignment. For polygons that did not have any corresponding point data, the value of “photo interpretation” was assigned. The Method ID attribute facilitated the AA sample allocation process, as polygons that had reliable field information for type assignment could be identified and omitted from the final allocation.

The following is a list of the values used:

- 1 = Rapid Assessment (current project)
- 2 = Relevé (current project)
- 3 = Field Verification (current project)
- 4 = Photointerpretation
- 5 = Adjacent Stand Information or Ground Photo
- 6 = AIS Reconnaissance (current project)
- 7 = Other Information
- 8 = Older Plot Data/Other Agency Recent Plot Data)
- 9 = Older Recon Data &/or Other Agency Recon Data
- 10 = Accuracy Assessment (current project)
- 60 = Additional Recon Information/Inconsequential Project Field Info

2.6.3.8 Land Use

Land use is the human use of the land and is embodied through such features as urban centers, towns, mining, agriculture, and individual settlements. As mentioned in Section 2.6.3.1.2, in this mapping effort land use was represented both as a possible vegetation class and as a separate attribute of a vegetated polygon. Every attempt was made to correlate the coding within both layers. A land use polygon was mapped if it was at least 1 acre in size.

The hierarchical format of the land use classification is such that more-detailed classes may be added at lower levels of the hierarchy for future more detailed land use mapping efforts. For example, the Urban (1000) class could be subdivided further into Residential (1100), Commercial (1200), Industrial (1300), Transportation/Communication (1400), and so on. The land use code assignment was mostly at an Anderson Level I (Anderson et al., 1972) as shown below:

- 0000 = Not assigned/Not assessed
- 1000 = Urban
- 2000 = Agriculture (includes nurseries)
- 9800 = Undifferentiated Water (contains water at time of imagery)

2.6.3.9 Modal Overstory Height Class (Trees)

Height attribution was mapped for forest and woodland types only, through a model crosswalk based off the modal height expression of vegetation type at maturity. During the mapping process stands that did not follow that modal expression for the type were flagged to be adjusted accordingly. Note that height categories >35-50m and >50m were not encountered.

- 01 = <1/2m
- 02 = 1/2-1m
- 03 = 1-2m
- 04 = 2-5m
- 05 = 5-10m
- 06 = 10-15m
- 07 = 15-20m
- 08 = 20-35m

09 = 35-50m
10 = >50m
999 = Not applicable/Not assigned

2.6.3.10 California Wildlife Habitat Relations (CWHR) Modal Size Class

CWHR Size, corresponding to ranges of diameter at base height (dbh) and life form, was assigned to each mapped vegetation type through a model crosswalk based off the modal size expression of vegetation type at maturity. Code values used are listed below: CWHR Size was mapped for forest and woodland types only, as part of the photointerpretation process.

1 = Seedlings (<1")
2 = Saplings (1-6")
3 = Pole (6-11")
4 = Small (11-24")
5 = Medium-Large (>24")
6 = Multi-layered medium-large trees over smaller trees in densities >60%
999 = Not applicable/Not assigned

2.6.4 Quality Control

Quality control was an iterative process, conducted at many phases of the mapping effort. For the entire duration of the project, photo interpreters consulted with one another as each module was mapped. This sharing of perspectives and examples ensured consistency in the mapping decisions made throughout the study area.

Completed modules were subjected to a series of automated checks. Any instances of invalid codes, uncoded polygons, adjoining polygons with the same code, or topology problems were flagged for correction by the photo interpreter. Another type of automated check verified that illogical combinations of codes were not used. For instance, a polygon coded as a conifer tree type must have a conifer cover code in the Conifer Cover attribute field. Additionally, a manual visual quality control was conducted, with each photo interpreter reviewing his or her completed module for consistent application of codes and MMU considerations.

When the preliminary mapping was completed a senior photo interpreter reviewed the data for quality of delineations, code accuracy, consistency of interpretations, adherence to the mapping criteria, and omissions in data capture. Automated final checks were again conducted for invalid codes and code attribute correlations. Topological errors were also checked and the data revised as needed. Another round of quality control was conducted after AA results had been applied to the database.

2.7 Accuracy Assessment

To validate the draft vegetation map from AIS, a field-based accuracy assessment (AA) was performed by CNPS in 2023. CDFW staff provided in-kind time to allocate the AA polygons to ensure an independent and un-biased approach. They selected a stratified random subset of polygons to ensure representation of all the major vegetation types mapped across the study area. They selected polygons using the following parameters: land ownership (BLM), proximity to roads and trails, and other accessibility indicators (e.g., more than 500 meters from an existing survey or within areas of lower shrub cover/near a fuel break). The polygons were assigned a field priority level based on the number of polygons within the vegetation type. Priority 3 was assigned to vegetation classes with more than 10 polygons in the allocation. Priority 2 was set for the vegetation classes that had the fewest polygons in the allocation, less than 5, where there is no chance to assess if the class has greater than 80% accuracy. Priority 1 was set for vegetation classes that had greater than 5 but fewer than 10 occurrences.

Using the field key developed during the classification development process, CNPS and VNLC field staff visited allocated polygons to determine the vegetation type or mapping unit from the ground view, without knowledge of the polygon attribution. The AA surveys assess the extent (or percentage) of the polygon viewed and other map attributes such as disturbance. The location of the AA surveys was collected on iPads within ArcGIS Field Maps and Survey123, and ground photos were taken at an AA GPS-point location. The field staff provided a primary vegetation type call and a list of dominant plant species, along with percent cover estimates by primary species and by vegetation stratum. For polygons containing more than one vegetation type that met the minimum mapping unit (MMU) requirements, an AA survey was completed for each type to provide sufficient information to divide the polygon.

AA field data was imported from Survey123 into a standardized Access database, developed by CDFW and CNPS. CDFW ecologists, independent from CNPS field and AIS mapping staff, scored the accuracy of the vegetation geodatabase based on a fuzzy logic method (rather than simply denoting whether a sample was correct or incorrect) as described in the Survey of California Vegetation (VegCAMP 2020). CDFW reviewed each AA field survey and removed from consideration any samples that had problems associated with access, vegetation identification, visibility, or significant changes in land use or vegetation since the date of the imagery on which the map was based. If the field crews could not easily identify the vegetation type based on the field key or incorrectly identified the type, CDFW re-assigned the correct type based on the species covers recorded in the survey, additional notes taken by the field crews, the field photos, the field key, and their collective knowledge about the vegetation types of the region. Cover and disturbance attributes were not scored but were used to update and inform map attributes in the final map product.

CDFW calculated the AA scores by vegetation type and summarized results in the form of a User's & Producer's summary table (**Table 9**) and a contingency table (Appendix I), so that specific and systematic errors could be addressed by the photo interpreters. Two forms of accuracy (User's and Producer's) can be estimated from the data (Story

and Congalton 1986). User's accuracy provides an estimate of commission error, or how well spatial mapping data actually represents what is found on the ground, i.e., when the user goes to a location mapped as a certain class, the resulting probability that it is in fact that class is provided (with a percent accuracy). Producer's accuracy, on the other hand, measures omission error, or the probability that vegetation of a given class in the field is mapped as that class. Producer's accuracy may inform the mappers how well a mapping class can be detected by the photo interpreters (Story and Congalton 1986, Lea and Curtis 2010). Both user's and producer's accuracy were calculated.

Each field-verified polygon was scored according to a set of decision rules (**Table 7**), with a total of 5 possible points for each. Scores were summed for each vegetation type, then divided by the total possible score and multiplied by 100 for the percent accuracy. Additionally, a total overall accuracy was calculated by counting up the AA surveys that were deemed correct (score of 5, or 100%) or acceptable (score of 3 or 4, or 60% or 80% accurate), and then dividing that count by the total number of AA surveys scored across all vegetation types. The minimum accuracy standard for California is an overall mapping score of at least 80%.

Once the draft map was scored, the senior photo interpreters at AIS reviewed the AA score results. In some cases, the photo interpreter flagged specific AA scores for follow-up discussion and review with CDFW and CNPS ecologists, which resulted in either accepting, modifying, or rejecting the AA call. Once AA review was completed, the AIS mapping staff and ecologists further evaluated any types not achieving 80% accuracy. The photo interpreters then revised the polygons based on the AA results.

Table 7: Accuracy Assessment Scoring Rules and Points

Code	Reason for Score	Score
A	PI completely correct.	5
B	The PI chose the correct Group OR the next level up in the hierarchy.	4
C	Threshold/transition between PI (Producers') call and Final (Field assessed) call. This was used when cover values of the dominant or indicator species were close to the values that would key to the PI's type (e.g., an AA call of <i>Yucca brevifolia</i> Alliance for a stand with 1% evenly distributed <i>Yucca brevifolia</i> over <i>Larrea tridentata</i> – <i>Ambrosia dumosa</i> would get this score if the PI call was <i>Larrea tridentata</i> – <i>Ambrosia dumosa</i> Alliance with <1% <i>Yucca brevifolia</i>).	4
D	Correct at Macrogroup level OR next level up in hierarchy.	3

Code	Reason for Score	Score
E	Based on close ecological similarity. Ecological similarity addresses assessed and mapped calls that contained vegetation with overlapping diagnostic species but were not technically closely related in the NVCS hierarchy. This was common in stands that contain a mix of species of late and early seral vegetation types and also common in zones of overlap between ecoregions.	3
F	Correct at Division level (OR next level up in hierarchy).	2
G	Some floristic/hydrologic similarity. This addresses cases in which the mapped and the assessed vegetation type had different diagnostic species, but bear some similarity in ecological traits based on predicted and actual setting such as hydrologic regime, overall climate, or successional state.	2
H	Correct only at Lifeform, without any floristic similarity.	1
I	No similarity above Formation and incorrect life form.	0
J	Survey removed because there was a significant change in the polygon (e.g., the stand was burned, developed, or cleared since the date of the base imagery).	no score
K	Survey removed because inadequate portion (<20%) of the polygon was viewed by the field assessment.	no score
L	Survey removed because field/PI data are incomplete, inadequate or confusing (e.g., cover values were not provided for key species in the stand).	no score
M	Supplementary record not scored (for multiple point assessments within a polygon where the AA call was the same).	no score

CHAPTER 3: Results

This section presents results for the vegetation mapping effort and the accuracy assessment.

3.1 Floristic Classification

3.1.1 Classification Data Collection

Between April and June 2022, 75 new vegetation classification surveys were collected within the study area (including 44 rapid assessments and 31 relevés) to evaluate vegetation resources and to establish a floristic classification before mapping. Two out of the 75 surveys included additional post-fire data following a modified post-fire protocol (Evens & LaFever-Jackson 2023). Also, 36 reconnaissance points were collected during the 2022-23 field effort to inform the project. CNPS compiled an additional 32 surveys through the BLM Assessment and Inventory and Monitoring (AIM) program (Herrick et al. 2005), which were collected within or adjacent to the map area, for a total of 143 classification surveys (**Figure 3**). All data were quality-controlled and standardized prior to vegetation classification development and archived into a Microsoft Access database. Data will be publicly available through CDFW's Biogeographic Information and Observation System (BIOS) and other data-sharing utilities upon project completion.

3.1.2 Classification Data & Vegetation Key, Descriptions

CNPS staff categorized the vegetation patterns in a floristic vegetation classification for the Walker Ridge (Molok Luyuk) map area. The classification provides a current catalog of the vegetation alliances and associations, which are the finest scale of the plant communities that they identify in the U.S. National Vegetation Classification (USNVC). The attributes of sampled vegetation, including species composition, structure, and cover, were used to develop a floristic key to the vegetation types (see Appendix E). CNPS field-tested the vegetation key during two field reconnaissance trips for mapping in September 2022 and March 2023. Upon completing this work, they summarized the classification within the USNVC hierarchy (see Appendix G), and wrote vegetation alliance and association descriptions for each type sampled in the region (see Appendix H).

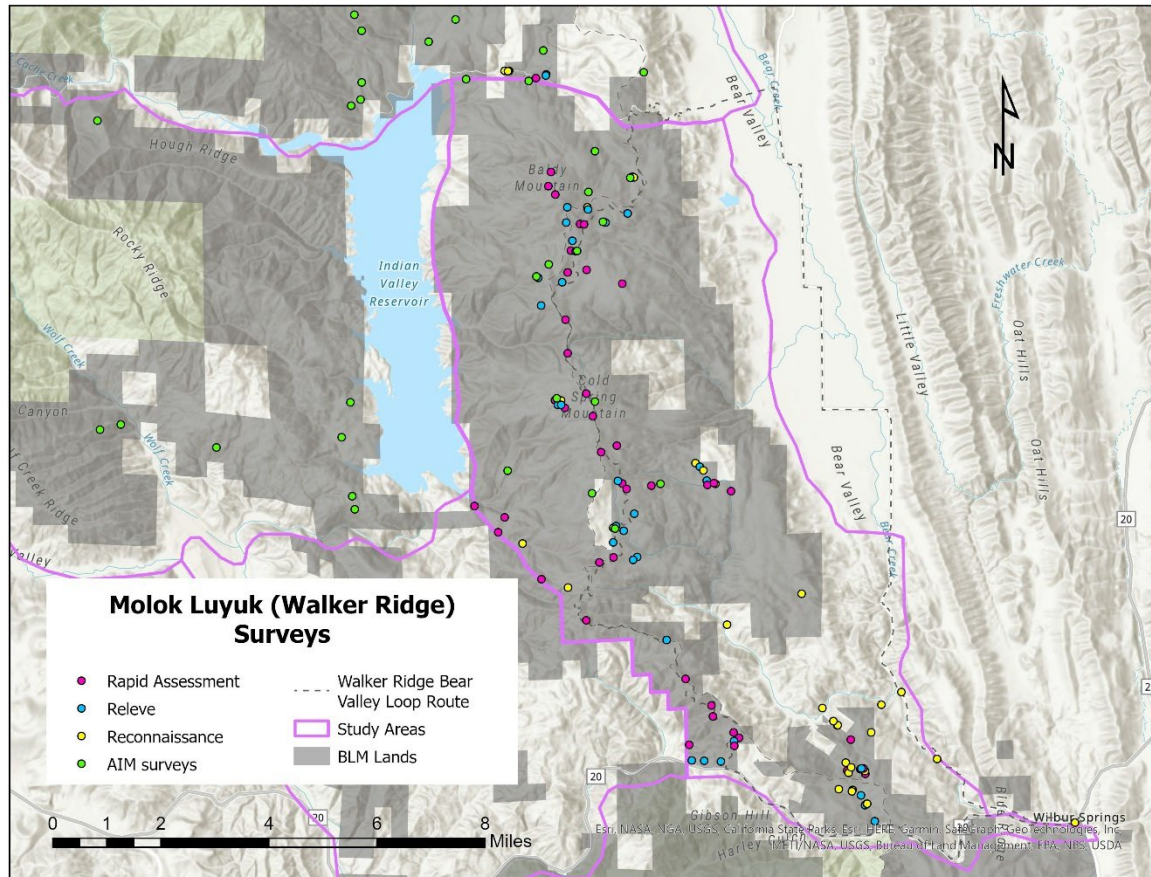


Figure 3 Geographic Locations of New and Compiled Vegetation Classification Surveys Along and Adjacent to Walker Ridge (Molok Luyuk)

The vegetation classification resulted in recognizing 48 alliances and 65 associations across the area: 10 tree-overstory, 17 shrubland, and 21 herbaceous/sparsely vegetated alliances (**Table 7**). Numerous vegetation types were documented in the reconnaissance and accuracy assessment field efforts that were not sampled in the initial classification surveys. Thus, those vegetation types are not represented in the vegetation descriptions found in Appendix H, but they are represented in the floristic key and summary tables.

Twenty-two of these alliances are currently considered sensitive plant communities (ranked S1-S3) and 26 are ranked as S4, S5 or SNA (not sensitive or State Rank Not Assessed). This includes 3 alliances and 6 associations that are considered “Semi-natural” or “Ruderal” because they are strongly dominated by non-native plants, which are reproducing and maintaining populations in the wild. The data collection and classification efforts provide updates to statewide alliance and association definitions, including one new provisional shrub association named Coast Range bindweed / yerba santa (*Calystegia collina* / *Eriodictyon californicum*) scrub under the post-fire / seral Deerweed - silver lupine - yerba santa scrub (*Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. shrubland) Alliance and five new herbaceous provisional associations.

Table 8. Floristic Classification Alliance and Association List for Walker Ridge (Molok Luyuk)

[With sample size based on survey type: Classification (CI), compiled Assessment Inventorying & Monitoring (AIM) plot, Reconnaissance (Rc), and Accuracy Assessment (AA). The last column denotes the new types identified during the classification.]

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
Forest and Woodland								
	<i>Aesculus californica</i> Alliance							
		<i>Aesculus californica</i> / <i>Toxicodendron diversilobum</i> / Moss	1			3	4	
		<i>Aesculus californica</i> alliance			1	1	2	
	<i>Eucalyptus</i> spp. – <i>Ailanthus altissima</i> – <i>Robinia pseudoacacia</i> Alliance							
		<i>Ailanthus altissima</i>				1	1	
	<i>Hesperocyparis</i> (<i>sargentii</i>, <i>macnabiana</i>) Alliance							
		<i>Hesperocyparis</i> (<i>sargentii</i> , <i>macnabiana</i>) alliance		3		1	4	
		<i>Hesperocyparis macnabiana</i> / <i>Arctostaphylos viscida</i>	4	1		7	12	
		<i>Hesperocyparis sargentii</i> / <i>Quercus durata</i> (Mesic)	1	2			3	
	<i>Pinus attenuata</i> Alliance							
		<i>Pinus attenuata</i> – Mixed oak / <i>Arctostaphylos viscida</i>	2			1	3	
		<i>Pinus attenuata</i> / <i>Adenostoma fasciculatum</i>	1				1	
	<i>Pinus attenuata</i> alliance						1	

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
	<i>Pinus sabiniana</i> Alliance							
		<i>Pinus sabiniana</i> / <i>Ceanothus cuneatus</i> – (<i>Rhamnus ilicifolia</i>)	1				1	
		<i>Pinus sabiniana</i> / <i>Quercus durata</i>	2			4	6	
	<i>Pinus sabiniana</i> alliance					1	1	
	<i>Populus fremontii</i> – <i>Fraxinus velutina</i> – <i>Salix gooddingii</i> Alliance							
	<i>Populus fremontii</i> – <i>Fraxinus velutina</i> – <i>Salix</i> <i>gooddingii</i> alliance		1				1	
	<i>Quercus chrysolepis</i> (tree) Alliance							
	<i>Quercus chrysolepis</i> (tree) alliance			1		1	2	
		<i>Quercus chrysolepis</i> – <i>Pinus sabiniana</i>				4	4	
		<i>Quercus chrysolepis</i> / <i>Quercus</i> (<i>wislizeni</i> , <i>parvula</i>)	1			4	5	
		<i>Quercus chrysolepis</i> / <i>Arctostaphylos viscida</i>				2	2	
		<i>Quercus chrysolepis</i> tree			1	0	1	
	<i>Quercus douglasii</i> Alliance							
		<i>Quercus douglasii</i> / Mixed herbaceous	1			5	6	
		<i>Quercus douglasii</i> – <i>Pinus sabiniana</i> / <i>Ceanothus cuneatus</i> – <i>Cercocarpus montanus</i>	1			3	4	
		<i>Quercus douglasii</i> / <i>Arctostaphylos manzanita</i> / herbaceous	1				1	
	<i>Quercus douglasii</i> alliance					2	2	

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
	<i>Quercus wislizeni</i> – <i>Quercus parvula</i> (tree) Alliance							
		<i>Quercus wislizeni</i> / <i>Toxicodendron diversilobum</i>	2				2	
	<i>Umbellularia californica</i> Alliance							
		<i>Umbellularia californica</i> – <i>Quercus wislizeni</i>				1	1	
Shrubland								
	<i>Adenostoma fasciculatum</i> Alliance							
		<i>Adenostoma fasciculatum</i>	4			2	6	
		<i>Adenostoma fasciculatum</i> – (<i>Arctostaphylos glandulosa</i> – <i>Ceanothus jepsonii</i>)		1		2	3	
		<i>Adenostoma fasciculatum</i> – (<i>Ceanothus cuneatus</i>)				5	5	
		<i>Adenostoma fasciculatum</i> – (<i>Lotus scoparius</i> – <i>Eriodictyon</i> spp.)	2	9		2	13	
	<i>Adenostoma fasciculatum</i> alliance			2		6	8	
	<i>Arctostaphylos (canescens, manzanita, stanfordiana)</i> Alliance							
		<i>Arctostaphylos manzanita</i>		1	1		2	
	<i>Arctostaphylos viscida</i> Alliance							
		<i>Arctostaphylos viscida</i> – <i>Adenostoma fasciculatum</i>				2	2	
		<i>Arctostaphylos viscida</i> – <i>Ceanothus jepsonii</i>	3			1	4	

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
	<i>Arctostaphylos viscida</i> alliance					1	1	
	<i>Ceanothus (oliganthus, tomentosus)</i> Alliance							
		<i>Ceanothus oliganthus</i>				1	1	
	<i>Ceanothus cuneatus</i> Alliance							
		<i>Ceanothus cuneatus</i>			1		1	
		<i>Ceanothus cuneatus</i> – <i>Adenostoma fasciculatum</i>				5	5	
	<i>Cephalanthus occidentalis</i> – <i>Rosa californica</i> Alliance							
		<i>Rosa californica</i>	1				1	
	<i>Cercocarpus montanus</i> Alliance							
		<i>Cercocarpus montanus</i> var. <i>glaber</i>			1	1	2	
	<i>Frangula californica</i> – <i>Rhododendron occidentale</i> – <i>Salix breweri</i> Alliance							
		<i>Frangula californica</i> (ssp. <i>crassifolia</i> , ssp. <i>tomentella</i>)				2	2	new
		<i>Salix breweri</i>	2		1		3	
		<i>Calycanthus occidentalis</i> – <i>Frangula californica</i> – <i>Salix breweri</i> / <i>Umbellularia californica</i>	1			2	3	new
	<i>Lotus scoparius</i> – <i>Lupinus albifrons</i> – <i>Eriodictyon</i> spp. Alliance							
		<i>Calystegia collina</i> / <i>Eriodictyon californicum</i>	1				1	new

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
		<i>Eriodictyon californicum</i> / Herbaceous	1		1		2	
		<i>Lupinus albifrons</i>	1			1	2	
	<i>Prunus ilicifolia</i> – <i>Heteromeles arbutifolia</i> – <i>Ceanothus spinosus</i> Alliance							
		<i>Heteromeles arbutifolia</i> Serpentine	2	1		4	7	
	<i>Quercus berberidifolia</i> Alliance							
		<i>Quercus berberidifolia</i> – <i>Adenostoma fasciculatum</i>	2			1	3	
		<i>Quercus berberidifolia</i> – <i>Cercocarpus montanus</i>				1	1	
		<i>Quercus berberidifolia</i> – <i>Heteromeles arbutifolia</i>				2	2	
		<i>Quercus berberidifolia</i>	2				2	
	<i>Quercus berberidifolia</i> alliance					2	2	
	<i>Quercus durata</i> Alliance							
		<i>Quercus durata</i>	2			2	4	
		<i>Quercus durata</i> – <i>Adenostoma fasciculatum</i>				2	2	
		<i>Quercus durata</i> – <i>Ceanothus jepsonii</i>	2			4	6	
	<i>Quercus durata</i> alliance			1		1	2	
	<i>Quercus wislizeni</i> – <i>Quercus chrysolepis</i> (shrub) Alliance							
		<i>Quercus palmeri</i>		2			2	new
		<i>Quercus wislizeni</i> – <i>Quercus berberidifolia</i>				4	4	
	<i>Quercus wislizeni</i> – <i>Quercus chrysolepis</i> (shrub) alliance		1	2		2	5	

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
		<i>Quercus wislizeni</i> var. <i>frutescens</i>	1	1			2	
	<i>Rhus trilobata</i> – <i>Crataegus rivularis</i> – <i>Forestiera pubescens</i> Alliance							
		<i>Rhus trilobata</i>			1		1	
	<i>Suaeda moquinii</i> Alliance							
	<i>Suaeda moquinii</i> alliance					1	1	
	<i>Tamarix</i> spp. Alliance							
		<i>Tamarix</i> spp			1	2	3	
Herbaceous								
	<i>Brassica nigra</i> – <i>Centaurea (solstitialis, melitensis)</i> Alliance							
	<i>Brassica nigra</i> – <i>Centaurea (solstitialis, melitensis)</i> alliance					1	1	
		<i>Centaurea solstitialis</i>				1	1	
	Californian Perennial Grassland Group							
	Californian Perennial Grassland Group		1				1	
	<i>Corethrogyne filaginifolia</i> – <i>Eriogonum (elongatum, nudum)</i> Alliance							
	<i>Corethrogyne filaginifolia</i> – <i>Eriogonum (elongatum, nudum)</i> alliance		1		1		2	
		<i>Eriogonum nudum</i>	1				1	
	<i>Deschampsia cespitosa</i> – <i>Hordeum brachyantherum</i> – <i>Danthonia californica</i> Alliance							
		<i>Hordeum brachyantherum</i> Lowland	3		1	1	5	

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
	<i>Distichlis spicata</i> Interior Alliance							
	<i>Distichlis spicata</i> Interior alliance					2	2	
	<i>Eschscholzia (californica) – Lupinus (nanus)</i> Alliance							
		<i>Chorizanthe membranacea</i>	1		1		2	new
	<i>Juncus (effusus, patens) – Carex (pansa, praegracilis)</i> Alliance							
		<i>Carex serratodens</i>	3		1	2	6	
	<i>Juncus (effusus, patens) – Carex (pansa, praegracilis)</i> alliance			1	1		2	
	<i>Juncus arcticus</i> (var. <i>balticus, mexicanus</i>) Alliance							
	<i>Juncus arcticus</i> (var. <i>balticus, mexicanus</i>) alliance					1	1	
	<i>Lasthenia californica – Plantago erecta – Vulpia microstachys</i> Alliance							
		<i>Hemizonia congesta – Lolium perenne</i>	2	3		1	6	
	<i>Lasthenia californica – Plantago erecta – Vulpia microstachys</i> alliance		1		2	2	5	
		<i>Lotus humistratus – Plantago erecta – Lomatium spp.</i>	1		1		2	
		<i>Micropus californicus</i>	2				2	
		<i>Vulpia microstachys – Plantago erecta – Calycadenia (truncata, multiglandulosa)</i>	2				2	
	<i>Lasthenia fremontii - Downingia (bicornuta)</i> Alliance							

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
	<i>Lasthenia fremontii</i> – <i>Downingia (bicornuta)</i> alliance					1	1	
	<i>Layia fremontii</i> – <i>Achyrrachaena mollis</i> Alliance							
		<i>Plagiobothrys austiniae</i> – <i>Achyrrachaena mollis</i>	1				1	
	<i>Lepidium latifolium</i> – <i>Lactuca serriola</i> Alliance							
		<i>Lepidium latifolium</i>			1		1	
		<i>Chenopodium album</i> – <i>Rumex</i> spp.			1		1	new
	<i>Leymus cinereus</i> – <i>Leymus triticoides</i> Alliance							
	<i>Leymus cinereus</i> – <i>Leymus triticoides</i> alliance					1	1	
	<i>Lolium perenne</i> Alliance							
		<i>Aegilops triuncialis</i> – <i>Hemizonia congesta</i> Provisional				1	1	
	<i>Lolium perenne</i> alliance					1	1	
	<i>Mimulus guttatus</i> – <i>Cirsium</i> spp. – <i>Stachys</i> spp. Alliance							
		<i>Cirsium douglasii</i> – <i>Stachys albens</i>	2	1			3	new
		<i>Mimulus guttatus</i>	1		1		2	
	<i>Nassella</i> spp. – <i>Melica</i> spp. Alliance							
		<i>Nassella pulchra</i> – <i>Hemizonia congesta</i>				1	1	
	<i>Phalaris aquatica</i> – <i>Phalaris arundinacea</i> Alliance							
		<i>Phalaris aquatica</i>			1		1	

Lifeform	Alliance or Group	Association	CI	AIM	Rc	AA	All	New
	<i>Phalaris aquatica</i> – <i>Phalaris arundinacea</i> alliance					1	1	
	<i>Polygonum</i> <i>lapathifolium</i> – <i>Xanthium strumarium</i> Alliance							
		<i>Xanthium strumarium</i>				1	1	
	<i>Schoenoplectus</i> (<i>acutus</i>, <i>californicus</i>) Alliance							
		<i>Schoenoplectus</i> <i>acutus</i>	1				1	
Sparsely Vegetated								
	<i>Allium</i> spp. – <i>Streptanthus</i> spp. – <i>Hesperolinon</i> spp. Serpentinite Alliance							
		<i>Allium falcifolium</i> – <i>Eriogonum</i> <i>dasyanthemum</i> – <i>Streptanthus breweri</i>	4				4	new
	<i>Dudleya cymosa</i> – <i>Dudleya lanceolata</i> / Lichen – Moss Alliance							
		<i>Dudleya cymosa</i> / Lichen – Moss	1				1	
	<i>Sedum spathulifolium</i> Alliance							
		<i>Sedum spathulifolium</i> – <i>Polypodium</i> <i>californicum</i> / Lichen – Moss			1		1	new

The classification names for each field survey are included within a combined geodatabase. The survey data will be publicly available through CDFW's Biogeographic Information and Observation System (BIOS; <https://apps.wildlife.ca.gov/bios6/>).

This classification is hierarchical and generally follows the USNVC (Faber-Langendoen et al. 2012, FGDC 2008, Jennings et al. 2009) and *A Manual of California Vegetation* (CNPS 2023). However, updates and modifications to this local classification and the hierarchy may be needed once further classification and mapping of the Inner Northern

Coast ecoregion is completed. Appendix G represents the classification list of alliances nested within the USNVC hierarchy.

3.2 Mapping

As noted above in Section 2.6.3.1, AIS was contracted to map to the Alliance level. Using the vegetation classification as a foundation, AIS developed a fine-scale vegetation map, which contained 42 mapped types, composed of 30 alliances and alliance-level types such as Provisional Alliances, Semi-natural Alliances, and Mapping Units, and 5 Miscellaneous Classes relating to features such as agriculture, water, and urban disturbance; and 7 upper-level hierarchical types, such as Macrogroup and Group. When the photo interpreter could not confidently classify a polygon at the alliance level, the polygon was assigned a broader upper-level code. This was most common with herbaceous communities, whose differences at the alliance level are often not readily discernible on imagery. Each map unit is described in Appendix B; the map classification is presented in Appendix A; and a summary table of polygon counts and acreage by map unit is presented in Appendix C.

The map has been produced at an original target scale of 1:6,000. While the map can be projected at finer scales in a GIS, we caution against application at finer scales because of the limits posed by spatial or thematic error. More importantly, even though the minimum map unit delineation is small at 0.1 hectare (ha), the focus should remain on the large patch pattern in any interpretation (e.g., 0.2 ha).

A total of 22,061 acres were mapped, with a total of 1,755 polygons. For area (including acreage), and polygon counts by vegetation type for the Walker Ridge study area, refer to Appendix C.

3.3 Accuracy Assessment

3.3.1 Accuracy Assessment Data Collection

The independent allocation of accuracy assessment polygons resulted in a selection of 176 polygons, of which 111 were assigned priority 3, 12 were priority 2, and 53 were priority 1. A total of 115 accuracy assessment surveys were collected across 28 vegetation types between May and June 2023. The polygons and polygon-based survey locations are displayed in **Figure 4**. CNPS staff recorded AA surveys at 113 locations where the vegetation was keyed to the alliance (or association) level, and sometimes modified to an appropriate higher level map class. For alliances (or associations) without a one-to-one relationship to the map classes, information regarding the geographic location of the point or the cultural history of the point was considered to place the point within the most appropriate map class.

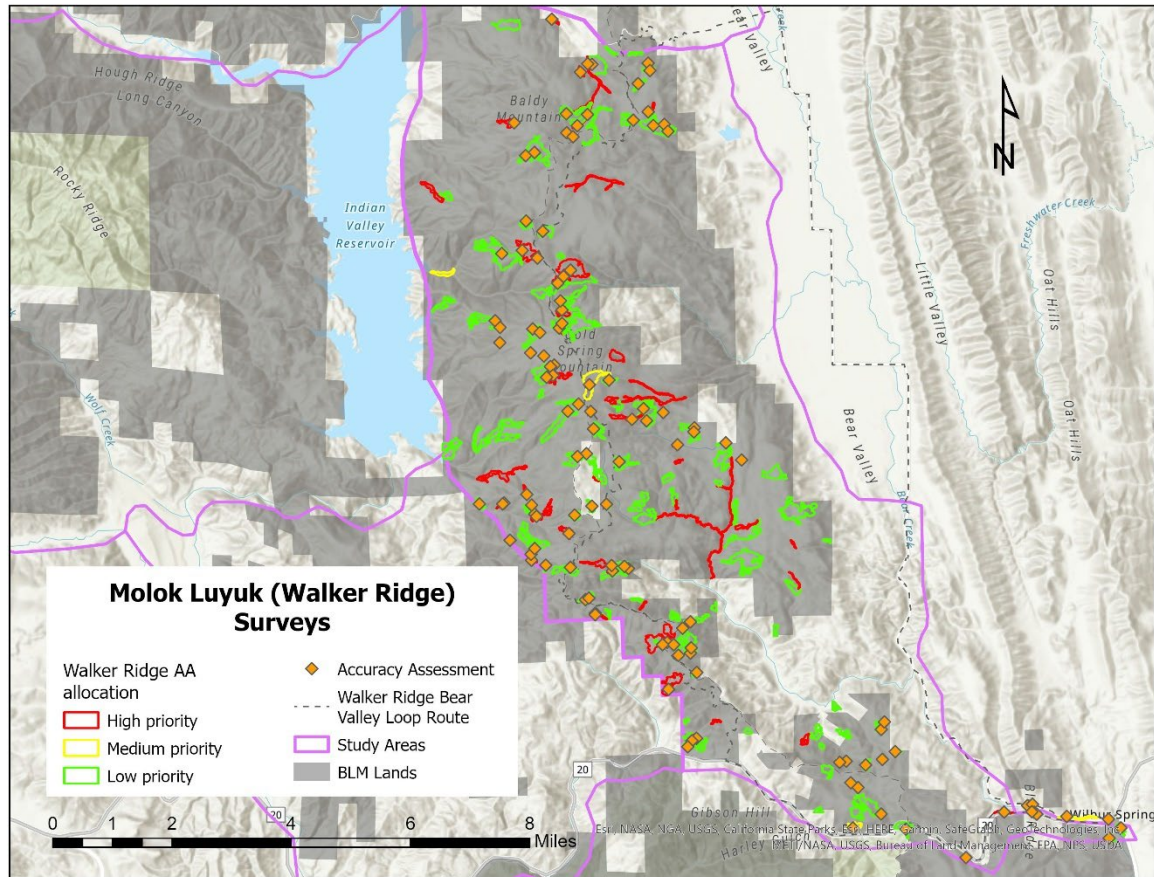


Figure 4: Map of the AA Survey Locations

3.3.2 Data Analysis

CDFW VegCAMP staff analyzed the AA field data to verify accuracy of the vegetation map. The resulting initial percent accuracy was greater than 80% overall for fuzzy scores 3 and above. The overall fuzzy AA analysis for the resulting vegetation map at the Alliance, Group, or Macrogroup levels was **89.7%**. The user's and producer's accuracies by each map unit are presented in **Table 8**.

Also, an AA contingency table and associated statistics for the initial accuracy assessment are presented in Appendix I. Each column in the table represents a type assessed in the field for each polygon (users), while each row represents the type mapped by the photo interpreters (producers). Numbers on the diagonal are correct calls by the photo interpreters. These contingency tables display the numbers of assessed polygons by type, and do not include fuzzy scores.

Table 9. User's and Producer's Accuracies by Map Class From the Initial Assessment.

Map Unit Code	Vegetation Alliance, Group, & Other Map Units	Users Accuracy	Users Count	Producers Accuracy	Producers Count
1111	<i>Aesculus californica</i> Alliance	95%	4	90%	6
1112	<i>Quercus chrysolepis</i> (tree) Alliance	96.4%	11	100%	8
1113	<i>Quercus douglasii</i> Alliance	95.6%	9	100%	7
1114	<i>Quercus wislizeni</i> - <i>Quercus parvula</i> (tree) Alliance	0%	0	80%	1
1115	<i>Umbellularia californica</i> Alliance	100%	1	86.7%	3
1121	<i>Hesperocyparis (sargentii, macnabiana)</i> Alliance	94.3%	7	86.7%	9
1122	<i>Pinus attenuata</i> Alliance	100%	2	100%	2
1123	<i>Pinus sabiniana</i> Alliance	100%	5	100%	5
1411	<i>Tamarix</i> spp. Semi-natural Alliance	100%	2	100%	2
3614	<i>Cornus sericea</i> – (<i>Salix</i> spp.) Association of the <i>Cornus sericea</i> Alliance	60%	1	0%	0
2111	<i>Adenostoma fasciculatum</i> Alliance	90%	16	95%	12
2113	<i>Arctostaphylos viscida</i> Alliance	80%	4	80%	4
2114	<i>Ceanothus cuneatus</i> Alliance	80%	5	80%	7
2121	<i>Ceanothus (oliganthus, tomentosus)</i> Alliance	80%	1	0%	0
2123	<i>Prunus ilicifolia</i> - <i>Heteromeles arbutifolia</i> - <i>Ceanothus spinosus</i> Alliance	72%	5	100%	1
2124	<i>Quercus berberidifolia</i> Alliance	85.7%	7	82.2%	9
2125	<i>Quercus durata</i> Alliance	86%	10	94.3%	7
2126	<i>Quercus wislizeni</i> - <i>Quercus chrysolepis</i> (shrub) Alliance	88%	5	84.4%	9
2211	<i>Lotus scoparius</i> - <i>Lupinus albifrons</i> - <i>Eriodictyon</i> spp. Alliance	0%	0	50%	2
2300	Californian Annual & Perennial Grassland Macrogroup	100%	4	87.5%	8
2320	Californian Annual Grassland & Forb Meadow Group	100%	3	100%	1
2410	Californian Ruderal Grassland, Meadow & Scrub Group	90%	2	100%	1
3111	<i>Frangula californica</i> - <i>Rhododendron occidentale</i> - <i>Salix breweri</i> Alliance	100%	3	90%	4

Map Unit Code	Vegetation Alliance, Group, & Other Map Units	Users Accuracy	Users Count	Producers Accuracy	Producers Count
3511	<i>Rhus trilobata</i> - <i>Crataegus rivularis</i> - <i>Forestiera pubescens</i> Alliance	0%	0	70%	2
3120	Vancouverian Freshwater Wet Meadow & Marsh Group	90%	2	100%	2
3121	<i>Deschampsia cespitosa</i> - <i>Hordeum brachyantherum</i> - <i>Danthonia californica</i> Alliance	80%	1	0%	0
3123	<i>Juncus (effusus, patens)</i> - <i>Carex (pansa, praegracilis)</i> Alliance	70%	2	0%	0
9320	Anthropogenic Areas of Little or No Vegetation Mapping Unit	40%	1	0%	0
	Overall AA polygon count		113		
	Polygons with 60-100% Accuracy (Score 3 or above)		110		
	Polygons with 80-100% Accuracy (Score 4 or above)		97		
	Overall Percent Accuracy with Fuzzy Scoring	89.7%			

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GLOSSARY

Alliance	a vegetation classification unit of low rank (7th level) containing one or more associations, and defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation (Jennings <i>et al.</i> 2006). Alliances reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes.
Bosque	in arid climates, an oasis-like ribbon of canopied vegetation that only exists near rivers, streams, or other water courses.
Cismontane	refers to the portion of Southern California on the coastal side of the Transverse and Peninsular mountain ranges. The term “Southern California” often refers to this region specifically. See also “ transmontane ”.
Colluvial	referring to loose earth material that has accumulated at the base of a hill through the action of gravity.
Cove (on a hillside)	a hollow or recess in a mountain; a narrow pass or sheltered area between woods or hills.
Cryptobiotic crust	a layer on the surface of desert soils composed of biotic organisms such as blue-green algae, lichens, mosses, green algae, microfungi, and bacteria.
Decadent	(botany) a plant that is dead or dying.
Desiccation	the state of being thoroughly dried up.
Edaphic	related to or caused by particular soil conditions, as of texture or drainage, rather than by physiographic or climatic factors.
Facultative	having the capacity to live under more than one specific set of environmental conditions - as opposed to “obligate”.
Fluvial	of or pertaining to a river; produced by or found in a river.
Geodatabase	a database designed to store, query, and manipulate geographic information and spatial data.
Group	a vegetation classification unit of intermediate rank (6th level) defined by combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (cf. Pignatti <i>et al.</i> 1994, Specht and Specht 2001).

Hummocky	relating to any topographic surface characterized by rounded or conical mounds.
Hydrophobic (soil)	a condition in which water collects on the soil surface rather than infiltrating into the ground. Wildfires generally cause soils to be hydrophobic temporarily.
Intermontane	a feature between mountains, such as a plateau or a basin.
Lens	a body of rock or ore that is thick in the middle and thinner toward the edges, similar in shape to a biconvex lens.
Lithomorphic	pertaining to a soil with a shallow profile, with organic soil horizons directly overlying bedrock.
Macrogroup	a vegetation classification unit of intermediate rank (5th level) defined by combinations of moderate sets of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (cf. Pignatti <i>et al.</i> 1994).
Mesic	of, pertaining to, or adapted to an environment having a balanced supply of moisture.
Phenology	the science dealing with the influence of climate on the recurrence of such annual phenomena of plant life as budding and other growth phases.
Pool and swale topography	landscape characterized by shallow depressions where water can collect seasonally (pools), and long, narrow, shallow, troughs or depressions that may slope downward (swales).
Premontane	pertaining to an elevation zone corresponding to foothills or lower mountain slopes.
Rhizomatous	a plant producing rhizomes, which are root-like subterranean stems, commonly horizontal in position, that usually produce roots below and send up shoots progressively from the upper surface.
Scald	a hard impermeable surface on saline or sodic soils as a result of wind or sheet erosion (dry scald) or by surface sealing through deposition of salts and clays following evaporation of surface water (wet scald).
Sclerophyllous	typically scrub, but also forest, in which the leaves of the trees and shrubs are evergreen, hard, thick, leathery, and usually small. A dominant plant form in hot dry areas, especially Mediterranean-type climates.
Seral	referring to a community that is an intermediate stage in ecological succession, preceding the climax community.

Signature	the visual characteristics of objects on an aerial photograph that allow one to differentiate them. The characteristics include tone, shape, size, pattern, texture, and shadow.
Stoloniferous	producing or bearing stolons, which are prostrate stems, at or just below the ground surface, that produce new plants from buds at their tips or nodes.
Transmontane	refers to the largely desert areas of Southern California, on the noncoastal side of the Transverse and Peninsular mountain ranges. See also “ cismontane ”.

Note: Refer to Appendices E and F for further vegetation terminology.

List of Acronyms

AA	Accuracy Assessment
AIS	Aerial Information Systems, Inc.
CDFG	California Department of Fish and Game
CDFW	California Department of Fish and Wildlife (name changed 1/1/13)
DEM	Digital Elevation Model
DRG	Digital Raster Graphics
FGDC	Federal Geographic Data Committee
GIS	Geographic Information System
GPS	Global Positioning System
MMU	Minimum Mapping Unit
MMW	Minimum Mapping Width
MOLA	Modoc-Lassen
NAIP	National Agricultural Imagery Program
NVCS	National Vegetation Classification Standards
OHV	Off-Highway Vehicle
OHVP	Off-Highway Vehicle Park
PI	Photointerpretation, photo interpreter
ROW	Right-of-way
USGS	US Geological Survey
VegCAMP	Vegetation Classification and Mapping Program

Mapping Classification Hierarchy 9/30/2023

Vegetation Type (Map Unit)

Class

Subclass

Formation

Division

Macrogroup

Group

Alliance

Association

No color 1-acre MMU; **Yellow ¼-acre MMU (special, riparian, wetland);** Gray Exotic;
(XXXX Code Value)

Forest & Woodland Class

Temperate & Boreal Forest & Woodland Subclass (1000)

Warm Temperate Forest & Woodland Formation

Californian Forest & Woodland Division

Californian Forest & Woodland Macrogroup M9 (1100)

Californian Broadleaf Forest & Woodland Group G195 (1110)

Aesculus californica Alliance (1111)

Aesculus californica / Toxicodendron diversilobum / Moss Association

Quercus chrysolepis (tree) Alliance (1112)

Quercus chrysolepis Association

Quercus chrysolepis / Quercus (wislizeni, parvula) Association

Quercus douglasii Alliance (1113)

Quercus douglasii / Arctostaphylos manzanita / Herbaceous Association

Quercus douglasii – Pinus sabiniana / Ceanothus cuneatus – Cercocarpus
montanus Association

Quercus douglasii / Mixed herbaceous Association

Quercus wislizeni–Quercus parvula (tree) Alliance (1114)

Quercus wislizeni / Toxicodendron diversilobum Association

Umbellularia californica Alliance (1115)

Umbellularia californica Association

Californian Conifer Forest & Woodland Group G198 (1120)

Hesperocyparis (sargentii, macnabiana) Alliance (1121)

Hesperocyparis macnabiana / Arctostaphylos viscida Association

Hesperocyparis sargentii / Quercus durata (Mesic) Association

Pinus attenuata Alliance (1122)

Pinus attenuata – mixed oak / Arctostaphylos viscida Association

Pinus attenuata / Adenostoma fasciculatum Association

Pinus sabiniana Alliance (1123)

Pinus sabiniana / Ceanothus cuneatus – (Rhamnus ilicifolia) Association

Pinus sabiniana / Quercus durata Association

Californian Ruderal Forest Macrogroup M513 (1200)

Californian Ruderal Forest Group G678 (1210)

Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-natural

Alliance (1211) Exotic

Ailanthus altissima Semi-natural Association

Temperate Flooded and Swamp Forest Formation

Western North American Interior Flooded Forest Division

Interior Warm & Cool Desert Riparian Forest Macrogroup M036 (1300)

Western Interior Riparian Forest & Woodland G797 (1310)

Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance (1311) Riparian

Salix gooddingii – Salix laevigata Alliance (1312) Riparian

Western Arid Ruderal Riparian Forest & Scrub Macrogroup M298 (1400)

West Arid Ruderal Lowland Riparian Forest & Scrub Group G510 (1410)

Tamarix spp. Semi-natural Alliance (1411) Riparian Exotic

Tamarix spp. Semi-Natural Association

Rubus armeniacus – Sesbania punicea – Ficus carica Semi-natural Alliance

(1412) Riparian Exotic

Rubus armeniacus Semi-Natural Association

Shrub & Herb Vegetation Class

Temperate & Boreal Grassland & Shrubland Subclass (2000)

Mediterranean Scrub & Grassland Formation

Californian Scrub & Grassland Division

Californian Chaparral Macrogroup M043 (2100)

Californian Xeric Chaparral Group G257 (2110)

Adenostoma fasciculatum Alliance (2111)

Adenostoma fasciculatum Association

Adenostoma fasciculatum – (Lotus scoparius – Eriodictyon spp.)
Association

Adenostoma fasciculatum – (Arctostaphylos glandulosa – Ceanothus
jepsonii) Association

Arctostaphylos (canescens, manzanita, stanfordiana) Alliance (2112)

Arctostaphylos manzanita Association

Arctostaphylos viscida Alliance (2113)

Arctostaphylos viscida – Ceanothus jepsonii Association

Ceanothus cuneatus Alliance (2114)

Ceanothus cuneatus Association

Californian Mesic & Pre-montane Chaparral Group G261 (2120)

Ceanothus (oliganthus, tomentosus) Alliance (2121)

Ceanothus oliganthus Association

Cercocarpus montanus Alliance (2122)

Cercocarpus montanus var. glaber Association

Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance (2123)

Heteromeles arbutifolia Serpentine Association

Quercus berberidifolia Alliance (2124)

Quercus berberidifolia Association

Quercus berberidifolia – Adenostoma fasciculatum Association

Quercus berberidifolia – Heteromeles arbutifolia Association

Quercus durata Alliance (2125)

Quercus durata Association

Quercus durata – Ceanothus jepsonii Association

Quercus wislizeni – Quercus chrysolepis (shrub) Alliance (2126)

Quercus wislizeni var. frutescens Association

Quercus wislizeni – Quercus berberidifolia Association

Quercus palmeri Association

Californian Coastal Scrub Macrogroup M044 (2200)

Californian Coastal-Foothill Seral Scrub Group G782 (2210)

Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance (2211)

Eriodictyon californicum / Herbaceous Association

Lupinus albifrons Association

Calystegia collina / Eriodictyon californicum Provisional Association

Californian Annual & Perennial Grassland Macrogroup M045 (2300)

Californian Perennial Grassland Group G496 (2310)

Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance (2311)

Eriogonum nudum Association

Corethrogyne filaginifolia - Acmispon brachycarpus Provisional Association

Nassella spp. – Melica spp. Alliance (2312)

Elymus multisetus – (Eschscholzia californica – Plantago erecta) Association

Californian Annual Grassland & Forb Meadow Group G766 (2320)

Amsinckia (menziesii, tessellata) – Phacelia spp. Alliance (2321)

Eschscholzia (californica) – Lupinus (nanus) Alliance (2322)

Chorizanthe membranacea Provisional Association)

Holocarpha (heermannii, virgata) Alliance (2323)

Holocarpha virgata Association

Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance (2324)

Hemizonia congesta – Lolium perenne Association

Lasthenia (californica, gracilis) Association

Lotus humistratus – Plantago erecta – Lomatium spp. Provisional Association

Micropus californicus Provisional Association

Vulpia microstachys – Plantago erecta – Calycadenia (truncata, multiglandulosa) Association

Plagiobothrys nothofulvus Alliance (2325)

Californian Ruderal Grassland, Meadow & Scrub Macrogroup M046 (2400) Exotic

Californian Ruderal Grassland, Meadow & Scrub Group G497 (2410) Exotic

Avena spp. – *Bromus* spp. Semi-natural Alliance (2411) Exotic

Brassica nigra – *Centaurea* (*solstitialis*, *melitensis*) Semi-natural Alliance (2412)
Exotic

Centaurea solstitialis Semi-natural Association

Cynosurus echinatus – *Arrhenatherum elatius* Semi-natural Alliance (2413)

Exotic

Lolium perenne Semi-natural Alliance (2414) Exotic

Aegilops triuncialis – *Hemizonia congesta* Provisional Semi-natural
Association

Western North American Ruderal Grassland & Shrubland Macrogroup M493 (2500)

Exotic

Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group G648 (2510)

Exotic

Conium maculatum – *Foeniculum vulgare* Semi-Natural Alliance (2511) Exotic

Conium maculatum Semi-Natural Association

Foeniculum vulgare Semi-Natural Association

Dipsacus (*fullonum*, *sativus*) Provisional Semi-Natural Association

Shrub & Herb Wetland Subclass (3000)

Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation

Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow &
Shrubland Division

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup M073 (3100)

Wetland

Vancouverian Wet Shrubland Group G322 (3110) Riparian

Frangula californica – *Rhododendron occidentale* – *Salix breweri* Alliance (3111)

Riparian

Salix breweri Association

Vancouverian Freshwater Wet Meadow & Marsh Group G517 (3120) Wetland

Deschampsia cespitosa – *Hordeum brachyantherum* – *Danthonia californica*
Alliance (3121) Wetland

Hordeum brachyantherum Lowland Association

Juncus arcticus (var. *balticus*, *mexicanus*) Alliance (3122) Wetland

Juncus arcticus var. *balticus* – (var. *mexicanus*) Association

Juncus (*effusus*, *patens*) – *Carex* (*pansa*, *praegracilis*) Alliance (3123) Wetland

Carex serratodens Association

Leymus cinereus – *Leymus triticoides* Alliance (3124) Wetland

Leymus triticoides Association

Mimulus guttatus – *Stachys* spp. – *Cirsium* spp. Alliance (3125) Wetland

Mimulus guttatus Association

Cirsium douglasii – *Stachys albens* Provisional Association

Temperate Pacific Freshwater Wet Mudflat Group G525 (3130) Wetland
Polygonum lapathifolium – Xanthium strumarium Alliance (3131) Wetland Exotic
Xanthium strumarium Association

Western North American Vernal Pool Macrogroup M074 (3200) Wetland
Californian Vernal Pool Group G530 (3210) Wetland
Layia fremontii – Achyrachaena mollis Alliance (3211) Wetland

Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup M301 (3300) Wetland Exotic
Western North American Ruderal Marsh, Wet Meadow & Shrubland Group G524 (3310) Wetland Exotic
Lepidium latifolium – Lactuca serriola Semi-natural Alliance (3311) Wetland
Exotic
Lepidium latifolium Semi-natural Association
Chenopodium album – Rumex spp. Provisional Semi-natural Association
Phalaris aquatica – Phalaris arundinacea Alliance (3312) Wetland Exotic

Arid West Interior Freshwater Marsh Macrogroup M888 (3400) Wetland
Arid West Interior Freshwater Marsh Group G531 (3410) Wetland
Schoenoplectus (acutus, californicus) Alliance (3411) Wetland
Schoenoplectus acutus Association
Typha (angustifolia, domingensis, latifolia) Alliance (3412) Wetland

Western North American Montane Marsh, Wet Meadow & Shrubland Macrogroup M893 (3500) Wetland
Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland Group G526 (3510) Wetland
Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance (3511)
Wetland
Rhus trilobata Association

Southwestern North American Warm Desert Freshwater Marsh & Bosque Division
Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland Macrogroup M076 (3600) Wetland
North American Warm Desert Riparian Low Bosque & Shrubland Group G533 (3610) Riparian
Cephalanthus occidentalis – Rosa californica Alliance (3611) Riparian
Rosa californica Association
Salix exigua Alliance (3612) Riparian
Salix lasiolepis Alliance (3613) Riparian
Cornus sericea Alliance (3614) Riparian

Salt Marsh Formation (4000)

North American Western Brackish Marsh, Playa & Shrubland Division

Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland Macrogroup M082 (4100)

North American Desert Alkaline-Saline Marsh & Playa Group G538 (4110)

Distichlis spicata Alkaline Interior Alliance (4111) **Wetland**

North American Desert Alkaline-Saline Wet Scrub Group G537 (4120) **Wetland**

Suaeda moquinii Alliance (4121) **Wetland**

Open Rock Vegetation Class (6000)

Temperate & Boreal Open Rock Vegetation Subclass

Temperate & Boreal Cliff, Scree & Other Rock Vegetation Formation

Western North American Temperate Cliff, Scree & Rock Vegetation Division

Western North American Cliff, Scree & Rock Vegetation Macrogroup M887 (6100)

Californian Cliff, Scree & Rock Vegetation Group G563 (6110) **Special**

Allium spp. – *Streptanthus* spp. – *Hesperolinon* spp. *Serpentinite* Alliance (6111)
Special

Allium falcifolium – *Eriogonum dasyanthemum* – *Streptanthus breweri*
Provisional Association

Dudleya cymosa – *Dudleya lanceolata* – Lichen/Moss Alliance (6112) **Special**

Dudleya cymosa / Lichen – Moss Provisional Association

Sedum spathulifolium Alliance (6113) **Special**

Sedum spathulifolium – *Polypodium californicum* / Lichen – Moss
Provisional Association

Miscellaneous Classes

Agriculture Mapping Unit (9200)

Woody Agriculture (orchards, vineyards) Mapping Unit (9210)

Non-woody Row and Field Agriculture Mapping Unit (9220)

Built-up & Urban Disturbance Mapping Unit (9300)

Anthropogenic Areas of Little or No Vegetation Mapping Unit (9320)

Exotic Planted Trees and Shrubs Mapping Unit (9500) **Exotic**

Sparsely Vegetated Recent Burned Areas Mapping Unit (9701)

Water Mapping Unit (9800) **Wetland**

Perennial Stream Channel (Open Water) Mapping Unit (9801) **Riparian**

Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit
(9803) **Wetland**

Other Attributes

Percent of Cover - Woody (Conifer, Hardwood, Total Tree, Shrub) Absolute Cover 1% increment

nnn = Absolute Cover

000 = None or None Observable

999 = Not Applicable/Not Assigned

Percent of Cover by Herbaceous

1 = None, None Observable, <2%

2 = >2-10%

3 = >10-40%

4 = >40%

9 = Not Applicable/Not Assigned

Exotics

0 = None Visible

1 = Low: Patches of exotics visible, but cover not significant (relative cover to total <33%)

2 = Moderate: Exotics (particularly herbaceous) significant and cover may exceed dominant vegetation strata (relative cover <66%)

3 = High: Stand characterized by exotics (vegetation type is "exotic") (relative cover >66%)

9 = Not Applicable/Not Assigned

Roadedness Disturbance

0 = None Visible

1 = Low (>2/3 contiguous roadless)

2 = Moderate (1/3 - 2/3 contiguous roadless)

3 = High (<1/3 contiguous roadless)

9 = Not applicable/Not Assigned

Development Disturbance

0 = None Visible

1 = Low (>0 - 2% of polygon affected)

2 = Moderate (>2% - 5% of polygon affected)

3 = High (>5% of polygon affected)

9 = Not applicable/Not Assigned

Anthropogenically Altered Disturbance

0 = None Visible

1 = Low (>0% – 33% of polygon affected)

2 = Moderate (>33% – 66% of polygon affected)

3 = High (>66% of polygon affected)

9 = Not Applicable/Not Assigned

Land Use

- 0 = Not Assigned/Not Assessed
- 1000 = Urban
 - 1436 = Water Transfer (Major Canals, Aqueducts and Agricultural Channels)
 - 1850 = Wildlife Preserves & Sanctuaries
- 2000 = Agriculture (Includes Nurseries)
 - 2100 = Non-woody Row & Field crops
 - 2200 = Orchards & Vineyards
 - 2300 = Improved Pastureland (Irrigated)
- 3000 = Vacant Land
 - 3500 = Vacant Land - Restoration
- 9800 = Undifferentiated Water
 - 9810 = Water Impoundment Feature

Modal Overstory Height Class (Trees) (note that categories >35-50m and >50m were not encountered)

- 01 = <.5m
- 02 = >.5-1m
- 03 = >1-2m
- 04 = >2-5m
- 05 = >5-10m
- 06 = >10-15m
- 07 = >15-20m
- 08 = >20-35m
- 09 = >35-50m
- 10 = >50m
- 999 = Not Applicable/Not Assessed

California Wildlife Habitat Relations (CWHR) Modal Size Class

- 1 = Seedlings (<1' dbh)
- 2 = Saplings (>1"-6" dbh)
- 3 = Pole (>6"-11" dbh)
- 4 = Small (>11"-24" dbh)
- 5 = Medium-large (>24" dbh)
- 6 = Multi-layered medium-large trees over smaller trees in densities >60%
- 999 = Not Applicable/Not Assessed

Method ID

- 1 = Rapid Assessment (current project)
- 2 = Relevé (current project)
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- 7 = Other Information
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10 = Accuracy Assessment (current project)
60 = Inconsequential Project Information

Note

A Comment Field in the database used to add any pertinent additional information, such as significant additional species present not accounted for in the alliance or association name.

Mapping Classification Numeric Short List 9/30/2023

Vegetation Type (Map Unit)

No color 1-acre MMU; Yellow ¼-acre MMU (special, riparian, wetland); Gray Exotic;
(XXXX Code Value)

Bold = Mapped in database

Tree Type

1111 = Aesculus californica Alliance

1112 = Quercus chrysolepis (tree) Alliance

1113 = Quercus douglasii Alliance

1114 = Quercus wislizeni–Quercus parvula (tree) Alliance

1115 = Umbellularia californica Alliance

1121 = Hesperocyparis (sargentii, macnabiana) Alliance

1122 = Pinus attenuata Alliance

1123 = Pinus sabiniana Alliance

1211 = Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-natural Alliance; Exotic

1311 = Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance; Riparian

1312 = Salix gooddingii – Salix laevigata Alliance; Riparian

Shrub Type

1411 = Tamarix spp. Semi-natural Alliance; Riparian; Exotic

1412 = Rubus armeniacus – Sesbania punicea – Ficus carica Semi-natural Alliance; Riparian; Exotic

2111 = Adenostoma fasciculatum Alliance

2112 = Arctostaphylos (canescens, manzanita, stanfordiana) Alliance

2113 = Arctostaphylos viscida Alliance

2114 = Ceanothus cuneatus Alliance

2121 = Ceanothus (oliganthus, tomentosus) Alliance

2122 = Cercocarpus montanus Alliance

2123 = Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance

2124 = Quercus berberidifolia Alliance

2125 = Quercus durata Alliance

2126 = Quercus wislizeni – Quercus chrysolepis (shrub) Alliance

2211 = Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance

3111 = Frangula californica – Rhododendron occidentale – Salix breweri Alliance; Riparian

3511 = Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance; Riparian

3611 = Rosa californica Alliance; Riparian

3612 = Salix exigua Alliance; Riparian

3613 = Salix lasiolepis Alliance; Riparian

3614 = Cornus sericea Alliance; Riparian

4121 = Suaeda moquinii Alliance; Riparian

Herbaceous Type

2300 = Californian Annual & Perennial Grassland Macrogroup

- 2310 = Californian Perennial Grassland Group (Native grassland and forbs)
 - 2311 = Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance
 - 2312 = Nassella spp. – Melica spp. Alliance

2320 = Californian Annual Grassland & Forb Meadow Group

- 2321 = Amsinckia (menziesii, tessellata) – Phacelia spp. Alliance
- 2322 = Eschscholzia (californica) – Lupinus (nanus) Alliance
- 2323 = Holocarpha (heermannii, virgata) Alliance

2324 = Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance

- 2325 = Plagiobothrys nothofulvus Alliance

2410 = Californian Ruderal Grassland, Meadow & Scrub Group Exotic

- 2411 = Avena spp. – Bromus spp. Semi-natural Alliance Exotic
- 2412 = Brassica nigra – Centaurea (solstitialis, melitensis) Semi-natural Alliance Exotic
- 2413 = Cynosurus echinatus – Arrhenatherum elatius Semi-natural Alliance Exotic
- 2414 = Lolium perenne Semi-natural Alliance Exotic
- 2511 = Conium maculatum – Foeniculum vulgare Semi-natural Alliance Exotic

3120 = Vancouverian Freshwater Wet Meadow & Marsh Group; Wetland

3121 = Deschampsia cespitosa – Hordeum brachyantherum – Danthonia californica Alliance; Wetland

- 3122 = Juncus arcticus (var. balticus, mexicanus) Alliance; Wetland

3123 = Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance; Wetland

- 3124 = Leymus cinereus – Leymus triticoides Alliance; Wetland

- 3125 = Mimulus guttatus – Stachys spp. – Cirsium spp. Alliance; Wetland

3130 = Temperate Pacific Freshwater Wet Mudflat Group; Wetland

- 3131 = Polygonum lapathifolium – Xanthium strumarium Alliance; Wetland

3210 = Californian Vernal Pool Group; Wetland

- 3211 = Layia fremontii – Achyrachaena mollis Alliance; Wetland

3310 = Western North American Ruderal Marsh, Wet Meadow & Shrubland Group; Wetland; Exotic

- 3311 = Lepidium latifolium – Lactuca serriola Semi-natural Alliance; Wetland; Exotic

3410 = Arid West Interior Freshwater Marsh Group; Wetland

- 3411 = Schoenoplectus (acutus, californicus) Alliance; Wetland

- 3412 = Typha (angustifolia, domingensis, latifolia) Alliance; Wetland

4110 = North American Desert Alkaline-Saline Marsh & Playa Group; Wetland

- 411 = Distichlis spicata Alkaline Wet Meadow Alliance; Wetland

6110 = Californian Cliff, Scree & Rock Vegetation Group; Special

6111 = Allium spp. – Streptanthus spp. – Hesperolinon spp. Serpentine
Alliance; Special

6112 = Dudleya cymosa – Dudleya lanceolata – Lichen/Moss Alliance; Special

6113 = Sedum spathulifolium Alliance; Special

Miscellaneous Classes

9200 = Agriculture Mapping Unit

9210 = Woody Agriculture (orchards, vineyards) Mapping Unit

9220 = Non-woody Row and Field Agriculture Mapping Unit

9300 = Built-up & Urban Disturbance Mapping Unit

9320 = Anthropogenic Areas of Little or No Vegetation Mapping Unit

9500 = Exotic Planted Trees and Shrubs Mapping Unit; Exotic

9700 = Sparsely Vegetated Mapping Unit

9701 = Sparsely Vegetated Recent Burned Areas Mapping Unit

9800 = Water Mapping Unit; Wetland

9801 = Perennial Stream Channel (Open Water) Mapping Unit; Riparian

**9803 = Small Earthen-dammed Ponds and Naturally Occurring Lakes
Mapping Unit; Wetland**

Other Attributes

Percent of Cover - Woody (Conifer, Hardwood, Total Tree, Shrub) Absolute Cover 1% increment

nnn = Absolute Cover

000 = None or None Observable

999 = Not Applicable, Not Assigned

Percent of Cover by Herbaceous

1 = None, None Observable, <2%

2 = >2-10%

3 = >10-40%

4 = >40%

9 = Not Applicable/Not Assigned

Exotics

0 = None Visible

1 = Low: Patches of exotics visible, but cover not significant (relative cover to total <33%)

2 = Moderate: Exotics (particularly herbaceous) significant and cover may exceed dominant vegetation strata (relative cover <66%)

3 = High: Stand characterized by exotics (vegetation type is "exotic") (relative cover >66%)

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Roadedness Disturbance

0 = None Visible

1 = Low (>2/3 contiguous roadless)

2 = Moderate (1/3 - 2/3 contiguous roadless)

3 = High (<1/3 contiguous roadless)

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Development Disturbance

0 = None Visible

1 = Low (>0 - 2% of polygon affected)

2 = Moderate (>2% - 5% of polygon affected)

3 = High (>5% of polygon affected)

9 = Not Applicable/Not Assigned

Anthropogenically Altered Disturbance

0 = None Visible

1 = Low (>0% – 33% of polygon affected)

2 = Moderate (>33% – 66% of polygon affected)

3 = High (>66% of polygon affected)

9 = Not Applicable/Not Assigned

Land Use

- 0 = Not Assigned/Not Assessed
- 1000 = Urban
 - 1436 = Water Transfer (Major Canals, Aqueducts and Agricultural Channels)
 - 1850 = Wildlife Preserves & Sanctuaries
- 2000 = Agriculture (Includes Nurseries)
 - 2100 = Non-woody Row & Field Crops
 - 2200 = Orchards & Vineyards
 - 2300 = Improved Pastureland (Irrigated)
- 3000 = Vacant Land
 - 3500 = Vacant Land - Restoration
- 9800 = Undifferentiated Water
 - 9810 = Water Impoundment Feature

Modal Overstory Height Class (Trees) (note that categories >35-50m and >50m were not encountered)

- 01 = <.5m
- 02 = >.5-1m
- 03 = >1-2m
- 04 = >2-5m
- 05 = >5-10m
- 06 = >10-15m
- 07 = >15-20m
- 08 = >20-35m
- 09 = >35-50m
- 10 = >50m
- 999 = Not Applicable/Not Assessed

California Wildlife Habitat Relations (CWHR) Modal Tree Size Class

- 1 = Seedlings (<1" dbh)
- 2 = Saplings (>1"-6" dbh)
- 3 = Pole (>6"-11" dbh)
- 4 = Small (>11"-24" dbh)
- 5 = Medium-large (>24" dbh)
- 6 = Multi-layered medium-large trees over smaller trees in densities >60%
- 999 = Not Applicable/Not Assessed

Method ID

- 1 = Rapid Assessment (current project)
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Note

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Mapping Classification Alphabetic Short List 9/30/2023

Vegetation Type (Map Unit)

No color 1-acre MMU; Yellow ¼-acre MMU (special, riparian, wetland); Gray Exotic; (XXXX Code Value)

Bold = Mapped in database

Tree Type

1111 = Aesculus californica Alliance

1211 = Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-natural Alliance; Exotic

1121 = Hesperocyparis (sargentii, macnabiana) Alliance

1122 = Pinus attenuata Alliance

1123 = Pinus sabiniana Alliance

1311 = Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance; Riparian

1112 = Quercus chrysolepis (tree) Alliance

1113 = Quercus douglasii Alliance

1114 = Quercus wislizeni–Quercus parvula (tree) Alliance

1312 = Salix gooddingii – Salix laevigata Alliance; Riparian

1115 = Umbellularia californica Alliance

Shrub Type

2111 = Adenostoma fasciculatum Alliance

2112 = Arctostaphylos (canescens, manzanita, stanfordiana) Alliance

2113 = Arctostaphylos viscida Alliance

2114 = Ceanothus cuneatus Alliance

2121 = Ceanothus (oliganthus, tomentosus) Alliance

2122 = Cercocarpus montanus Alliance

3614 = Cornus sericea Alliance; Riparian

3111 = Frangula californica – Rhododendron occidentale – Salix breweri Alliance; Riparian

2211 = Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance

2123 = Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance

2124 = Quercus berberidifolia Alliance

2125 = Quercus durata Alliance

2126 = Quercus wislizeni – Quercus chrysolepis (shrub) Alliance

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4121 = Suaeda moquinii Alliance; Riparian

1411 = Tamarix spp. Semi-natural Alliance; Riparian; Exotic

Herbaceous Type

3410 = Arid West Interior Freshwater Marsh Group; Wetland

3411 = *Schoenoplectus* (acutus, californicus) Alliance; Wetland

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2300 = Californian Annual & Perennial Grassland Macrogroup

2310 = Californian Perennial Grassland Group

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2320 = Californian Annual Grassland & Forb Meadow Group

2321 = *Amsinckia* (menziesii, tessellata) – *Phacelia* spp. Alliance

2322 = *Eschscholzia* (californica) – *Lupinus* (nanus) Alliance

2323 = *Holocarpha* (heermannii, virgata) Alliance

2324 = *Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance

2325 = *Plagiobothrys* nothofulvus Alliance

2410 = Californian Ruderal Grassland, Meadow & Scrub Group; Exotic

2411 = *Avena* spp. – *Bromus* spp. Semi-natural Alliance; Exotic

2412 = *Brassica nigra* – *Centaurea* (solstitialis, melitensis) Semi-natural Alliance; Exotic

2413 = *Cynosurus echinatus* – *Arrhenatherum elatius* Semi-natural Alliance; Exotic

2414 = *Lolium perenne* Semi-natural Alliance; Exotic

2511 = *Conium maculatum* – *Foeniculum vulgare* Semi-Natural Alliance; Exotic

6110 = Californian Cliff, Scree & Rock Vegetation Group; Special

6111 = *Allium* spp. – *Streptanthus* spp. – *Hesperolinon* spp. Serpentine Alliance; Special

6112 = *Dudleya cymosa* – *Dudleya lanceolata* – Lichen/Moss Alliance; Special

6113 = *Sedum spathulifolium* Alliance; Special

3210 = Californian Vernal Pool Group; Wetland

3211 = *Layia fremontii* – *Achyrochaena mollis* Alliance; Wetland

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4111 = *Distichlis spicata* Alkaline Wet Meadow Alliance; Wetland

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3131 = *Polygonum lapathifolium* – *Xanthium strumarium* Alliance; Wetland

3120 = Vancouverian Freshwater Wet Meadow & Marsh Group; Wetland

3121 = *Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance; Wetland

3122 = *Juncus arcticus* (var. balticus, mexicanus) Alliance; Wetland

3123 = *Juncus* (effusus, patens) – *Carex* (pansa, praeegracilis) Alliance; Wetland

3124 = *Leymus cinereus* – *Leymus triticoides* Alliance; Wetland

3125 = *Mimulus guttatus* – *Stachys* spp. – *Cirsium* spp. Alliance; Wetland

3310 = Western North American Ruderal Marsh, Wet Meadow & Shrubland Group; Wetland; Exotic

3311 = Lepidium latifolium – Lactuca serriola Semi-natural Alliance; Wetland; Exotic

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9210 = Woody Agriculture (orchards, vineyards) Mapping Unit

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9801 = Perennial Stream Channel (Open Water) Mapping Unit; Riparian

9803 = Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit; Wetland

Other Attributes

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1% increment

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 - 3500 = Vacant Land - Restoration
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Modal Overstory Height Class (Trees) (note that categories >35-50m and >50m were not encountered)

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- 03 = >1-2m
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- 06 = >10-15m
- 07 = >15-20m
- 08 = >20-35m
- 09 = >35-50m
- 10 = >50m
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California Wildlife Habitat Relations (CWHR) Modal Size Class

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APPENDIX B: Map Unit Descriptions 09/30/2023

Explanation of Map Unit Descriptions

This appendix contains descriptions for each of the Vegetation Types (Map Unit) represented in the final geodatabase for the current project. It is divided into sections by lifeform; Trees, Shrubs, Herbaceous, and Miscellaneous Classes, with special types highlighted in yellow and exotics in gray.

The descriptions for the majority of vegetation types have the following components:

A **screenshot** of aerial imagery and a **ground photo** are featured on the first page. The screenshots give the reader a sense of the photo signatures. The stand of vegetation being described is outlined in red. The ground photos, taken by field staff (AIS, CNPS, VNLC) show the appearance of the plants on the landscape.

The second page includes a **Description**, which discusses the expected locations, percent cover considerations, and other factors pertaining to each vegetation type; **Photointerpretation Signature**, which describes the color, tone, texture, pattern, etc. commonly seen on the aerial imagery; and a listing of **Types with Similar Photointerpretation Signatures**. The signature traits and other characteristics that differentiate each vegetation type in the list from the vegetation type being described are addressed.

Following the Types with Similar Photointerpretation Signatures is a distribution map and a brief discussion of the **Distribution** of the vegetation type in the study area. For vegetation types with only a few small polygons in the entire study area, the size of the polygons on the distribution map was enhanced (or represented as a star) so that their locations could be seen.

Following the distribution map discussion is an **Elevation Range** chart showing the elevation values (count) for a given vegetation type within the study area. The chart was derived by extracting the elevation data (30-meter pixels) from the Digital Elevation Models (DEMs) in the National Elevation Dataset, available from the USGS, using the areal extent of the vegetation type. Along the vertical axis is the number of pixels occurring in the established elevation ranges. Along the horizontal axis are the elevation in meters. This chart is not an elevation profile of the vegetation type, nor does it represent the geographic distribution of its elevation range. It includes the full extent of the vegetation type as mapped in the current mapping effort

Trees

MU ¼ acre for special, wetland, riparian, rock, land use

1111 = *Aesculus californica* Alliance

1121 = *Hesperocyparis (sargentii, macnabiana)* Alliance

1122 = *Pinus attenuata* Alliance

1123 = *Pinus sabiniana* Alliance

1311 = *Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance; Riparian

1112 = *Quercus chrysolepis* (tree) Alliance

1113 = *Quercus douglasii* Alliance

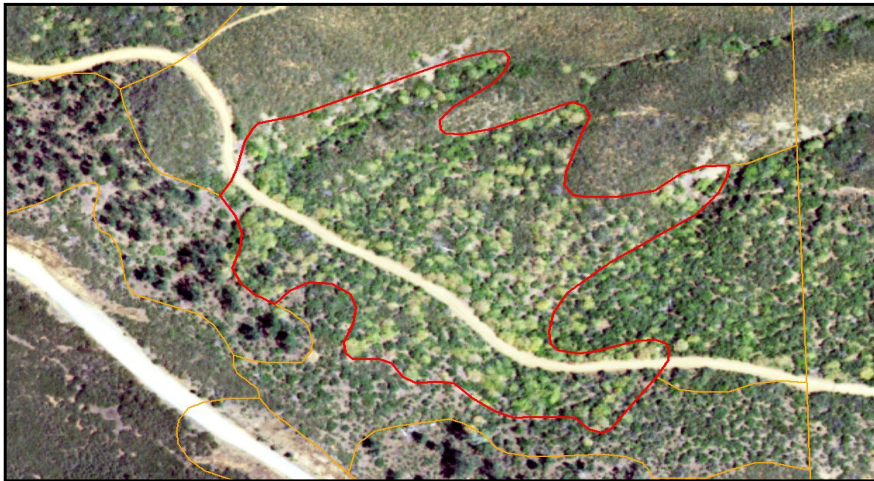
1114 = *Quercus wislizeni*–*Quercus parvula* (tree) Alliance

1312 = *Salix gooddingii* – *Salix laevigata* Alliance; Riparian

1115 = *Umbellularia californica* Alliance

***Aesculus californica* Alliance (1111)**

California buckeye Alliance



Aerial view of an open to intermittent cover stand of *Aesculus californica* among mixed mesic chaparral on a northeast-facing slope. Note the yellow color of senescing leaves of the *Aesculus*.



Ground view of a hillslope showing the leaf-off condition of *Aesculus californica* in the fall.

***Aesculus californica* Alliance (1111)**

DESCRIPTION: *Aesculus californica* is strongly dominant in open to moderately dense woodlands. If *Aesculus* is co-dominant with *Quercus douglasii* the stand is considered as the *Quercus douglasii* Alliance. If *Aesculus* is co-dominant with *Quercus wislizeni* then the stand is considered as the *Quercus wislizeni* – *Quercus parvula* Alliance. A variety of shrubs and herbs may be found in the understory, including *Fraxinus dipetala*, *Sambucus nigra*, *Quercus berberidifolia*, and *Toxicodendron diversilobum*.

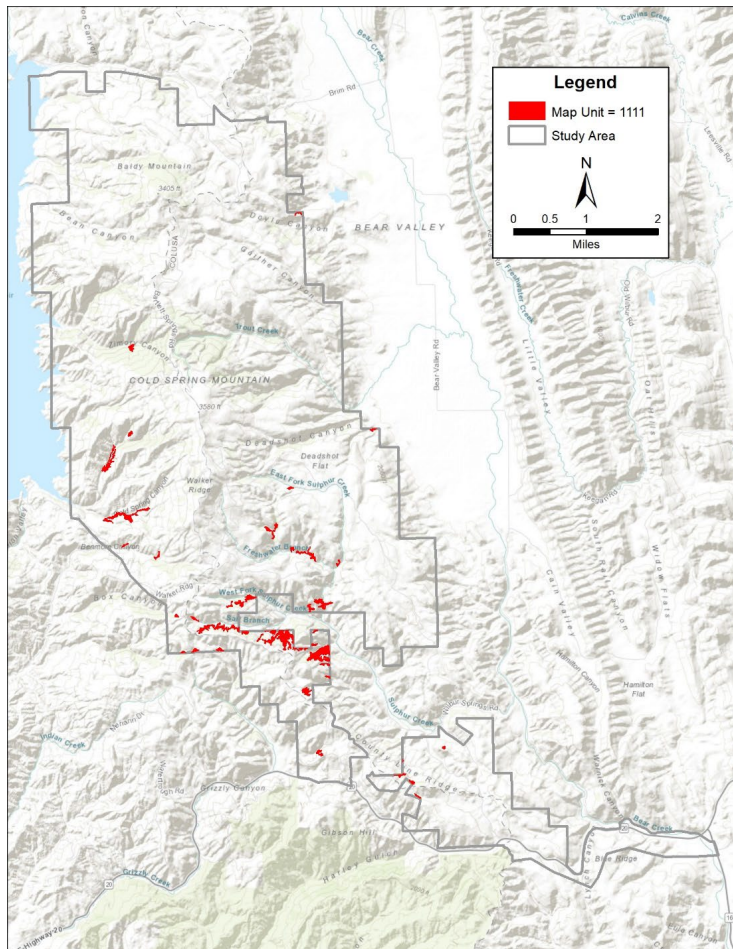
This alliance tends to mix with chaparral on mesic north-facing lower slopes. It does not occur on serpentine. Chaparral shrubs present may include *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Ceanothus cuneatus*, *Cercocarpus montanus*, and *Fraxinus dipetala*. In some situations, *Umbellularia californica* can be present.

PHOTOINTERPRETATION SIGNATURE: *Aesculus californica* is both drought- and cold-season deciduous. In most settings, early summer NAIP imagery reflects the stressing yellow to brown color of the leaves before they fall off the tree. On the base imagery, *Aesculus californica* has bright yellow-green color, large rounded crowns with smooth edges, occurring in mesic draws, and often north-facing. *Aesculus* is usually emergent above dense shrub understory, but can also be emergent over grasses in drier settings. On the color infrared imagery, *Aesculus* is very light in color, and the trees are distinct amongst the surrounding redder signatures.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

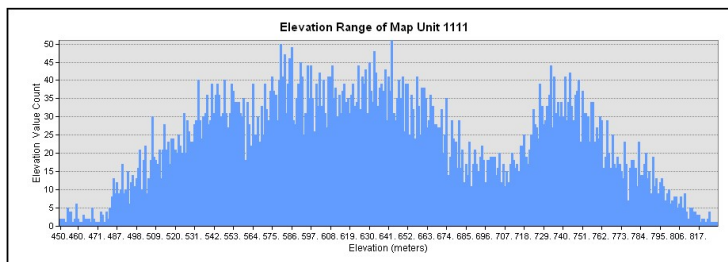
- *Quercus berberidifolia* Alliance (2124) – *Quercus berberidifolia* often mixes with emergent *Aesculus californica* but with less than 8-10% cover of trees. *Q. berberidifolia* stands tend to be less mesic with little or no *Aesculus*. *Q. berberidifolia* has a shorter stature and is green in color.

***Aesculus californica* Alliance (1111)**



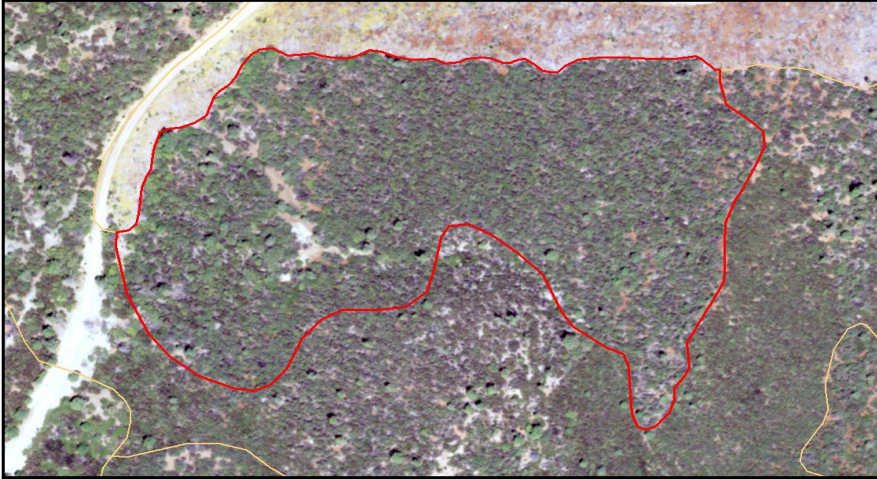
DISTRIBUTION: *Aesculus californica* Alliance is fairly common in the central third of the study area, occurring on steep mesic northerly slopes at the mid elevations between 1500 and 2500 feet.

***Aesculus californica* Alliance (1111)**



Hesperocyparis (sargentii, macnabiana) Alliance (1121)

Sargent Cypress, Macnab's Cypress Alliance



Aerial view of an open to intermittent cover stand of *Hesperocyparis macnabiana*. Note the bull dozer scrape where a 2018 burn occurred to the north.



Ground view of an *Hesperocyparis macnabiana* stand. Note that the stand has recovered after a past burn.

Hesperocyparis (sargentii, macnabiana) Alliance (1121)

DESCRIPTION: *Hesperocyparis macnabiana* or *H. sargentii* dominates or characterizes stands on slopes, ridges, or along stream benches and terraces of serpentine, volcanic, or other ultramafic substrates. *Arctostaphylos* spp., *Ceanothus* spp. and shrubby *Quercus* spp. are commonly found in stands.

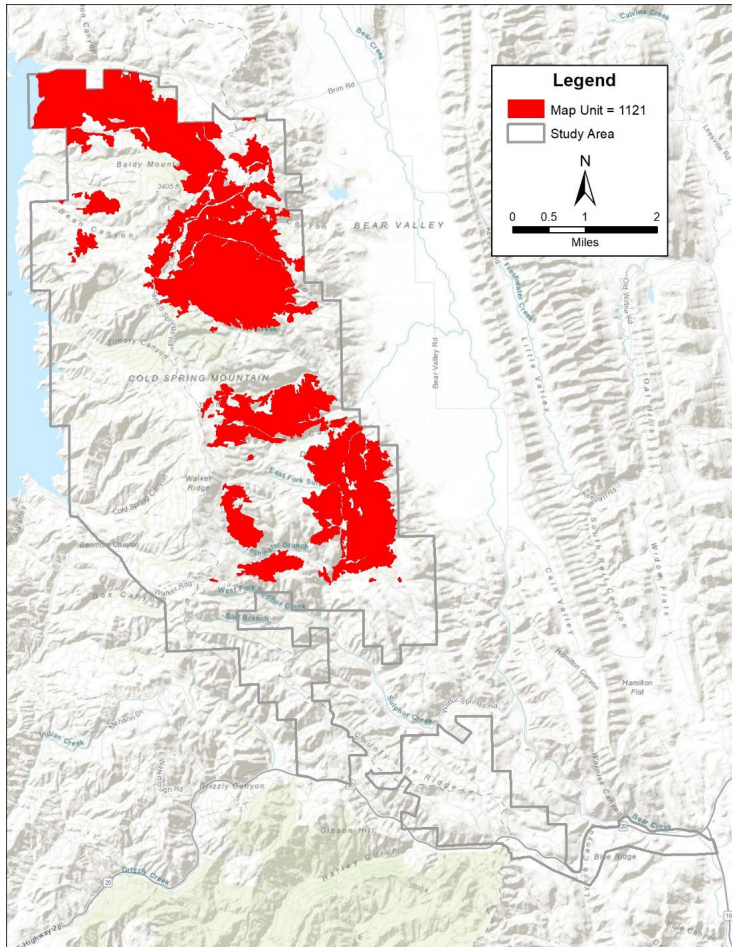
Hesperocyparis sargentii is found at the north edge or just outside of the study area in a steep protected north-facing canyon along which County Road (Bartlett Springs Road) runs. *Hesperocyparis macnabiana* is extensive and common at the higher elevations of the study area with *Quercus durata*, *Arctostaphylos viscida*, and *Ceanothus jepsonii*. Stands of *Pinus attenuata*, and sparse *Pinus sabiniana*, and *Quercus chrysolepis* may also occur in proximity. Some settings of recent post-burn recovery have resulted in an abundant recruitment of *Hesperocyparis macnabiana* seedlings and saplings.

PHOTOINTERPRETATION SIGNATURE: *Hesperocyparis macnabiana* signatures may vary. Color is typically brownish olive-green. Dense stands have uniform height of short tree, with a fairly smooth texture. Sometime have a very bright green signature. Color infrared imagery shows magenta rather than red of the mixing shrubs. *Hesperocyparis sargentii* appears as a tall narrow form more typical of conifers.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

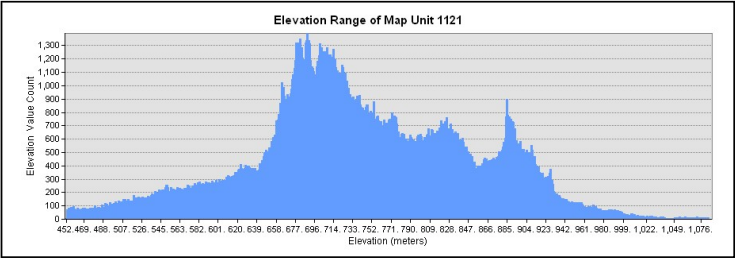
- *Arctostaphylos viscida* Alliance (2113) – In post-burn recovery situations the two species mix, and when the *Hesperocyparis macnabiana* is short, it can be slightly emergent to the shrub layer, and very difficult to differentiate on imagery.
- *Quercus durata* Alliance (2125) – In post-burn recovery situations the two species mix, and when the *Hesperocyparis macnabiana* is short, it can be slightly emergent to the shrub layer, and very difficult to differentiate on imagery.

Hesperocyparis (sargentii, macnabiana) Alliance (1121)



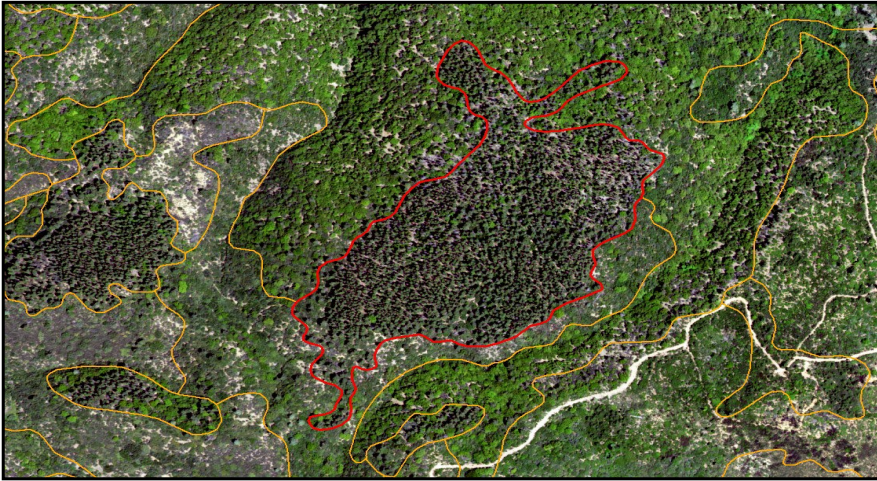
DISTRIBUTION: Stands of *Hesperocyparis (sargentii, macnabiana)* Alliance are very common and extensive in the eastern half and north end of the study area, while no stands are mapped in the southern third. *Hesperocyparis macnabiana* occupies gentler slopes on higher elevations ranging from 1500 to 3500 feet. *Hesperocyparis sargentii* is found at the north edge of the study area in deep canyons.

Hesperocyparis (sargentii, macnabiana) Alliance (1121)



***Pinus attenuata* Alliance (1122)**

Knobcone Pine Alliance



Aerial view of dense stand of dark-colored *Pinus attenuata* on a fairly gentle slope. Note the consistent stippling of the individual tree crowns.



Ground view of a dense stand of *Pinus attenuata* in the mid view of the photo on a fairly flat slope.

***Pinus attenuata* Alliance (1122)**

DESCRIPTION: *Pinus attenuata* dominates or co-dominates with one or more *Quercus* spp. in the tree overstory or is strongly regenerating after fire. Shrubs present may include *Arctostaphylos viscida*, *Ceanothus integerrimus*, *Pickeringia montana*, and/or *Quercus berberidifolia*.

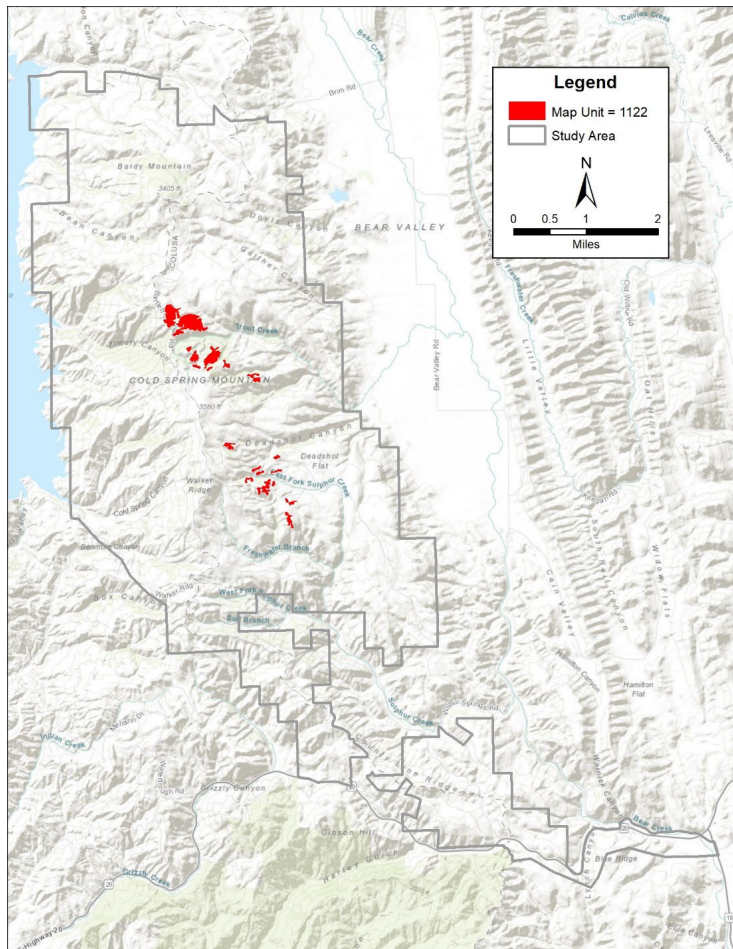
Pinus attenuata can occur in sparse to dense stands at the higher elevations within the study area both on and off serpentine. *P. attenuata* regenerates after a fire with many seedlings.

PHOTOINTERPRETATION SIGNATURE: *Pinus attenuata* is characterized by very narrow crowns. The usually dense cover forms a stipple-like texture, which is unique to this type, and represents the tall narrow individual crowns, casting large shadows. Image signature generally yields a dark gray-green color, which is distinct from other pine species in the study area.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

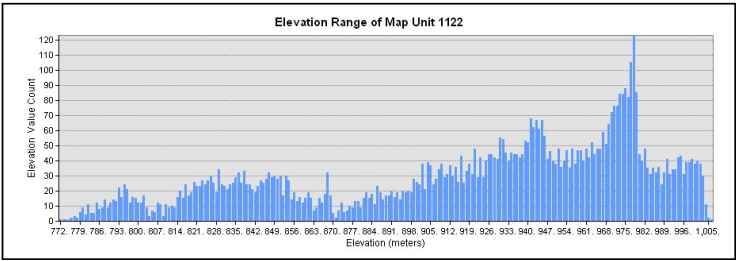
- None

***Pinus attenuata* Alliance (1122)**



DISTRIBUTION: *Pinus attenuata* Alliance forms small to moderately sized stands and is fairly restricted, mainly at the higher elevations at the center of the study area. It is mapped above 2500 feet on fairly gentle slopes.

***Pinus attenuata* Alliance (1122)**



***Pinus sabiniana* Alliance (1123)**

Foothill Pine Alliance



Aerial view of an open to intermittent cover stand of *Pinus sabiniana*. Note the shadows indicating relative height compared to surrounding vegetation.



Ground view of an open stand of the tall conifer *Pinus sabiniana* on the upper slope of a draw. Note the large soft slightly grayish green crowns.

***Pinus sabiniana* Alliance (1123)**

DESCRIPTION: *Pinus sabiniana* is strongly dominant or the sole dominant tree in the overstory with mature trees generally >10% absolute cover, shrubs may exceed pine in cover. Where *Pinus sabiniana* co-dominates with *Umbellularia californica* on serpentine the stand is considered as the *Pinus sabiniana* Alliance. Associated shrubs may include *Rhamnus ilicifolia*, *Ceanothus cuneatus*, *Quercus berberidifolia*, *Heteromeles arbutifolia*, *Toxicodendron diversilobum*, and/or *Quercus durata*.

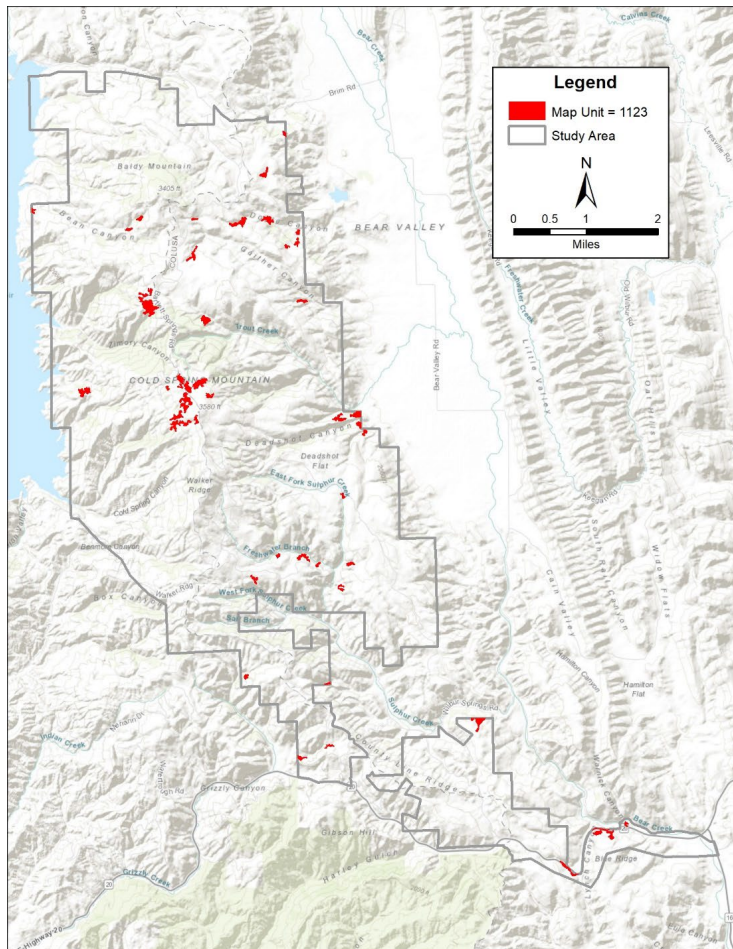
Pinus sabiniana tends to form small stands, but is common as a component of other types. It can occur on or off serpentine.

PHOTOINTERPRETATION SIGNATURE: *Pinus sabiniana* is easily recognizable using the base NAIP imagery. The species yields a gray-blue color with an irregularly shaped medium to large-sized tall crown.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

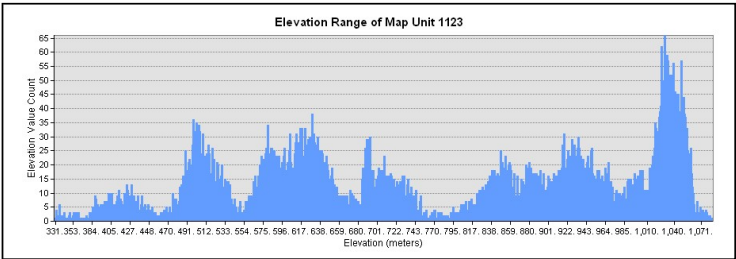
- None

***Pinus sabiniana* Alliance (1123)**



DISTRIBUTION: *Pinus sabiniana* Alliance is mapped as small stands scattered throughout the study area. Occurrences range from 1000 to 3500 feet in elevation on variable slopes, including gentle slopes and in draws.

Pinus sabiniana Alliance (1123)



***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance
(1311)**

Fremont's Cottonwood – Velvet Ash – Black Willow Alliance



Aerial view of very open stand of bright green *Populus fremontii* in a meadow at Eaton Springs.



Ground view of a tall *Populus fremontii* stand over shorter riparian shrubs at Eaton Springs.

***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance (1311)**

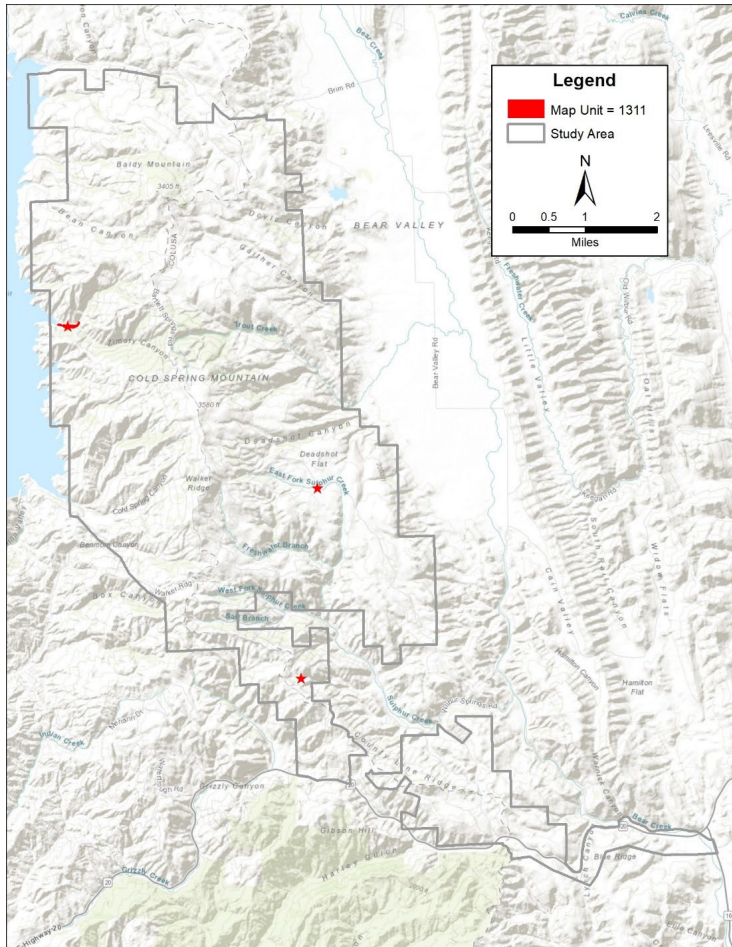
DESCRIPTION: *Populus fremontii* dominates the overstory with sometimes as little as 5% absolute cover, usually as a dominant or co-dominant in the overstory with willows or other riparian tree species. *Populus* is rare in the study area.

PHOTOINTERPRETATION SIGNATURE: Mature *Populus fremontii* trees have a bright yellow-green color; and occur in an open meadow setting in the study area. Multiple crowning is also noted in individuals. *P. fremontii* also prefers deep soil and an enhanced flowing water supply such as below stream confluences, springs, and seeps.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

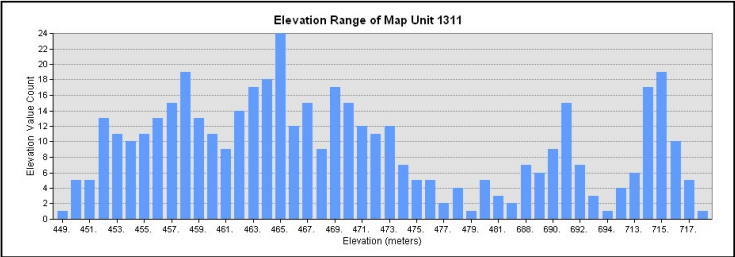
- *Salix laevigata* – *Salix gooddingii* Alliance (1312) - As *Salix laevigata*, signatures are very similar. That of *Salix* is slightly brighter than *Populus*. Differentiation based on field information.

***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance (1311)**



DISTRIBUTION: Only three polygons of *Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance were mapped as *Populus fremontii*, at Eaton Springs, at the mouth of Zimory Canyon, and at a small dammed pond in the southern portion of the study area on a tributary of Sulphur Creek.

***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance (1311)**



***Quercus chrysolepis* (tree) Alliance (1112)**

Canyon Live Oak Alliance



Aerial view of an open to intermittent cover stand of *Quercus chrysolepis* on a gentle northerly slope. Note the bright green signature typical of *Q. chrysolepis*.



Ground view of a *Quercus chrysolepis* stand. Note its typical dense rounded crown.

***Quercus chrysolepis* (tree) Alliance (1112)**

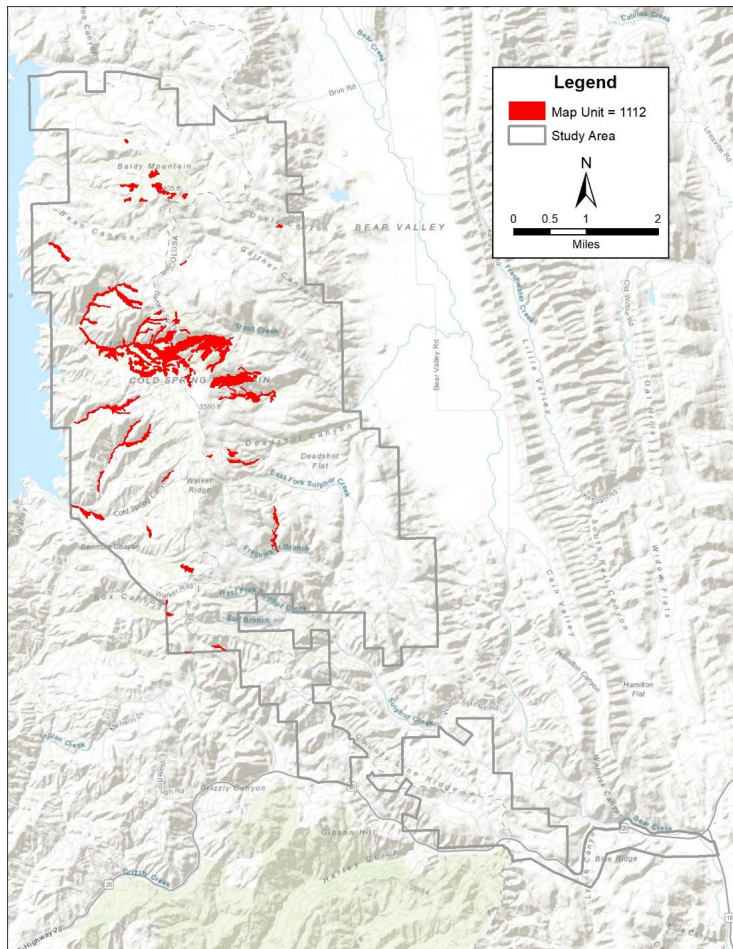
DESCRIPTION: *Quercus chrysolepis* is strongly dominant to dominant as a tree on north-facing slopes and steep draws with *Umbellularia californica* or emergent *Pinus sabiniana* at low cover. If *Q. chrysolepis* is co-dominant with *Pinus attenuata* the stand is considered as the *Pinus attenuata* Alliance. If *Umbellularia californica* is co-dominant with *Quercus chrysolepis* then the stand is considered as *Quercus chrysolepis* (tree) Alliance. *Quercus wislizeni* can be present with high cover in the shrub layer. If *Q. chrysolepis* and *Q. wislizeni* are co-dominant as shrubs, the stand is considered as the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance. *Q. chrysolepis* typically does not occur on serpentine, and is found in the study area at higher elevations or on well protected canyons and ravine bottoms. It can occur with mixed oaks at higher elevations. *Arctostaphylos viscida*, *Heteromeles arbutifolia*, *Toxicodendron diversilobum*, and/or shrub *Quercus wislizeni* may occur in the understory.

PHOTOINTERPRETATION SIGNATURE: On the base imagery *Quercus chrysolepis* has a bright green signature and is seen as large trees with rounded crowns in mesic settings. Stands are typically dense, but can be open over dense shrubs.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

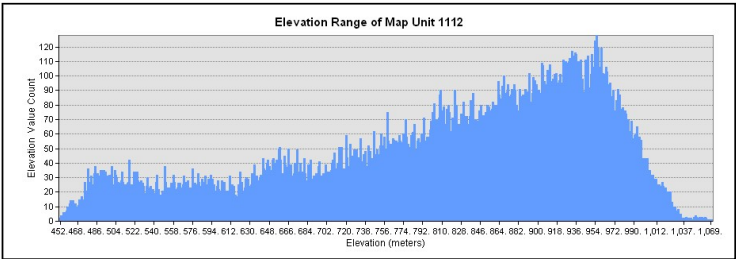
- *Quercus berberidifolia* Alliance (2124) – Both alliances may occur in similar settings. The signature color of *Q. berberidifolia* is not as bright green as that of *Q. chrysolepis*, and the stature is shorter, being a shrub. *Q. berberidifolia* also tends to occur at lower elevations.
- *Quercus wislizeni* – *Quercus chrysolepis* (shrub) (2126) – *Quercus chrysolepis* and/or *Quercus wislizeni* dominant or co-dominant as the shrub form is mapped as this alliance. *Quercus wislizeni* signature color is not as bright green as *Q. chrysolepis*.
- *Quercus wislizeni* – *Quercus parvula* (tree) (1114) – The signature color of *Quercus wislizeni* is not as bright green as that of *Quercus chrysolepis*, and the crown is not as rounded. *Quercus wislizeni* can occur in similar but slightly drier settings than *Q. chrysolepis*.
- *Umbellularia californica* Alliance (1115) – Both alliances have similar settings and signature color and so makes photointerpretation challenging. *Q. chrysolepis* has a rounded crown, whereas *U. californica* can be irregular in shape and more upright.

***Quercus chrysolepis* (tree) Alliance (1112)**



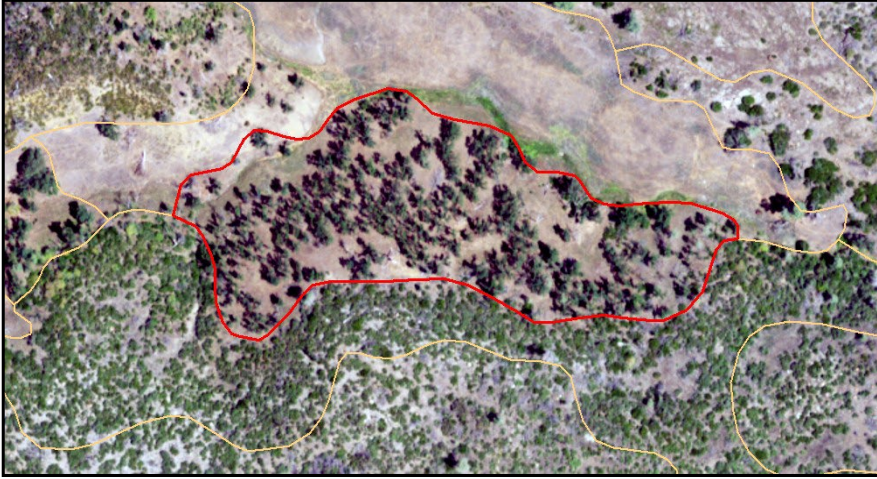
DISTRIBUTION: The *Quercus chrysolepis* (tree) Alliance is mapped throughout the study area with the exception of the southern third, but is concentrated more in the central higher elevation portion of the area. It favors steep protected northerly mesic aspects, and is mapped at elevations ranging from 1500 to 3500 feet.

***Quercus chrysolepis* (tree) Alliance (1112)**



***Quercus douglasii* Alliance (1113)**

Blue Oak Alliance



Aerial view of an open to intermittent cover stand of *Quercus douglasii* over grassland as typical understory.



Ground view of a *Quercus douglasii* stand over grassland, on a gentle slope, with *Adenostoma fasciculatum* in the foreground and background.

***Quercus douglasii* Alliance (1113)**

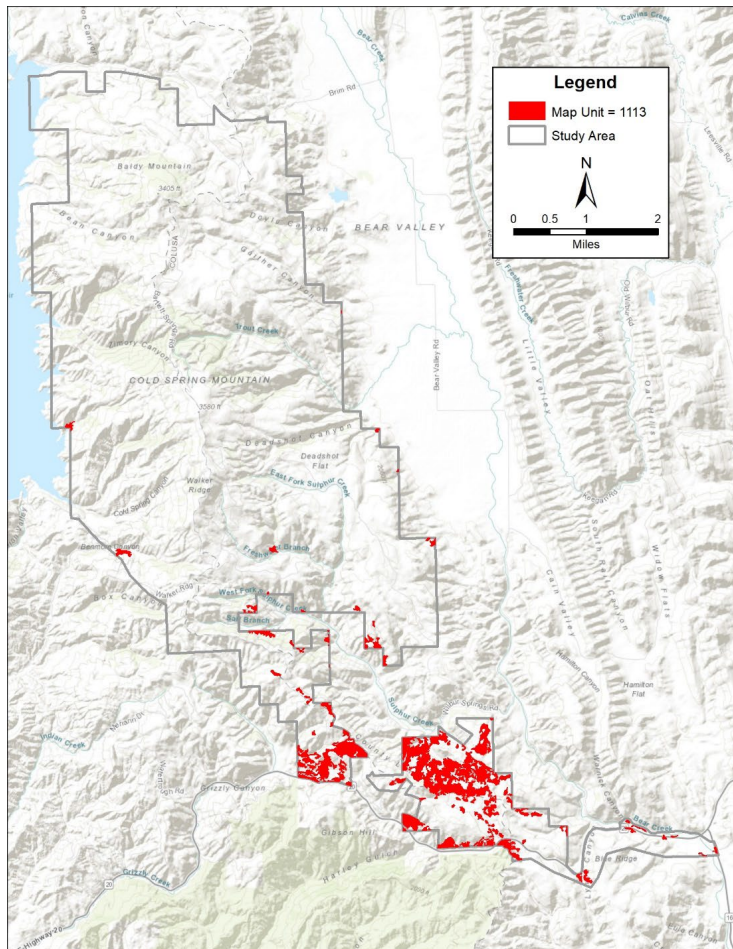
DESCRIPTION: *Quercus douglasii* dominates in the tree overstory and *Pinus sabiniana* may be present. Where *Pinus sabiniana* is co-dominant with *Quercus douglasii* the stand is considered as the *Quercus douglasii* Alliance. Where *Aesculus californica* co-dominates with *Quercus douglasii*, the stand is considered as *Quercus douglasii* Alliance. Shrubs may include *Arctostaphylos* spp., *Cercocarpus betuloides* (*C. montanus*), *Heteromeles arbutifolia*, and *Ceanothus cuneatus*. Stands may also have a dense understory herbaceous layer, with a mixture of native and non-native forbs and grasses. *Quercus douglasii* does not occur on serpentine substrate, and is found at lower elevations of the study area. Some stands are drought-stressed and/or affected by fire and have dieback or death.

PHOTOINTERPRETATION SIGNATURE: *Quercus douglasii* has a characteristic blue-gray signature with a diffuse, irregularly shaped crown varying considerably in size. Stands in more xeric environments trend more to the blue-gray color while stands in mesic settings have a more blue-green signature. Stands are often in grassy woodland settings.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

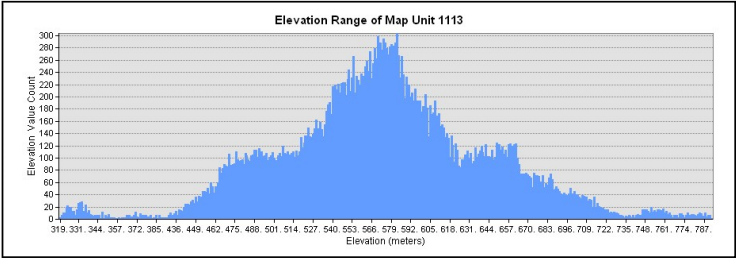
- *Cercocarpus montanus* Alliance (2122) – *Cercocarpus montanus* has shorter stature than *Quercus douglasii*, and has a brownish-green color. Where the two mix, *Q. douglasii*, being a tree must be greater than 8-10% cover to be *Quercus douglasii* Alliance.
- *Pinus sabiniana* Alliance (1123) – *Pinus sabiniana* and *Quercus douglasii* do mix in stands. On the imagery *P. sabiniana* will be taller in stature with a much narrower crown and a bluer color. Co-dominance of the two tree species goes to the *Quercus douglasii* Alliance.

***Quercus douglasii* Alliance (1113)**



DISTRIBUTION: The *Quercus douglasii* Alliance is mapped primarily at lower elevations below 2500 feet. Most of the sites are mapped in the southern third of the study area on gentle to steep variable slopes.

***Quercus douglasii* Alliance (1113)**



***Quercus wislizeni* – *Quercus parvula* (tree) Alliance (1114)**

Interior Live Oak – Santa Cruz Island Oak Alliance



Aerial view of an intermittent cover stand of medium to dark green *Quercus wislizeni* in the draws of a canyon. *Q. wislizeni* stand is surrounded by shorter chaparral.



Ground view of a *Quercus wislizeni* in tree form in several draws and the bottom of a canyon, surrounded by shorter stands of *Adenostoma fasciculatum* on convexities.

***Quercus wislizeni* – *Quercus parvula* (tree) Alliance (1114)**

DESCRIPTION: *Quercus wislizeni* dominates in the tree canopy with scattered shrubs including *Frangula californica* ssp. *californica* and *Toxicodendron diversilobum*. If *Quercus wislizeni* is co-dominant with *Quercus chrysolepis*, then the stand is considered as the *Quercus chrysolepis* Alliance. Where *Quercus wislizeni* co-dominates with *Umbellularia californica*, then the stand is considered as the *Umbellularia californica* Alliance. If *Q. wislizeni* has a shrubby habit or is regenerating and intermixing with a variety of other shrub species, then the stand is considered as the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance.

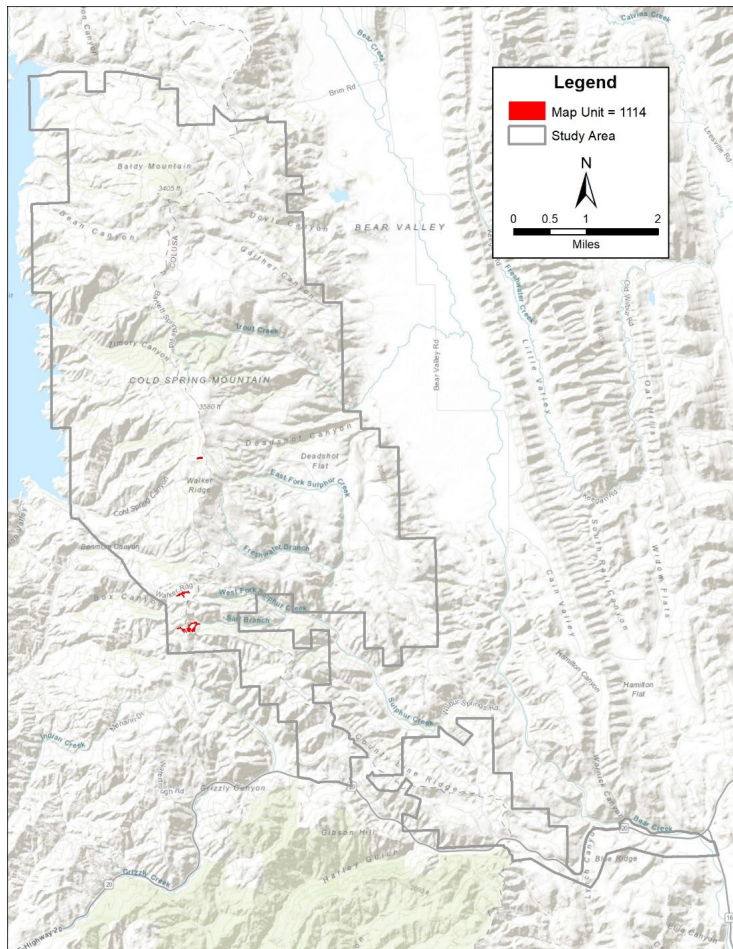
Quercus wislizeni as tree form is rare in the study area, does not occur on serpentine, and occurs at the mid to higher elevations, where it replaces *Quercus berberidifolia* on protected north-facing lower slopes. *Q. wislizeni* is less mesic than *Quercus chrysolepis*.

PHOTOINTERPRETATION SIGNATURE: Stands range from dark to medium green depending on leaf age, with irregular to rounded shaped crowns, occurring in dense mesic draws within the study area. Stands are mapped based on field data.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

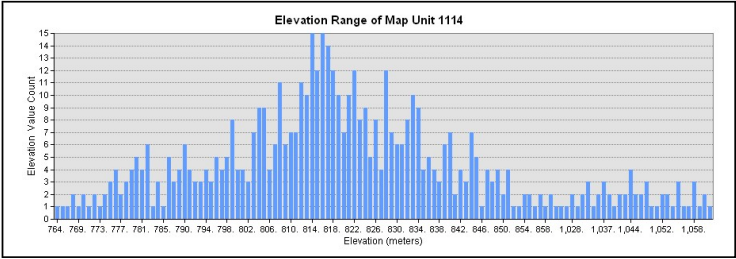
- *Quercus berberidifolia* Alliance (2124) – *Quercus berberidifolia* has similar signature, but is shorter in stature than *Quercus wislizeni*.
- *Quercus chrysolepis* (tree) Alliance (1112) – *Quercus chrysolepis* has a brighter green signature and typically has a very rounded crown compared to *Quercus wislizeni*.
- *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance (2126) – *Quercus wislizeni* as a shrub occurs in mixed mesic chaparral. This is the shrub form of *Quercus wislizeni* and has a similar photo signature but is shorter in stature.

***Quercus wislizeni* – *Quercus parvula* (tree) Alliance (1114)**



DISTRIBUTION: The *Quercus wislizeni* – *Quercus parvula* (tree) Alliance was mapped only on four sites and is based on field information, at 2500 to 3500 feet in elevation, mainly in mesic draws.

***Quercus wislizeni* – *Quercus parvula* (tree) Alliance (1114)**



***Salix gooddingii* – *Salix laevigata* Alliance (1312)**

Black Willow – Red Willow Alliance



Aerial view of a stand of *Salix laevigata* at the bottom of a well-watered canyon. Note the bright green signature color of the *Salix*.



Ground view of a light green stand of *Salix laevigata* at the bottom of a canyon. Note the dark green *Quercus chrysolepis* on the slope to the left.

***Salix gooddingii* – *Salix laevigata* Alliance (1312)**

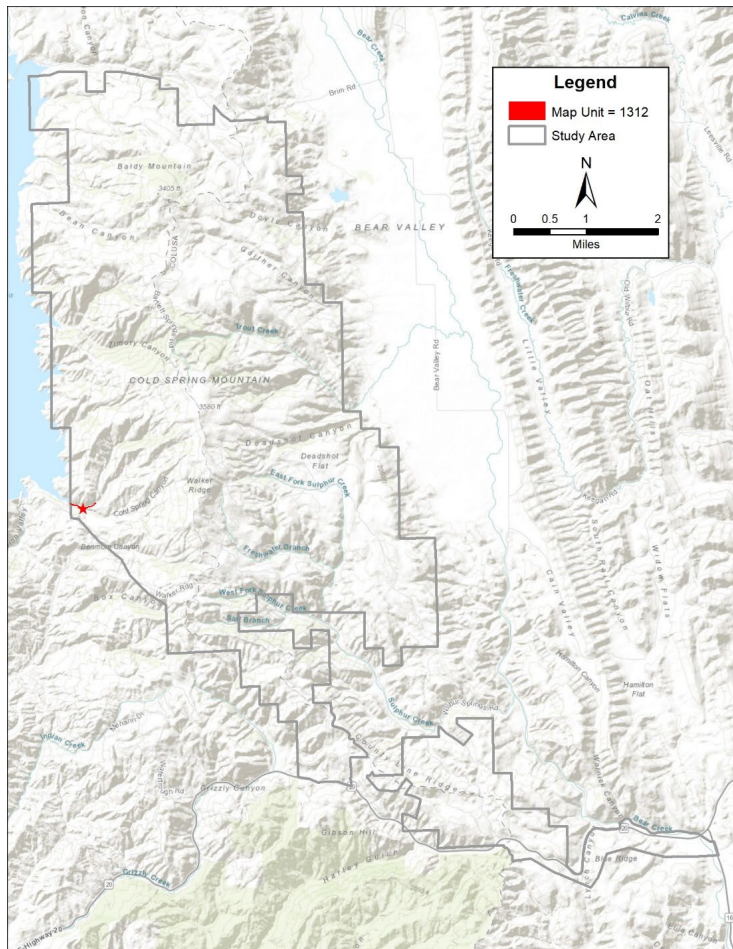
DESCRIPTION: *Salix laevigata* dominates along streams, rivers, and pond edges. Associated trees and shrubs include *Populus fremontii*, *Rubus*, *Salix*, and others. Where *Populus fremontii* is co-dominant with *Salix laevigata* or *Salix gooddingii*, then the stand is considered as the *Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance. The *Salix gooddingii* – *Salix laevigata* Alliance is rare within the study area.

PHOTOINTERPRETATION SIGNATURE: Only one polygon of *Salix laevigata* was mapped based on field data, and was located in a riparian draw. The base imagery shows *Salix laevigata* as a bright green signature

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

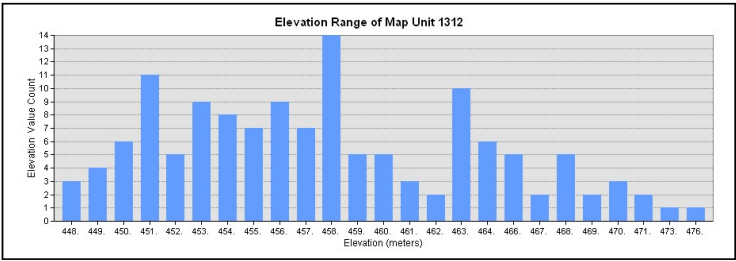
- *Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance (1311) – The *Populus fremontii* signature is very similar to that of *Salix laevigata*, with *Salix* slightly brighter than *Populus*. Differentiation based on field information.

***Salix gooddingii* – *Salix laevigata* Alliance (1312)**



DISTRIBUTION: Only one polygon of *Salix gooddingii* – *Salix laevigata* Alliance was mapped in the study area, based on field data, at the mouth of Cold Spring Canyon at about 1500 to 1550 feet.

***Salix gooddingii* – *Salix laevigata* Alliance (1312)**



***Umbellularia californica* Alliance (1115)**

California Bay Alliance



Aerial view of an open to intermittent cover stand of emergent *Umbellularia californica* over mesic chaparral shrubs at the bottom of a canyon. Note the bright green color of the *Umbellularia* signature.



Ground view of an *Umbellularia californica* stand at the bottom of a canyon. Note the brighter green taller *Umbellularia* trees over the tall shrubs.

***Umbellularia californica* Alliance (1115)**

DESCRIPTION: *Umbellularia californica* is dominant in the tree layer of mesic serpentine drainages with *Quercus wislizeni*, *Quercus berberidifolia*, *Heteromeles arbutifolia*, *Calycanthus occidentalis*, *Frangula californica*, and/or *Salix breweri* in the shrub layer. If *U. californica* is co-dominant with *Pinus sabiniana* in a serpentine setting, it is considered as the *Pinus sabiniana* Alliance. If *Quercus chrysolepis* co-dominates with *Umbellularia californica*, then the stand is considered as the *Quercus chrysolepis* Alliance. Where *Quercus wislizeni* co-dominates with *Umbellularia californica*, then the stand is considered as the *Umbellularia californica* Alliance.

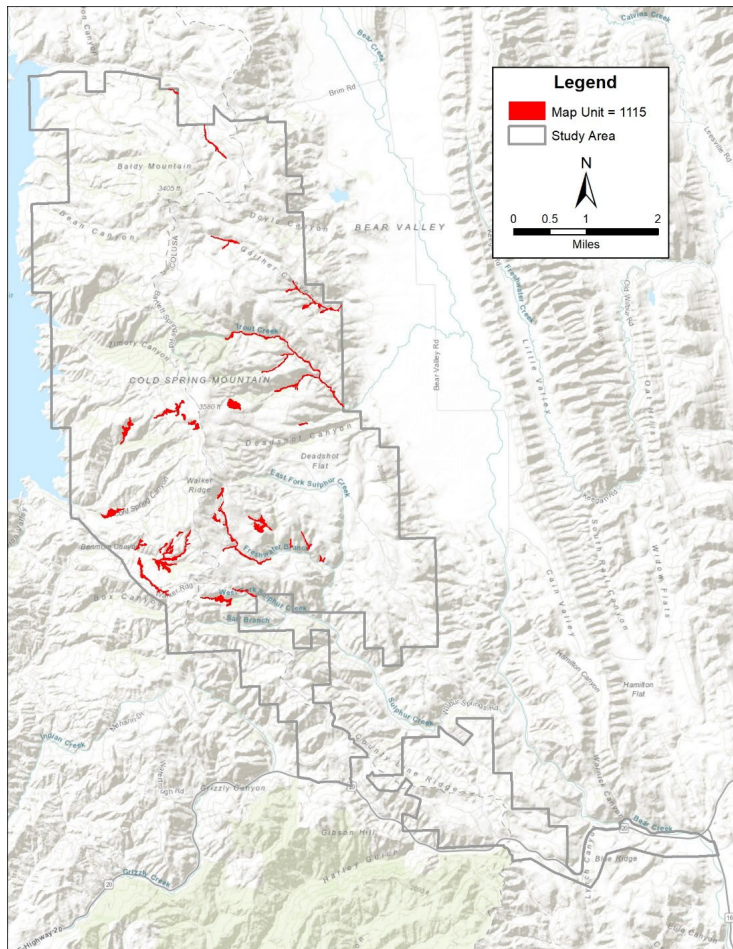
Umbellularia californica can occur on and off serpentine at mid to higher elevations within the study area, and can occur with mixed mesic chaparral on north-facing lower slopes and bottoms. Associated plants may include *Quercus berberidifolia*, *Heteromeles arbutifolia*, *Fraxinus dipetala*, *Ceanothus cuneatus*, *Cercocarpus montanus*, *Quercus wislizeni* tree and shrub, *Quercus chrysolepis*, *Salix breweri*, and *Frangula californica*.

PHOTOINTERPRETATION SIGNATURE: Narrow to irregularly shaped billowy tall crowns generally consistent throughout the stand characterize this type; often with a bright green signature, and located in mesic settings.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

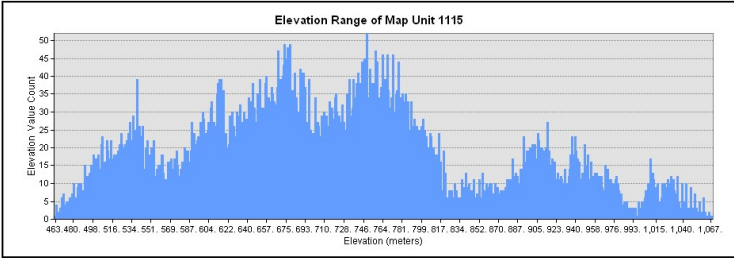
- *Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance (2123) – As *Heteromeles arbutifolia*, the signature is medium to bright green, especially when younger, appearing similar to that of *Umbellularia*. *Heteromeles* is shorter in stature, while *Umbellularia* will be tall and narrow with shadows.
- *Quercus chrysolepis* (tree) Alliance (1112) – *Quercus chrysolepis* has very similar bright green color but the crown is rounder and slightly shorter. *Umbellularia* crowns are more irregular in shape, and billowy.
- *Quercus wislizeni* – *Quercus parvula* Alliance (tree) Alliance (1114) – *Quercus wislizeni* signature is darker green than that of *Umbellularia*, and is shorter. *Quercus wislizeni* was mapped based on field data.

***Umbellularia californica* Alliance (1115)**



DISTRIBUTION: The *Umbellularia californica* Alliance is mapped scattered over the northern two-thirds of the study area. It is mapped primarily along draws and drainages, from 1500 to 3500 feet.

Umbellularia californica Alliance (1115)



Shrubs

MU ¼ acre for special, wetland, riparian, rock, land use

Exotic

2111 = *Adenostoma fasciculatum* Alliance

2112 = *Arctostaphylos (canescens, manzanita, stanfordiana)* Alliance

2113 = *Arctostaphylos viscida* Alliance

2114 = *Ceanothus cuneatus* Alliance

2121 = *Ceanothus (oliganthus, tomentosus)* Alliance

2122 = *Cercocarpus montanus* Alliance

3614 = *Cornus sericea* Alliance, **Riparian**

3111 = *Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance, **Riparian**

2211 = *Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance

2123 = *Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance

2124 = *Quercus berberidifolia* Alliance

2125 = *Quercus durata* Alliance

2126 = *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance

3511 = *Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance, **Riparian**

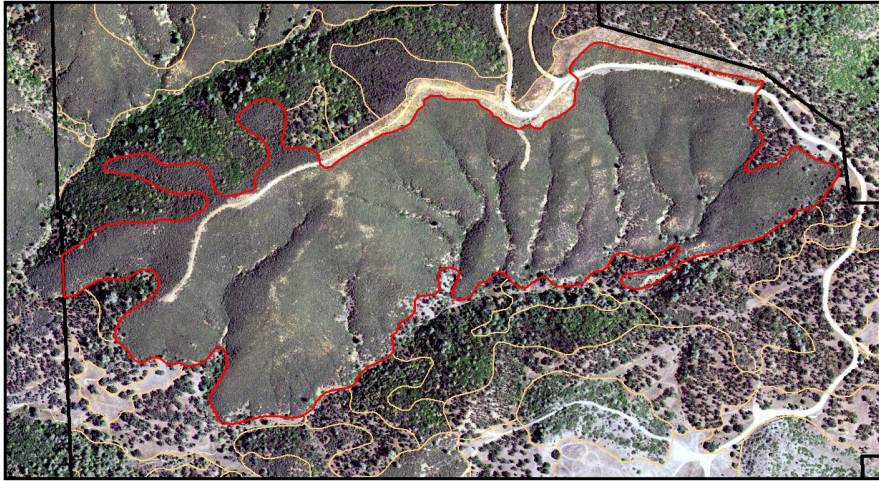
3613 = *Salix lasiolepis* Alliance, **Riparian**

1411 = *Tamarix* spp. Semi-natural Alliance; **Riparian**; Exotic

Formatted: English (United States)

***Adenostoma fasciculatum* Alliance (2111)**

Chamise Alliance



Aerial view of large dense uniform stand of dark dull green *Adenostoma fasciculatum* primarily on south-facing slopes.



Ground view of a stand of medium to olive-green *Adenostoma fasciculatum* on a gentle slope.

***Adenostoma fasciculatum* Alliance (2111)**

DESCRIPTION: *Adenostoma fasciculatum* is dominant in the overstory with low cover of other chaparral species such as *Ceanothus cuneatus*. *A. fasciculatum* may be co-dominant with disturbance related species such as *Eriodictyon californicum* and *Acmispon glaber* (*Lotus scoparius*). If *A. fasciculatum* co-dominates with *Arctostaphylos viscida*, *Ceanothus cuneatus*, *Quercus berberidifolia*, or shrub *Quercus* spp., the stand is considered as *Arctostaphylos viscida* Alliance, *Ceanothus cuneatus* Alliance, *Quercus berberidifolia* Alliance, and *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance respectively. Or if another *Arctostaphylos* sp. is present, then *A. fasciculatum* is >60% relative cover.

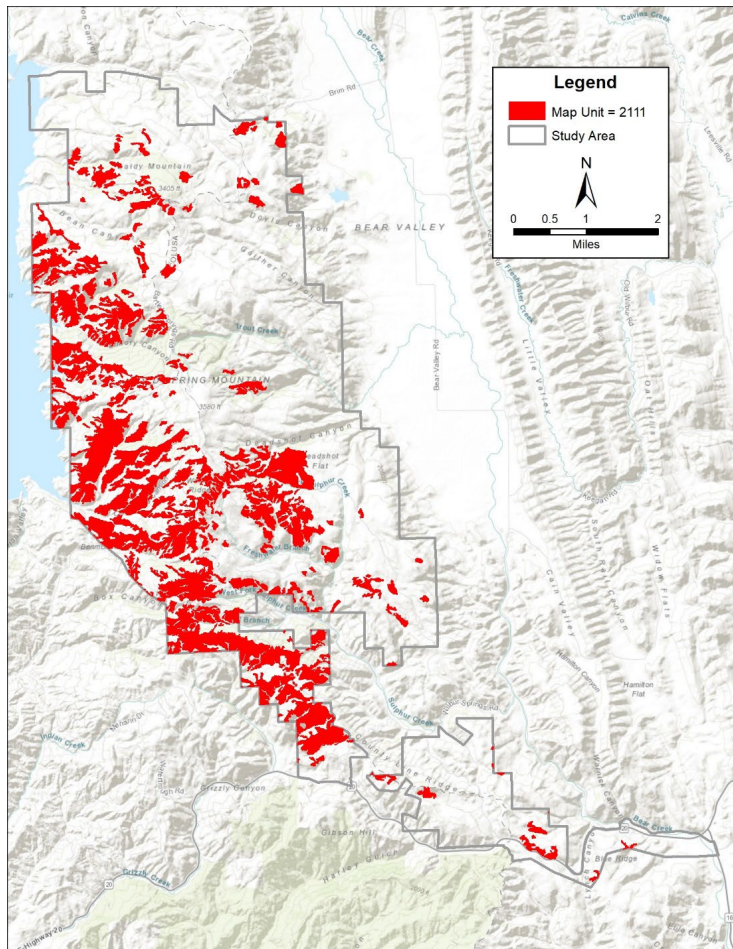
Adenostoma fasciculatum favors south-facing exposed xeric slopes. This alliance is very common and extensive, and occurs at all elevations within the study area. It is more prevalent off serpentine. It is more commonly occurring with *Arctostaphylos viscida* or *Ceanothus cuneatus*.

PHOTOINTERPRETATION SIGNATURE: *Adenostoma fasciculatum* tends to form mostly homogenous stands where signature variability fluctuates minimally throughout the stand. Stand signature has a dull green color and appear to be of uniform height. Stands are typically dense, except in post-burn situations. Color infrared imagery shows dull mauve to dark brownish-purple color tone.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

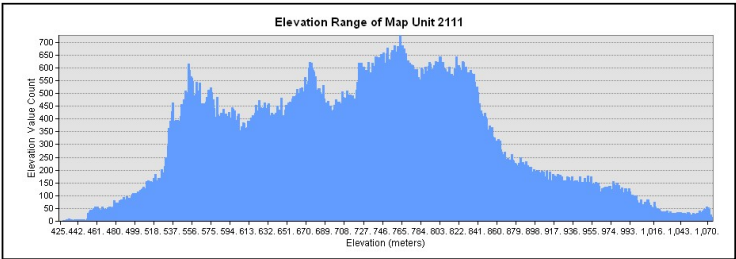
- *Arctostaphylos* (*canescens*, *manzanita*, *stanfordiana*) Alliance (2112) – *Arctostaphylos manzanita* can mix with *Adenostoma*. *A. manzanita* is much taller and greener, with distinct round crowns. The one *A. manzanita* stand was mapped based on field data.
- *Arctostaphylos viscida* Alliance (2113) – *A. viscida* can mix with *Adenostoma*, and has more texture. Color infrared imagery shows the *Arctostaphylos* with a redder color. Co-dominance goes to the *Arctostaphylos viscida* Alliance.
- *Ceanothus cuneatus* Alliance (2114) – On the natural color base imagery *Ceanothus cuneatus* has a gray color with texture. On the color infrared imagery it appears red, whereas *Adenostoma* is dull red to brownish purple. The *Ceanothus* typically mixes with *Adenostoma* rather than forming pure stands. Mixed stands tend to have more texture than pure stands of *Adenostoma*. White signature on Google Earth imagery of flowering *C. cuneatus* assists in assessing its presence. Co-dominance goes to the *Ceanothus cuneatus* Alliance.
- *Quercus durata* Alliance (2125) – *Quercus durata* occurs on serpentine strata, whereas *Adenostoma* for the most part does not, but may in some cases. *Q. durata* is more open than *Adenostoma* and has a mottled signature.

***Adenostoma fasciculatum* Alliance (2111)**



DISTRIBUTION: The *Adenostoma fasciculatum* Alliance is ubiquitous throughout the study area, primarily on the western regional slope. It favors southerly slopes, and is mapped at elevations ranging from 1500 to 3500 feet.

***Adenostoma fasciculatum* Alliance (2111)**



***Arctostaphylos* (*canescens*, *manzanita*, *stanfordiana*) Alliance (2112)**

Hoary manzanita, Common manzanita, Stanford's manzanita Alliance



Aerial view of an open well-spaced *Arctostaphylos manzanita* over *Adenostoma fasciculatum*. Note the well-formed smooth rounded dark green crowns with shadows indicating emergence over the *Adenostoma*.



Ground view of a bright green *Arctostaphylos manzanita* over gray and green homogeneous *Adenostoma fasciculatum*.

Arctostaphylos (canescens, manzanita, stanfordiana) Alliance (2112)

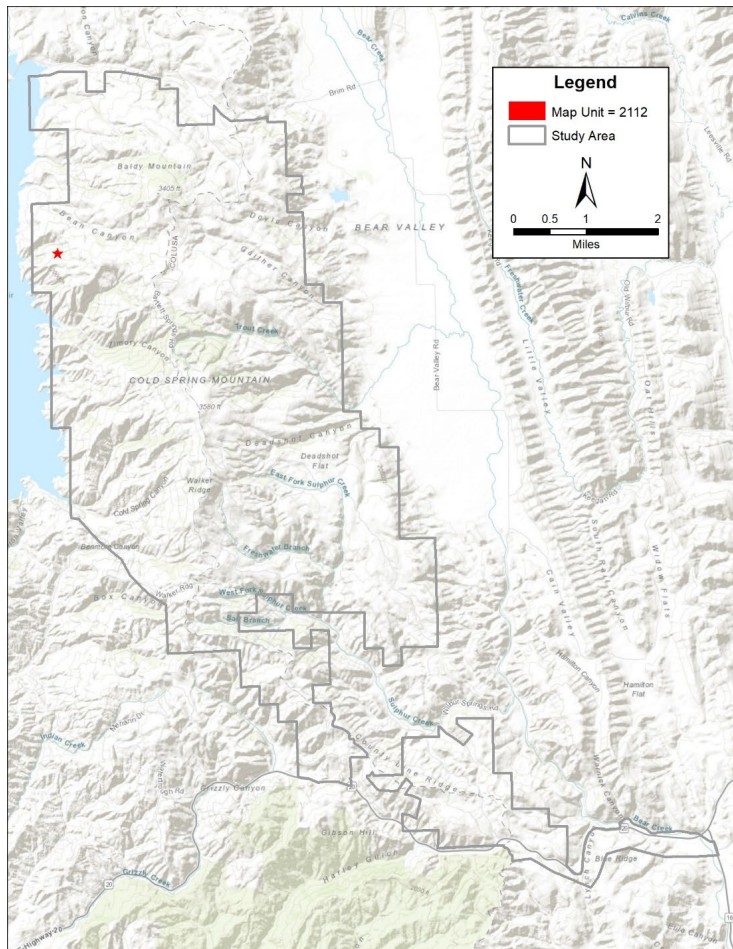
DESCRIPTION: *Arctostaphylos manzanita* is dominant or co-dominant with *Eriodictyon californicum*. If *Arctostaphylos manzanita* co-dominates with *Adenostoma fasciculatum* then the stand is considered as the *Arctostaphylos (canescens, manzanita, stanfordiana)* Alliance. This one alliance is recognized for multiple manzanita vegetation types, with associations specific to each species. This alliance is rare within the study area and does not occur on serpentine. *A. manzanita* was mapped as one polygon from field data.

PHOTOINTERPRETATION SIGNATURE: *Arctostaphylos manzanita* has a distinct round dull olive-green crown, and is much taller than *Adenostoma fasciculatum*. On the color infrared imagery, it has a bright red color.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

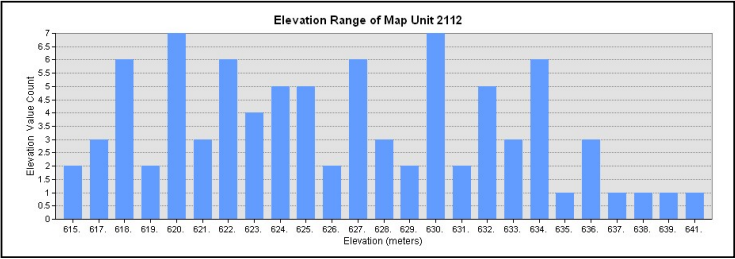
- *Adenostoma fasciculatum* Alliance (2111) – *A. manzanita* is taller and forms individual rounded crowns compared to the dense compact homogeneous *Adenostoma* with irregular crowns. Co-dominance goes to *Arctostaphylos*.
- *Arctostaphylos viscida* Alliance (2113) – *A. viscida* is grayer in color with smaller crowns.

Arctostaphylos (canescens, manzanita, stanfordiana) Alliance (2112)



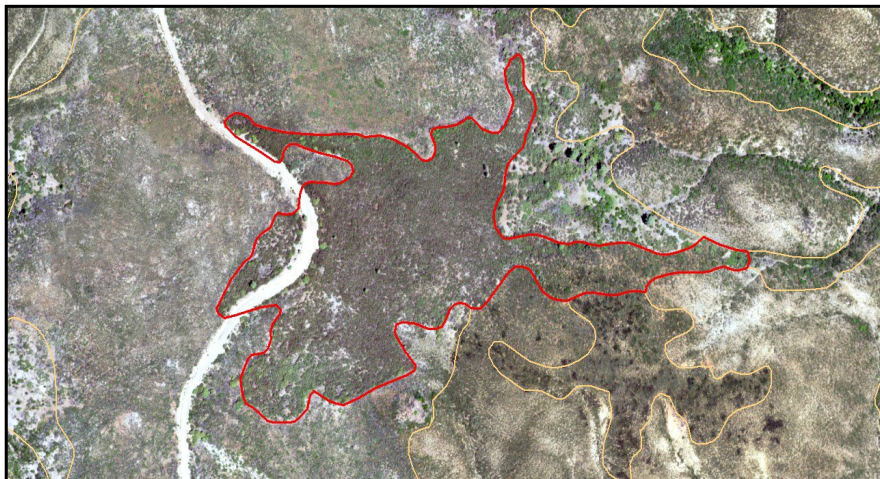
DISTRIBUTION: Only one polygon of *Arctostaphylos (canescens, manzanita, stanfordiana)* Alliance was mapped as *A. manzanita*, based on field data, at an elevation of 2050 feet.

Arctostaphylos (canescens, manzanita, stanfordiana) Alliance (2112)



***Arctostaphylos viscida* Alliance (2113)**

Whiteleaf manzanita Alliance



Aerial view of a fairly homogeneous stand of dark olive-green *Arctostaphylos viscida* on a gentle slope.



Ground view of a dense stand of *Arctostaphylos viscida* in the foreground. Leaves appear bright green with reflections from the sun.

***Arctostaphylos viscida* Alliance (2113)**

DESCRIPTION: *Arctostaphylos viscida* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*. Other shrubs may be present to sub-dominant including *Ceanothus cuneatus*, *C. jepsonii*, *Heteromeles arbutifolia*, and *Q. wislizeni*. If *Arctostaphylos viscida* co-dominates with *Quercus durata* and/or *Ceanothus jepsonii* (on serpentine), then the stand is considered as the *Quercus durata* Alliance.

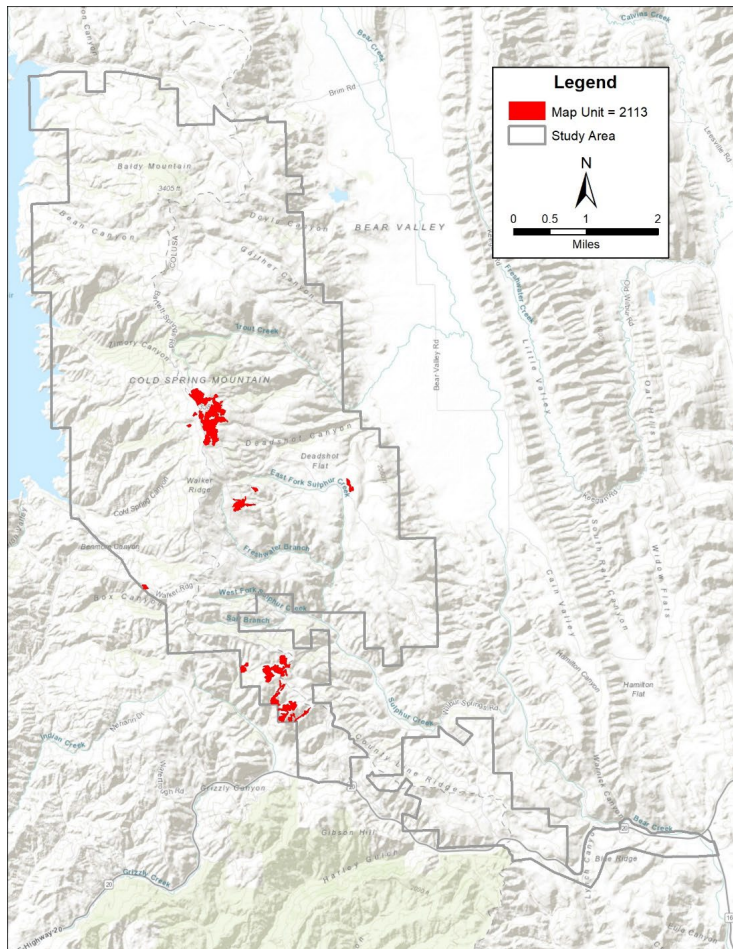
Arctostaphylos viscida can occur on or off serpentine substrate, and is found at the mid to higher elevations in the study area. Stands of this alliance are strongly dominant on serpentine, otherwise here they are mixed with *Quercus durata* and are therefore called as the *Quercus durata* Alliance.

PHOTOINTERPRETATION SIGNATURE: *Arctostaphylos viscida*, where it dominates the stand in dense cover tends to show a lot of texture on the aerial imagery and has a gray-green to a brownish green color and. Crown edges are rounded to irregular. Stands tend to be dense especially when mixed with *Adenostoma fasciculatum*. Color infrared signature is redder than the dull *Adenostoma* signature.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

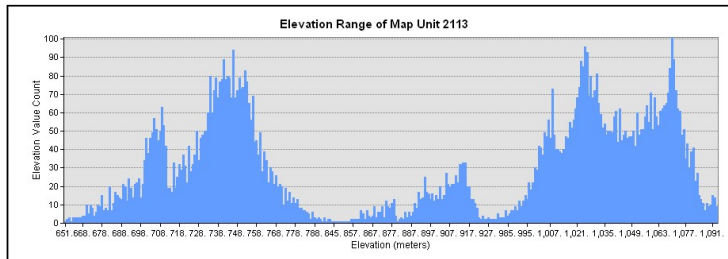
- *Adenostoma fasciculatum* Alliance (2111) – *Adenostoma* is slightly shorter than *A. viscida*, with greener color and less texture. On color infrared *Adenostoma* has a duller red to dark brownish purple color.
- *Arctostaphylos (canescens, manzanita, stanfordiana)* Alliance (2112) – *A. manzanita* was mapped as one polygon from field data. It appears as well-defined edged rounded dull olive-green crowns emergent above the *Adenostoma*.
- *Ceanothus cuneatus* Alliance (2114) – *Ceanothus cuneatus* appears as a grayer color on the base imagery compared to greener *A. viscida*. Google Earth imagery can show the white flowers of *C. cuneatus*. Both species do mix with *Adenostoma fasciculatum*.
- *Hesperocyparis (sargentii, macnabiana)* Alliance (1121) – *Hesperocyparis macnabiana* is a short tree that can be emergent over *A. viscida* on serpentine substrate. *H. macnabiana* can have a brownish olive-green to bright green signature, but will have some emergence above *A. viscida*. *Hesperocyparis macnabiana* must be less than 8-10% cover over *A. viscida* be mapped as the *Arctostaphylos viscida* Alliance.
- *Quercus berberidifolia* Alliance (2124) – *Q. berberidifolia* is a brighter green compared to *A. viscida* gray-green, and is often more mesic. On the color infrared imagery *Q. berberidifolia* is brighter red, both have texture, but *Q. berberidifolia* is more billowy, with sub-crowns.
- *Quercus durata* Alliance (2125) – *Quercus durata* has a dull green signature color and is typically on serpentine substrate. Stands are typically more open than those of *A. viscida*. When the two species mix, co-dominance goes to *Quercus durata* Alliance. *Q. durata* can hide in *A. viscida* stands, so when *A. viscida* stands are dense then the stand is more likely strongly dominant *A. viscida*. When the stand is open then there is more likely co-dominance with *Q. durata*.

***Arctostaphylos viscida* Alliance (2113)**



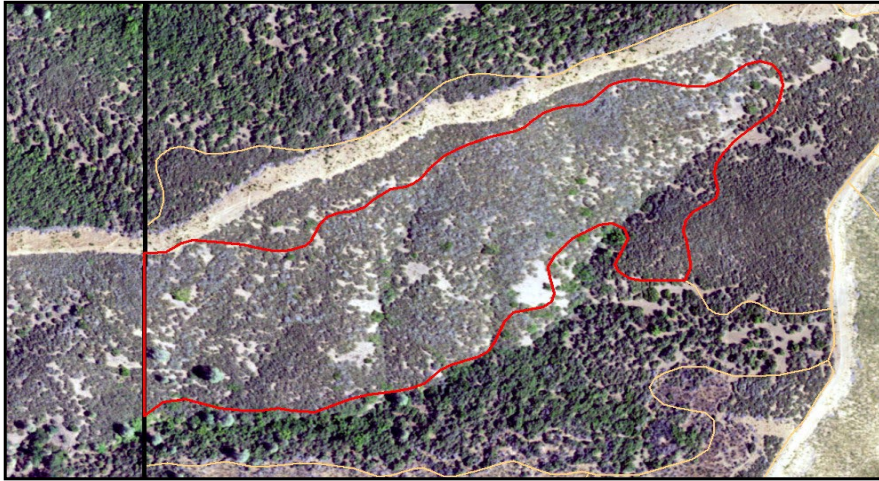
DISTRIBUTION: Stands mapped as the *Arctostaphylos viscida* Alliance are not common and are primarily mapped in the central part of the study area, above 2000 feet, up to 3500 feet.

***Arctostaphylos viscida* Alliance (2113)**



***Ceanothus cuneatus* Alliance (2114)**

Wedgeleaf Ceanothus Alliance



Aerial view of a south-facing stand of gray *Ceanothus cuneatus* on a steep slope. Note the white dotted signature of individual flowering *C. cuneatus* shrubs.



Ground view of a dense stand of *Ceanothus cuneatus* Alliance on the lower left half of the photo, as a co-dominant mix with *Adenostoma fasciculatum*. The right half of photo shows strongly dominant *Adenostoma fasciculatum*. Also note emergent *Pinus sabiniana* on the hill slopes in the background.

***Ceanothus cuneatus* Alliance (2114)**

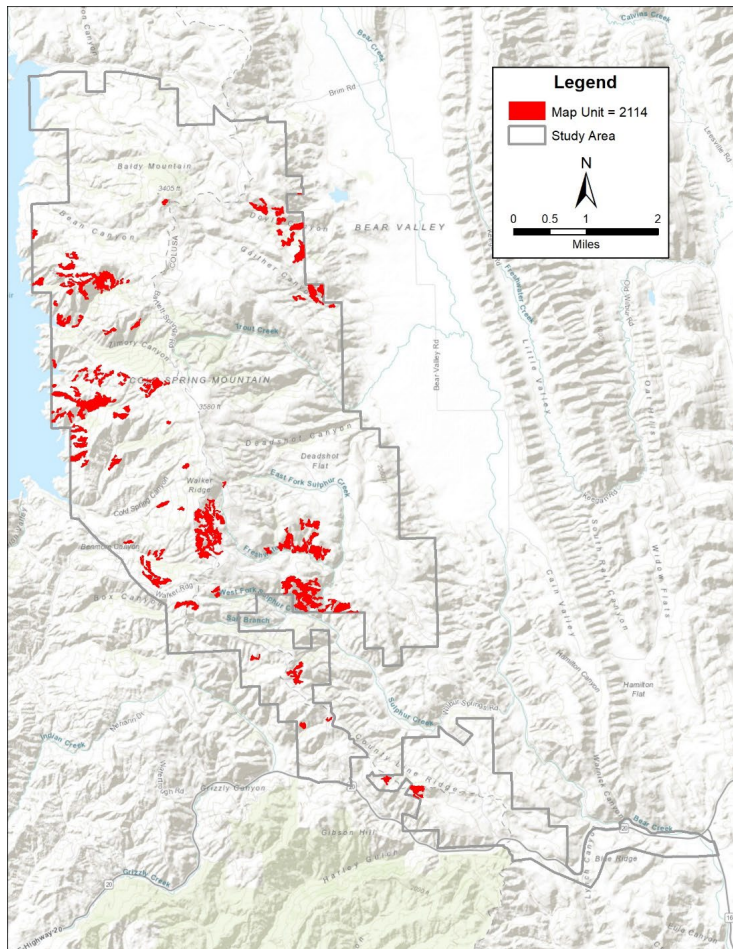
DESCRIPTION: *Ceanothus cuneatus* dominates or co-dominates with *Adenostoma fasciculatum*. A variety of shrubs may intermix, including *Arctostaphylos* spp., *Heteromeles arbutifolia*, *Quercus wislizeni*, and others.

PHOTOINTERPRETATION SIGNATURE: *Ceanothus cuneatus* yields a dull gray-green color signature, often mixing in dense stands of *Adenostoma fasciculatum*. The color infrared imagery shows red shrubs in the duller red *Adenostoma* matrix. Google Earth shows the shrubs covered with white flowers visible on spring imagery.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

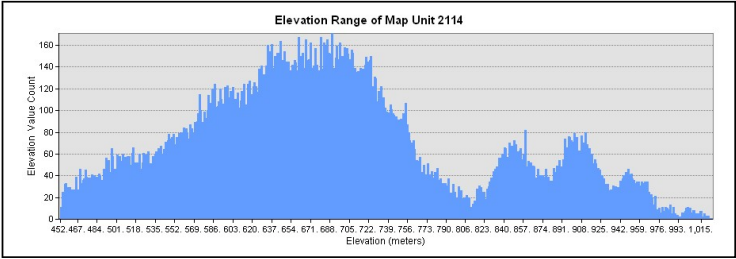
- *Adenostoma fasciculatum* Alliance (2111) – *Adenostoma* has a smoother texture when occurring without *C. cuneatus*, and is also duller red to dark brownish purple on the color infrared imagery.
- *Arctostaphylos viscida* Alliance (2113) – The signature for *A. viscida* is much more textured. Spring Google Earth does not show flowering on *A. viscida* as it does for *C. cuneatus*. Most *A. viscida* sites were mapped from field data and then extrapolated.
- *Quercus berberidifolia* Alliance (2124) – *Quercus berberidifolia* has a brighter green color and more texture. It is also located on more mesic sites.

***Ceanothus cuneatus* Alliance (2114)**



DISTRIBUTION: The *Ceanothus cuneatus* Alliance is common throughout most of the study area, mostly mixing with *Adenostoma fasciculatum*. It is not mapped in the southeasternmost and northernmost part of the study area. Elevation ranges from 1500 to 3300 feet.

***Ceanothus cuneatus* Alliance (2114)**



Ceanothus (oliganthus, tomentosus) Alliance (2121)

Hairy leaf Ceanothus, Woolly leaf Ceanothus Alliance



Aerial view of a dense stand of dark green *Ceanothus oliganthus* on a north-facing slope, just above a stand of a lighter colored *Aesculus californica*.



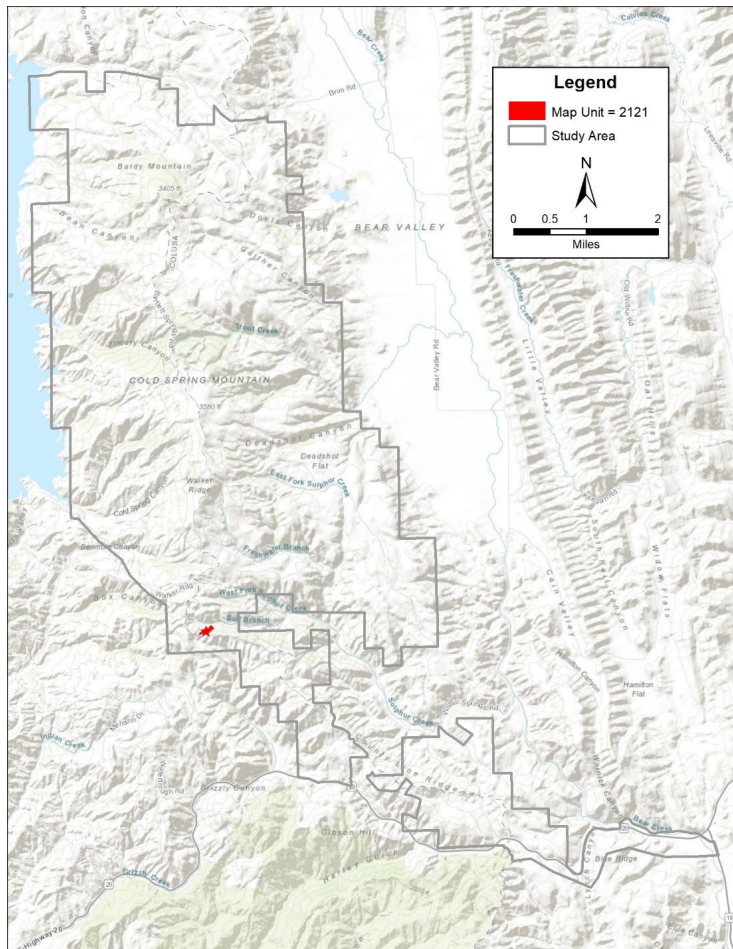
Ground view of dense stand of medium green *Ceanothus oliganthus* just behind a narrow band of dark green *Adenostoma fasciculatum* with yellow inflorescences.

Ceanothus (oliganthus, tomentosus) Alliance (2121)

DESCRIPTION: *Ceanothus oliganthus* dominates in shrublands that are often found in localized patches following fires. If *Quercus wislizeni* is co-dominant, then the stand is considered as the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance. Does not occur on serpentine substrate in the study area.

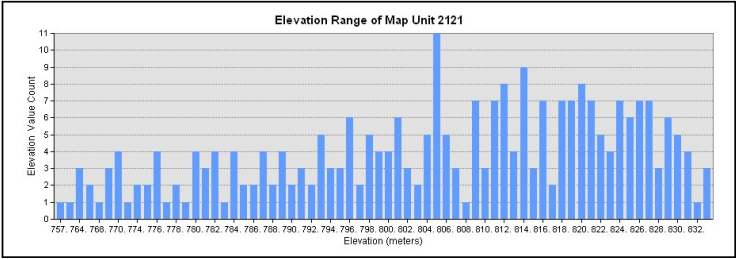
PHOTOINTERPRETATION SIGNATURE: On the base imagery the *Ceanothus oliganthus* has a bright dark green signature in a dense diverse stand, highly textured with individual narrow crowns visible. Only one stand was mapped from field data. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

Ceanothus (oliganthus, tomentosus) Alliance (2121)



DISTRIBUTION: Only one stand of *Ceanothus oliganthus* was mapped as the *Ceanothus (oliganthus, tomentosus) Alliance*, on a north-facing slope in the central part of the study area. It was mapped from field data at 2600 feet in elevation.

Ceanothus (oliganthus, tomentosus) Alliance (2121)



***Cercocarpus montanus* Alliance (2122)**

Birchleaf Mountain Mahogany Alliance



Aerial view of stand of medium green *Cercocarpus montanus* of variable cover. Note a stand of *Quercus douglasii* woodlands to the south, and bright green *Heteromeles arbutifolia* to the north.



Ground view of an open stand of gray green *Cercocarpus montanus* on a steep slope.

***Cercocarpus montanus* Alliance (2122)**

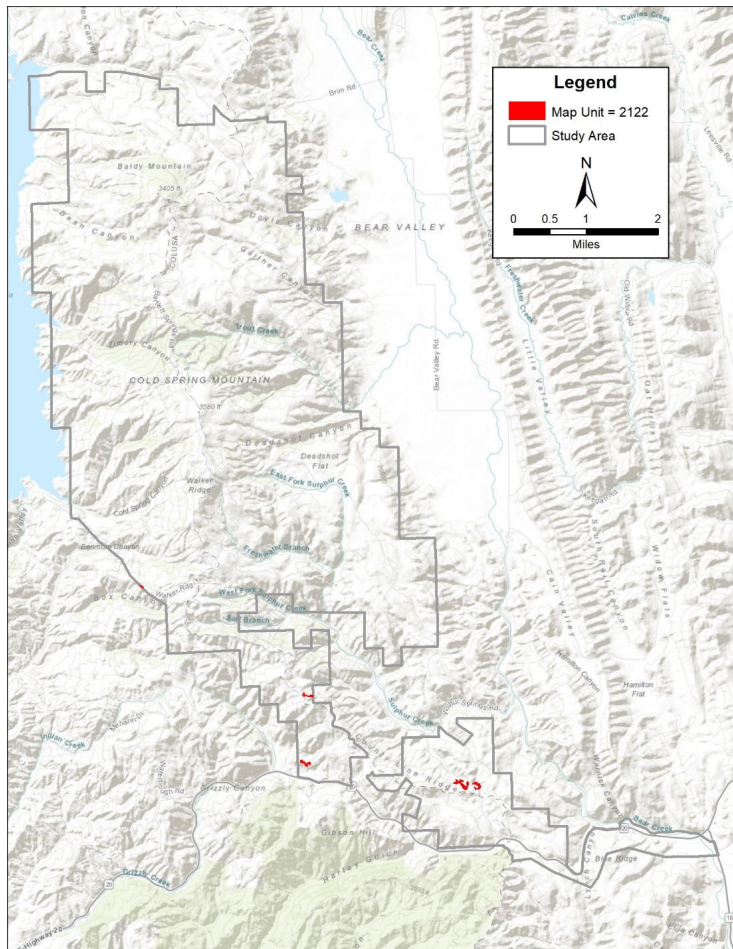
DESCRIPTION: *Cercocarpus montanus* (*C. betuloides*) dominates with other shrubs including *Heteromeles arbutifolia*. The alliance can occur as post-fire stands on the edge of *Quercus douglasii* stands.

PHOTOINTERPRETATION SIGNATURE: *Cercocarpus montanus* is a medium- to tall-statured shrub with an irregularly shaped crown and a dull olive-green color. Stands are open on upper northerly slopes. Stands were mostly mapped from field data.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

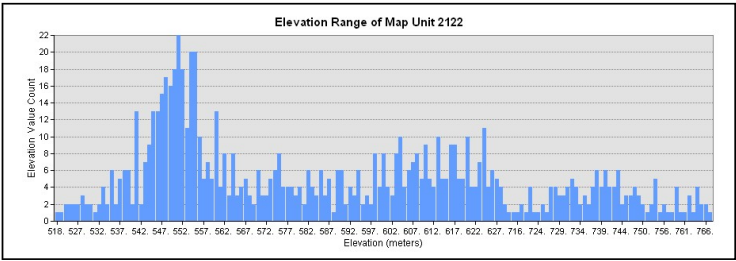
- *Adenostoma fasciculatum* (2111) – *Adenostoma fasciculatum* has similar but slightly greener signature, and tends to be more uniform in texture when not mixing with other shrubs. *Cercocarpus* is deciduous and would not have leaves on leaf-off imagery.
- *Arctostaphylos viscida* Alliance (2113) – *A. viscida* has a similar signature, but with slightly greener color and tends to be in denser stands in the study area. *Cercocarpus* is deciduous and would not have leaves on leaf-off imagery.
- *Quercus berberidifolia* Alliance (2124) – *Quercus berberidifolia* has a brighter green color signature and is more mesic. *Cercocarpus* is deciduous and would not have leaves on leaf-off imagery.
- *Quercus durata* Alliance (2125) – *Cercocarpus montanus* in the study area are small stands, were mapped based on field data, and are primarily adjacent to stands of *Quercus douglasii*. *Q. durata* form large stands on ultramafic substrate, are often adjacent to *Adenostoma fasciculatum* or *Hesperocyparis macnabiana* stands, and is not deciduous and would be leaf-on on winter imagery.

***Cercocarpus montanus* Alliance (2122)**



DISTRIBUTION: Only five polygons of the *Cercocarpus montanus* Alliance were mapped in the southern half of the study area, primarily from field data. Elevations range from 1800 to 2500 feet.

***Cercocarpus montanus* Alliance (2122)**



***Cornus sericea* Alliance (3614)**

Red osier Alliance



Aerial view of a small stand of bright green *Cornus sericea* Alliance on a slightly convex northeast-facing slope.



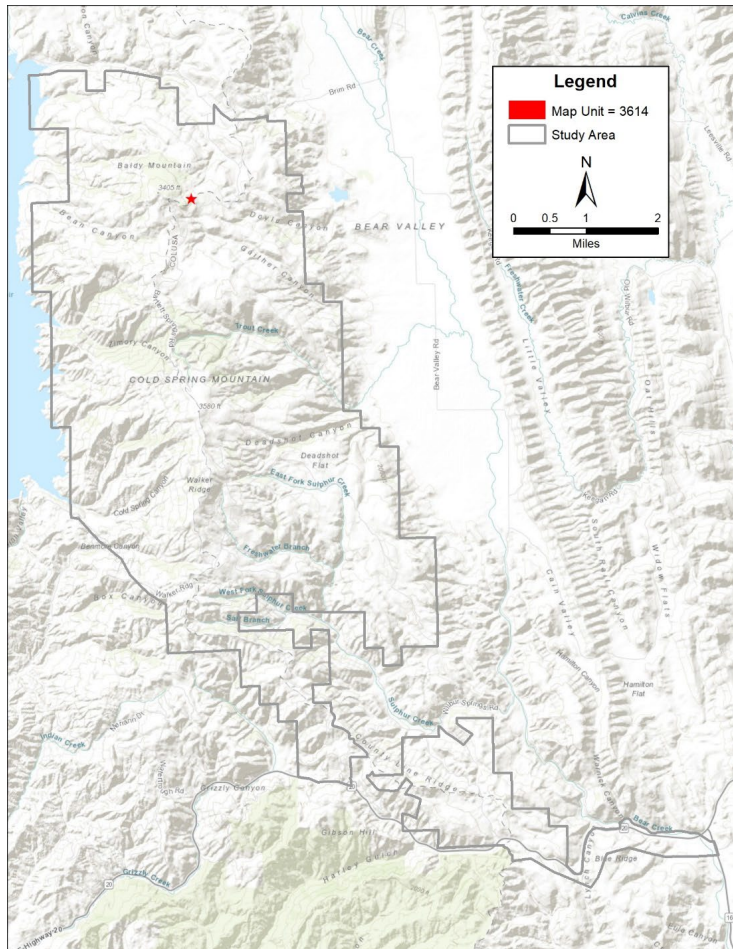
Ground view of dense stand of *Cornus sericea* Alliance. Note the lanceolate leaves.

***Cornus sericea* Alliance (3614)**

DESCRIPTION: *Cornus glabrata* or *C. sericea* dominates in the shrub canopy with a diverse mix of other shrubs including *Ceanothus integerrimus*, *Cercis occidentalis*, and *Salix lasiolepis*.

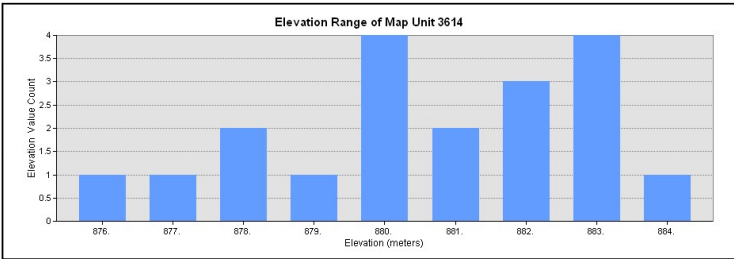
PHOTOINTERPRETATION SIGNATURE: Only one polygon was mapped based on field data. The stand has a bright green to medium green signature, is fairly short to moderate in height, and rather dense. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

***Cornus sericea* Alliance (3614)**



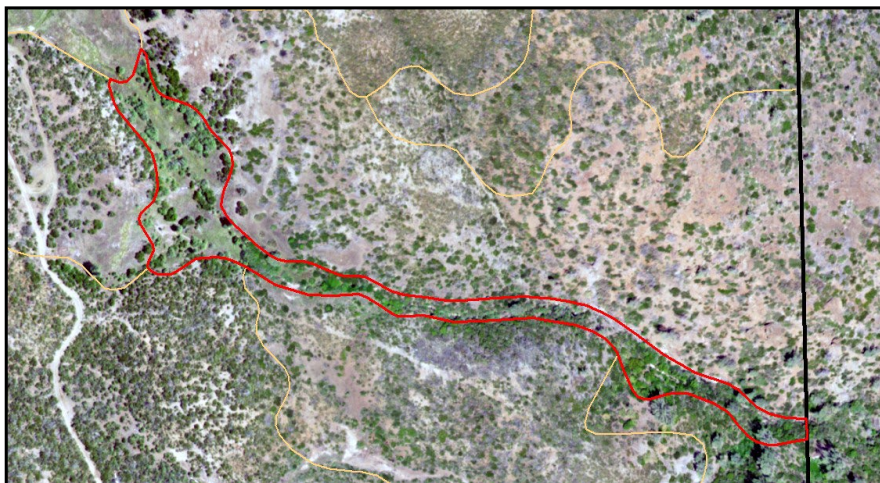
DISTRIBUTION: Only one stand of *Cornus sericea* Alliance is mapped from field data on a slightly convex northeast-facing slope at approximately 2000 feet in elevation, in the northern part of the study area.

***Cornus sericea* Alliance (3614)**



***Frangula californica* – *Rhododendron occidentale* – *Salix breweri*
Alliance (3111)**

California Coffeeberry – Western Azalea – Brewer's Willow Alliance



Aerial view of the *Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance along a drainage on serpentine substrate.



Ground view of stand of medium to dark green *Frangula californica* in a meadow setting adjacent to springs.

***Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance (3111)**

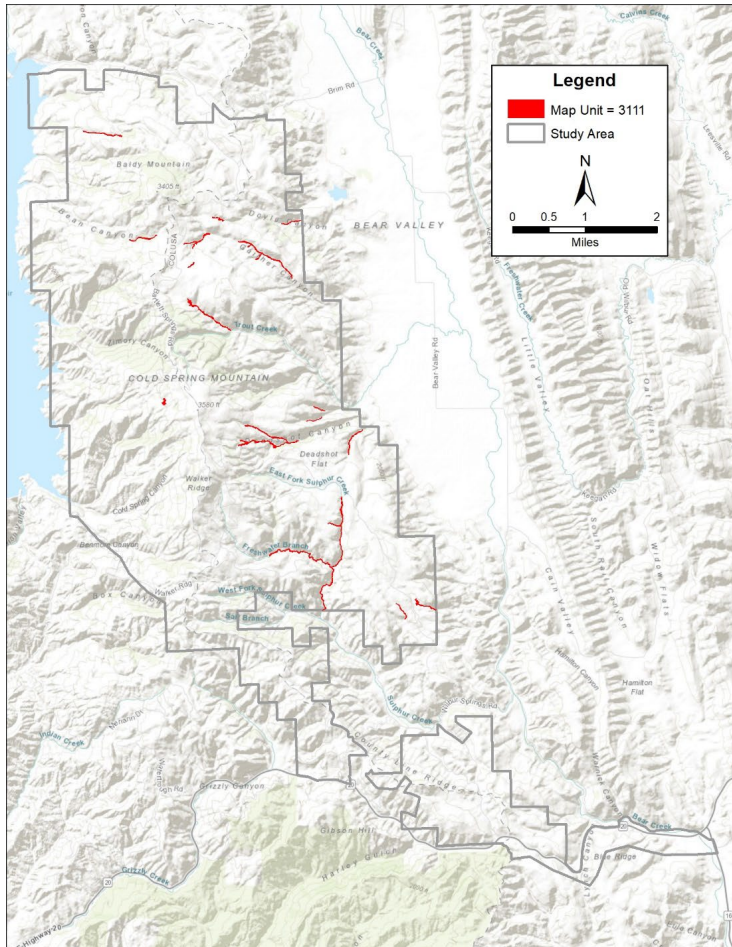
DESCRIPTION: *Salix breweri* and/or *Frangula californica* ssp. *tomentella* are dominant or co-dominant along springs, seeps, and ravines, on serpentine-derived alluvium. Commonly found with other moisture loving plants, such as *Solidago velutina*, *Carex serratodens* and *Stachys albens*. Tends to occur on serpentine substrate at higher elevations in the study area.

PHOTOINTERPRETATION SIGNATURE: Stands have a medium green color and are textured, with short stature and are found along narrow riparian drainages or wet meadow edge settings. Color infrared show a bright red signature.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

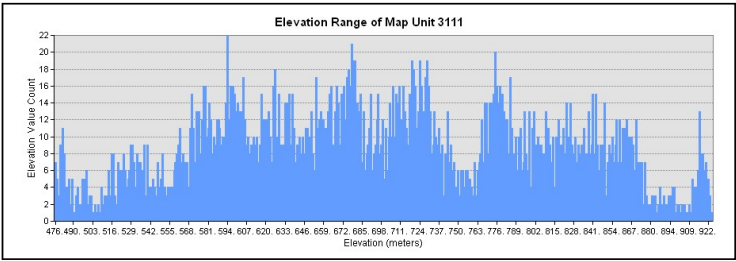
- *Salix lasiolepis* Alliance (3613) – *Salix lasiolepis* generally does not occur on serpentine substrate.

***Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance (3111)**



DISTRIBUTION: The *Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance is mapped in riparian settings and some meadows near springs, on serpentine substrate. It is mapped mainly on the regional eastern slope in the central portion of the study area. Elevations range from 1500 to 3000 feet.

***Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance (3111)**



***Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance
(2211)**

Deer weed – Silver Bush Lupine – Yerba Santa Alliance



Aerial view of an open stand of low stature *Eriodictyon californicum* on a variable slope.



Ground view of an open stand of *Eriodictyon californicum* on a steep disturbed slope.

***Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance (2211)**

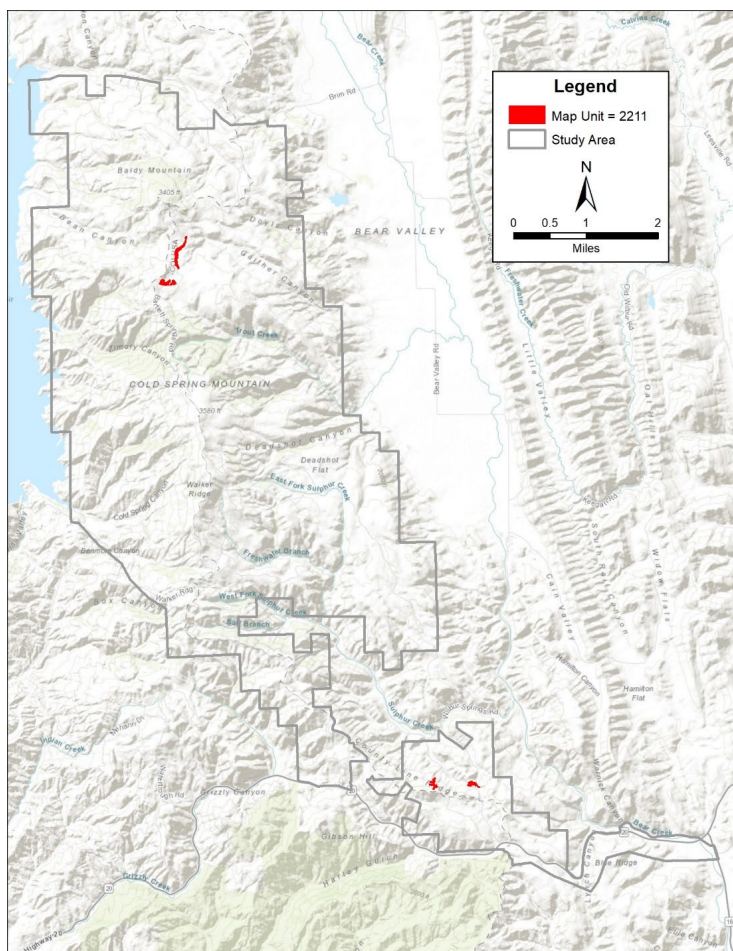
DESCRIPTION: *Eriodictyon californicum*, *Acmispon glaber* (*Lotus scoparius*), *Pickeringia montana*, or *Lupinus albifrons* dominates or co-dominates with other seral scrub, often in stands that are open and/or display recent evidence of fire or other disturbance such as road cuts. Other scrub may be present at lower cover including *Toxicodendron diversilobum*. The understory may be composed of mixed native and non-native herbs, including *Calystegia collina* and *Cryptantha intermedia*, which sometimes have higher cover than the overstory. *Eriodictyon* is the most common of these characteristic species and may occur on or off serpentine. *Lupinus* can occur on steep sparse to grassy thin soils. Where *Eriodictyon* is co-dominant with *Adenostoma fasciculatum*, *Quercus durata*, or *Arctostaphylos viscida*, then the stand is considered as *Adenostoma fasciculatum* Alliance, *Quercus durata* Alliance, or *Arctostaphylos viscida* Alliance respectively. *Eriodictyon* co-dominance with *Quercus durata* and *Arctostaphylos viscida* together would be called as the *Quercus durata* Alliance.

PHOTOINTERPRETATION SIGNATURE: On the base imagery *Eriodictyon californicum* tends to have an olive-green to medium green signature. On the color infrared imagery, it appears as light red to pink. Signature may vary due to amount of time of recovery from burn or scraping. *Lotus scoparius* and *Lupinus albifrons* were not mapped.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

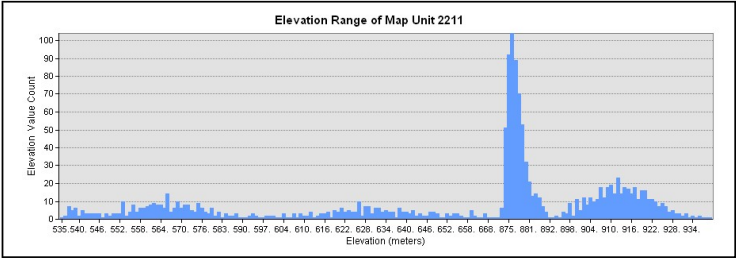
- Anthropogenic Areas of Little or No Vegetation Mapping Unit (9320) – Cleared area, with minimal regeneration of vegetation. In the study area *Eriodictyon* comes in following scraping, especially along bull dozer lines.
- *Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance (2123) – The signature for *Heteromeles arbutifolia* is brighter green, with a larger stature and denser crown. Stands are in more mesic settings.
- *Quercus berberidifolia* Alliance (2124) – *Q. berberidifolia* is typically mesic and dense. *Eriodictyon* occurs on open drier disturbed settings and has a shorter stature. Most sites were mapped from field data.
- *Quercus durata* Alliance (2125) – Most *Eriodictyon* sites are mapped from field data. *Eriodictyon* is more open with a low stature on disturbed sites. *Q. durata* can have a more mottled brown signature than *Eriodictyon*. *Eriodictyon* co-dominance goes to *Quercus durata* Alliance.

***Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance (2211)**



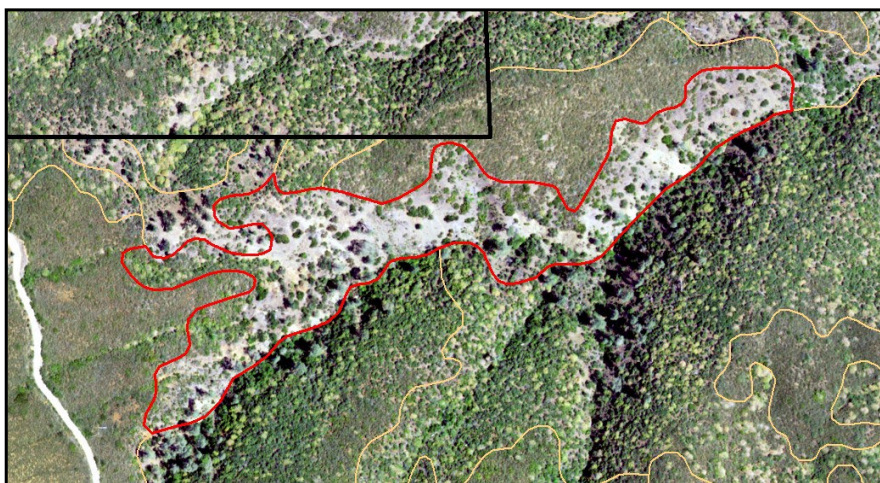
DISTRIBUTION: Only four polygons were mapped, two in the north and two in the south of the study area, primarily from field data. Elevations range from 1500 to 3000 feet, on gentle slopes.

***Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance (2211)**



***Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus*
Alliance (2123)**

Hollyleaf Cherry – Toyon – Greenbark Ceanothus Alliance



Aerial view of an open stand of medium to bright green *Heteromeles arbutifolia* on a protected lower south-facing slope.



Ground view of an open *Heteromeles arbutifolia* stand on a steep lower slope in the middle view. Note the white flowers on the shrubs.

***Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance (2123)**

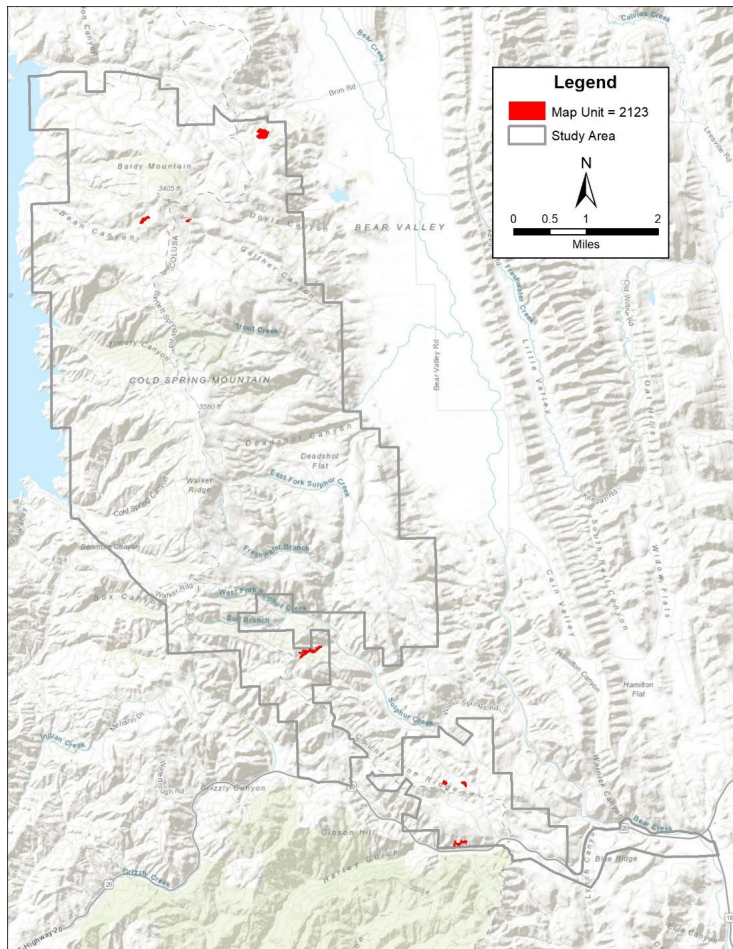
DESCRIPTION: *Heteromeles arbutifolia* dominates or co-dominates with a diverse mixture of shrubs including *Cercis occidentalis*, *Cercocarpus montanus* (*C. betuloides*), *Fraxinus dipetala*, *Rhus trilobata* (*R. aromatica*), and/or *Toxicodendron diversilobum*. Stands found primarily in post-fire settings on serpentinite. *Heteromeles* may occur as post-fire stands at base of *Quercus douglasii* stands. Where *Quercus berberidifolia* co-dominates with *Heteromeles arbutifolia*, the stand is considered as *Quercus berberidifolia* Alliance.

PHOTOINTERPRETATION SIGNATURE: *Heteromeles arbutifolia* has a medium green color signature with a coarse crown texture and an irregular to rounded crown.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

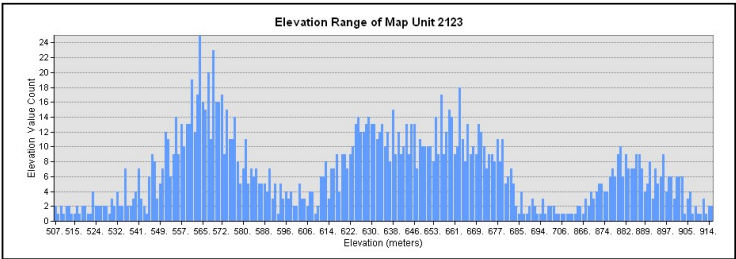
- *Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance (2211) – *Heteromeles arbutifolia* has a brighter green signature, with a larger stature and denser crown.
- *Quercus berberidifolia* Alliance (2124) – *Heteromeles arbutifolia* has a brighter green signature. South-facing low slope stands are open. Mesic *Heteromeles* stands have variable density and coloring. *Q. berberidifolia* is typically more dense and more mesic. *Quercus berberidifolia* co-dominating with *Heteromeles arbutifolia* goes to *Quercus berberidifolia* Alliance.
- *Quercus durata* Alliance (2125) – *Quercus durata* has a duller green signature and is shorter in stature. *Quercus durata* co-dominating goes to *Quercus durata* Alliance.

***Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance (2123)**



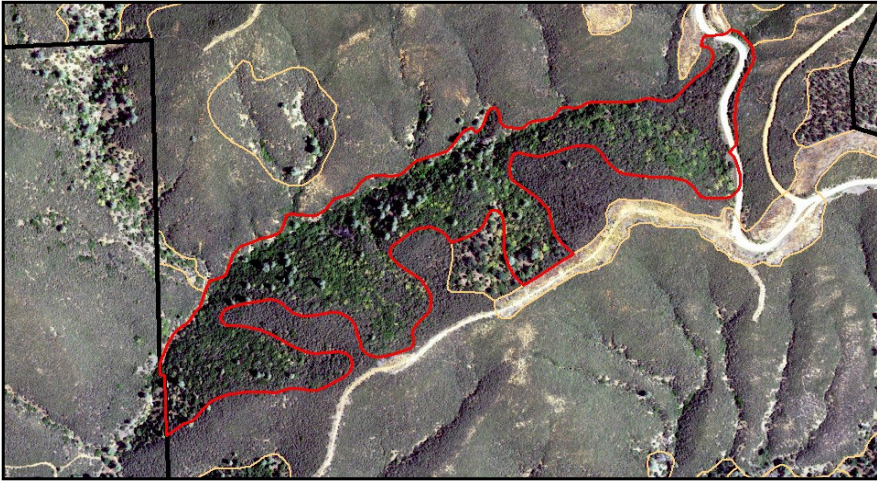
DISTRIBUTION: Seven polygons of the *Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance were mapped, scattered throughout the study area. The stands were mainly composed of *Heteromeles arbutifolia* as open stands on northerly or protected lower southerly slopes. Elevations range from 1500 to 3000 feet.

***Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance (2123)**



***Quercus berberidifolia* Alliance (2124)**

Scrub Oak Alliance



Aerial view of dense stand of bright medium green *Quercus berberidifolia* with a mix of mesic chaparral shrubs and emergent bluish *Pinus sabiniana*, on a northerly mid to lower slope.



Ground view of a dense *Quercus berberidifolia* stand on a steep slope (mid view). Note dense extensive stands of *Adenostoma fasciculatum* in the background.

***Quercus berberidifolia* Alliance (2124)**

DESCRIPTION: *Quercus berberidifolia* dominates or co-dominates in a mesic setting with *Adenostoma fasciculatum*, *Cercocarpus montanus* (*C. betuloides*) and/or other chaparral shrubs including *Heteromeles arbutifolia*, *Fraxinus dipetala*, and *Ceanothus cuneatus*. Trees such as *Aesculus californica* may emerge at low cover. *Arctostaphylos* spp., *Quercus wislizeni*, and *Umbellularia californica* may also be present.

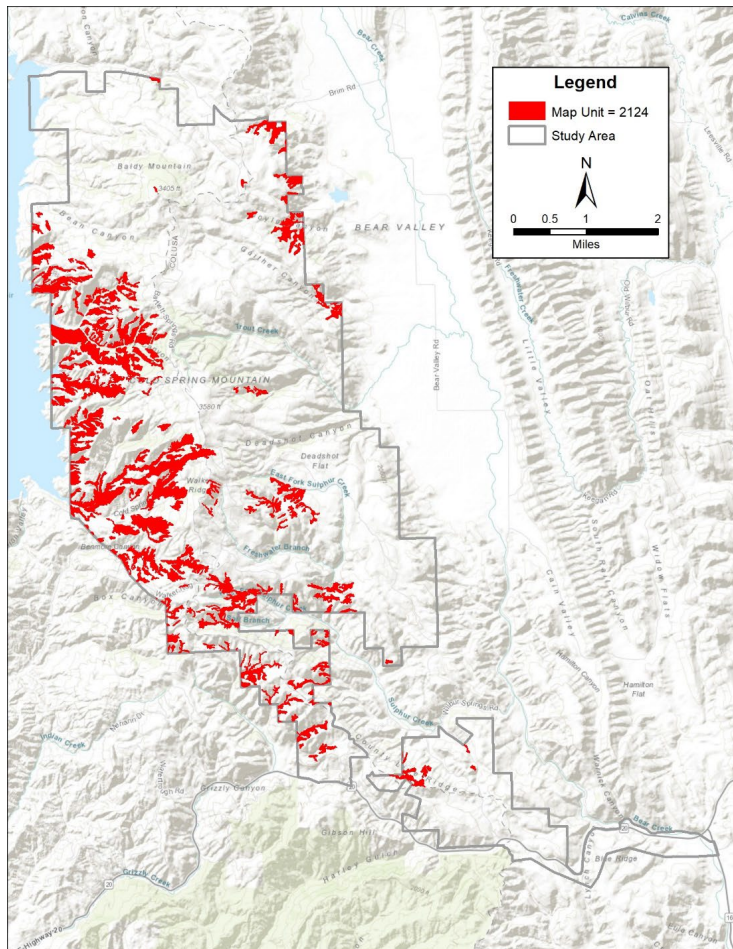
Quercus berberidifolia Alliance can occur as north-facing mixed mesic chaparral stands at lower to middle elevations in the study area, and is not found on serpentine. It can occur on steeper lower slopes as open stands with *Heteromeles arbutifolia* and/or *Ceanothus montanus*. It is not as mesic as *Quercus wislizeni* tree or *Quercus chrysolepis* tree stands.

PHOTOINTERPRETATION SIGNATURE: *Quercus berberidifolia* occurs as very dense stands to open stands on neutral to convexly shaped mid to lower northerly slopes. Signature characteristics appear as a medium green medium-sized shrubs with a fairly even crown height, and a slightly bumpy texture especially when the stand is diverse. Color infrared imagery displays red color. Diverse stands may be more variable in signature and can be difficult to discern species composition and dominance within the stand.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

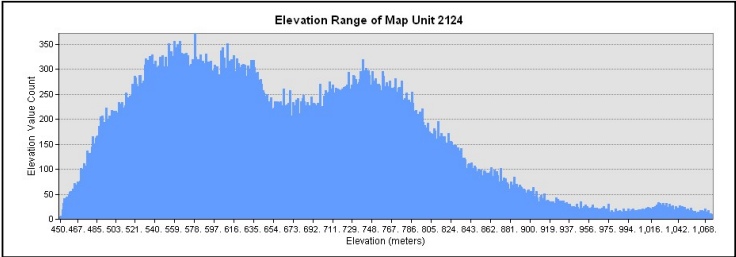
- *Adenostoma fasciculatum* Alliance (2111) – *Quercus berberidifolia* has a brighter signature color than *Adenostoma*, as well as a taller stature and visible individual crowns. Where the two intermix, co-dominance goes to *Quercus berberidifolia* Alliance.
- *Arctostaphylos viscida* Alliance (2113) – *A. viscida* is gray-green to a brownish green color, whereas *Q. berberidifolia* is brighter green and often more mesic. On the color infrared imagery *Q. berberidifolia* is brighter red, both with texture, but *Q. berberidifolia* is much more billowy with subcrowns.
- *Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance (2123) – *Heteromeles arbutifolia* has a brighter green signature. South-facing low slope stands are open. Mesic *Heteromeles* stands have variable density and coloring. *Q. berberidifolia* is typically more dense and more mesic. *Quercus berberidifolia* co-dominating with *Heteromeles arbutifolia* goes to *Quercus berberidifolia* Alliance.
- *Quercus durata* Alliance (2125) – *Q. durata* occurs on serpentine substrate and is a drab green where as *Q. berberidifolia* is brighter green with larger crowns and typically in mesic settings.
- *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance (2126) – Having a similar signature, *Quercus wislizeni* shrubs tend to occur at higher elevations than *Q. berberidifolia*, typically above 2700 feet unless north-facing, then down to 2000 feet. For the most part mapped based on field data. *Q. wislizeni* shrub is more likely to be associated with *Quercus chrysolepis* tree and *Pinus attenuata* than is *Q. berberidifolia*. *Q. berberidifolia* is more often associated with *Quercus douglasii* and *Adenostoma fasciculatum* or *Ceanothus cuneatus*.

***Quercus berberidifolia* Alliance (2124)**



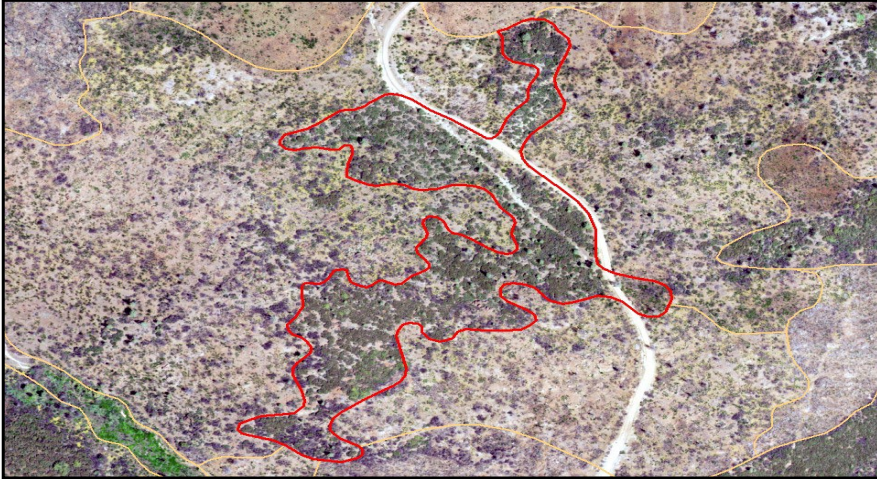
DISTRIBUTION: *Quercus berberidifolia* Alliance is ubiquitous throughout the western half of the study area, but is scattered in the eastern half. It tends to occur on mid to lower northerly slopes at elevations from 1500 to 3500 feet.

***Quercus berberidifolia* Alliance (2124)**



***Quercus durata* Alliance (2125)**

Leather Oak Alliance



Aerial view of a fairly dense stand of *Quercus durata* Alliance in a post-burn area.



Ground view of a *Quercus durata* Alliance stand composed of a mix of *Quercus durata* (dark green) and taller *Arctostaphylos viscida* (bright yellow-green).

***Quercus durata* Alliance (2125)**

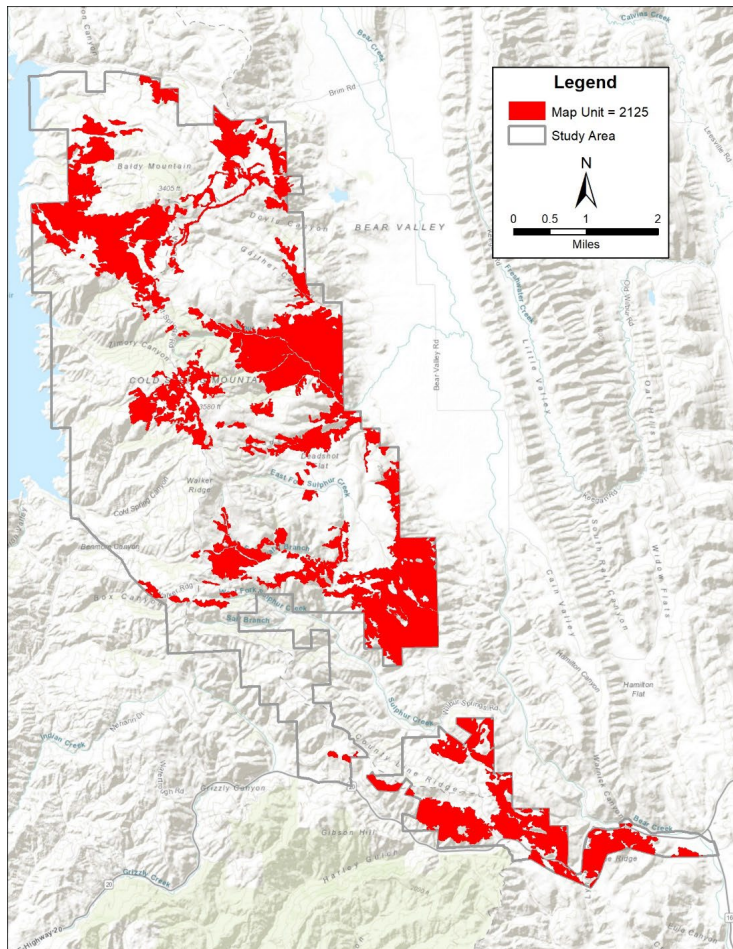
DESCRIPTION: *Quercus durata* dominates or co-dominates with *Heteromeles arbutifolia*, *Arctostaphylos viscida* and/or *Adenostoma fasciculatum* on ultramafic soils (e.g., serpentine, gabbro). *Ceanothus jepsonii* may also be present and co-dominant.

PHOTOINTERPRETATION SIGNATURE: *Quercus durata* signature is olive-green, but can be brighter, especially in the vicinity of *Hesperocyparis macnabiana*. In very dense stands in mesic settings, it tends to be a brighter green, especially when it has *Heteromeles arbutifolia* as a component. On color infrared imagery it is duller red. *Quercus durata* for the most part is found in serpentine substrate.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

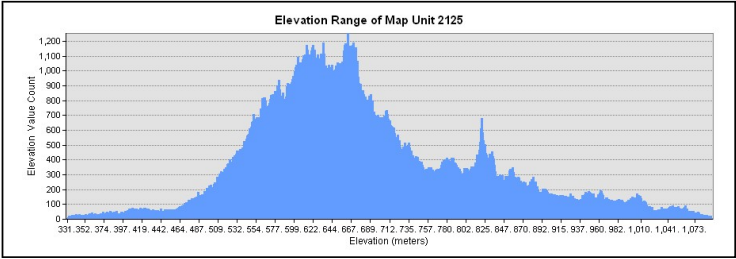
- *Adenostoma fasciculatum* Alliance (2111) – *Adenostoma* is a duller dark burgundy tone on the color infrared imagery compared to the dull red of *Q. durata*. On the base imagery both have a similar color, however *Adenostoma* is typically denser in cover and duller in tone.
- *Arctostaphylos viscida* Alliance (2113) – *A. viscida* has a similar signature. *Q. durata* tends to occur in more open stands and can co-dominate with *A. viscida*. In co-dominance, the call goes to *Quercus durata* Alliance.
- *Hesperocyparis (sargentii, macnabiana)* Alliance (1121) – Differentiation is difficult, especially in post-burn situations. *Q. durata* is typically a component of *Hesperocyparis macnabiana* stands. *H. macnabiana* must be greater than 8-10 percent cover in the stand to be called as *Hesperocyparis (sargentii, macnabiana)* Alliance.

***Quercus durata* Alliance (2125)**



DISTRIBUTION: The *Quercus durata* Alliance is ubiquitous throughout the entire study area, occurring mainly on serpentine substrate, and on variable terrain. Elevation ranges from 1000 to 3500 feet.

***Quercus durata* Alliance (2125)**



***Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance (2126)**

Interior Live Oak – Canyon Live Oak (shrub) Alliance



Aerial view of a mixed stand of *Quercus wislizeni* shrub and *Adenostoma fasciculatum*, and called as the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance. Note the rounded crowns of the brighter green *Q. wislizeni* over the less distinct and shorter *A. fasciculatum*.



Ground view of *Quercus wislizeni* with larger brighter green leaves and crowns as compared to the shorter and needle-like duller green leaves of the *Adenostoma fasciculatum* interspersed in between.

***Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance (2126)**

DESCRIPTION: *Quercus wislizeni*, *Quercus chrysolepis*, or *Quercus palmeri* dominates or co-dominates as a shrub or regenerating tree with *Umbellularia californica*, *Adenostoma fasciculatum*, *Ceanothus* spp., *Quercus berberidifolia*, and a variety of other shrubs that prefer more mesic, northerly exposures. *Umbellularia californica* is often emergent, while a variety of other shrubs intermix as sub-dominants. When *Q. wislizeni* dominates or co-dominates as an overstory tree, key to the *Quercus wislizeni* – *Quercus parvula* (tree) Alliance.

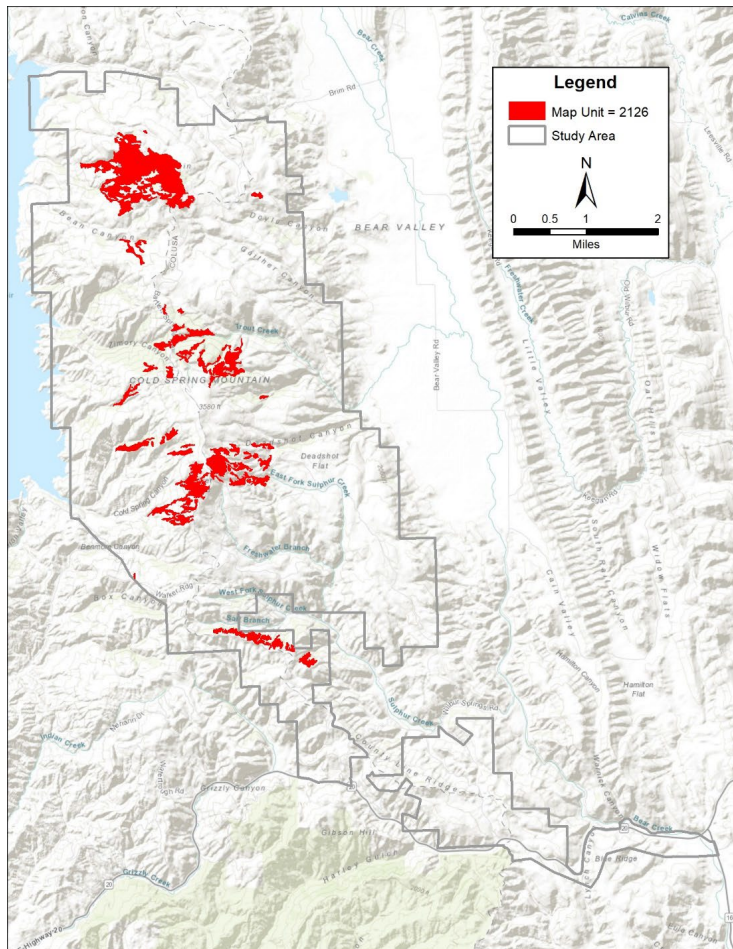
This alliance occurs at higher elevations in the study area on north-facing lower to mid slopes off of serpentine. It is more mesic than *Quercus berberidifolia* but occurs in similar settings and not as exposed. Other shrubs present may include *Ceanothus cuneatus*, *Cercocarpus montanus*, *Heteromeles arbutifolia*, *Ceanothus integerrimus*, *Arctostaphylos viscida*, *Quercus berberidifolia*, and *Adenostoma fasciculatum*.

PHOTOINTERPRETATION SIGNATURE: Signature color is a medium green, stature is shrub-like with heights appearing typically below 4 meters, and shadows are minimal. Individual crowns are dense, with some texture, and rounded with irregular edges, Color infrared displays a bright red signature. Post-burn stands have similar signatures but are more open.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

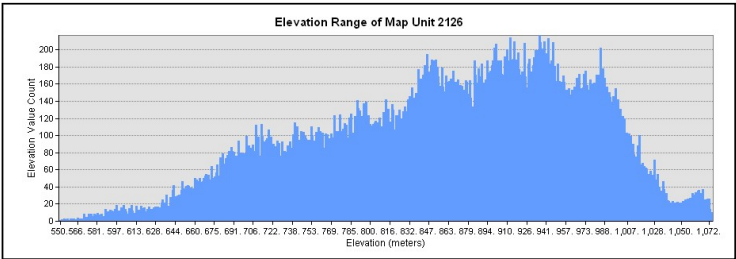
- *Adenostoma fasciculatum* Alliance (2111) – *Adenostoma* has a duller green signature, with a shorter stature, and less distinct crowns.
- *Ceanothus cuneatus* Alliance (2114) – *C. cuneatus* signature on color infrared is less red and duller than *Q. wislizeni*. Crowns also tend to be smaller and shorter.
- *Quercus berberidifolia* Alliance (2124) – *Quercus berberidifolia* has a similar signature, but tends to occur at lower elevations. Transition is based on field data and elevation.
- *Quercus chrysolepis* (tree) Alliance (1112) – *Quercus chrysolepis* in tree form is taller in stature, with larger rounded crowns, and with a brighter green signature.

***Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance (2126)**



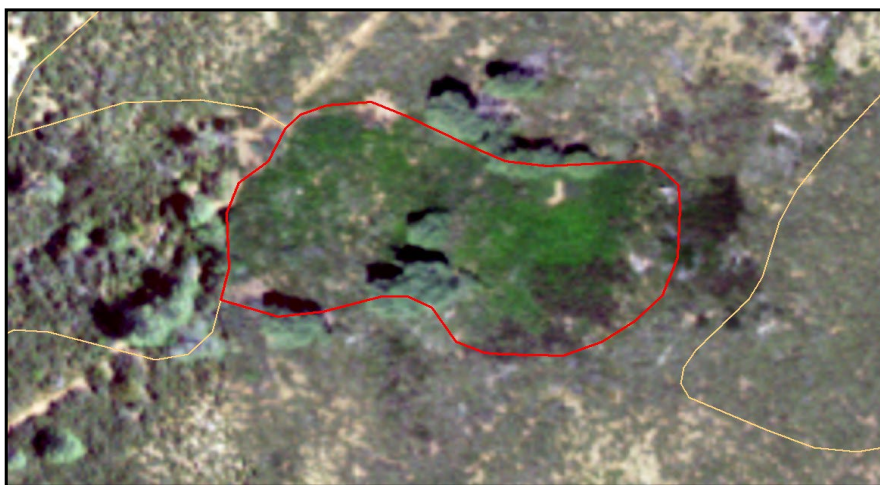
DISTRIBUTION: The *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance is common in the central north-south spine of the study area, but is not mapped in the southern portion. Stands are primarily the shrub form of *Quercus wislizeni* rather than that of *Q. chrysolepis*. They occur on northerly to easterly aspects, but also are found on protected southerly draws. Elevation ranges from 1800 to 3500 feet.

***Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance (2126)**



***Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance
(3511)**

Basket Bush – River Hawthorn – Desert Olive Alliance



Aerial view of a consistently dense stand of medium to bright green *Rhus trilobata* on a slight concavity on a gentle slope.



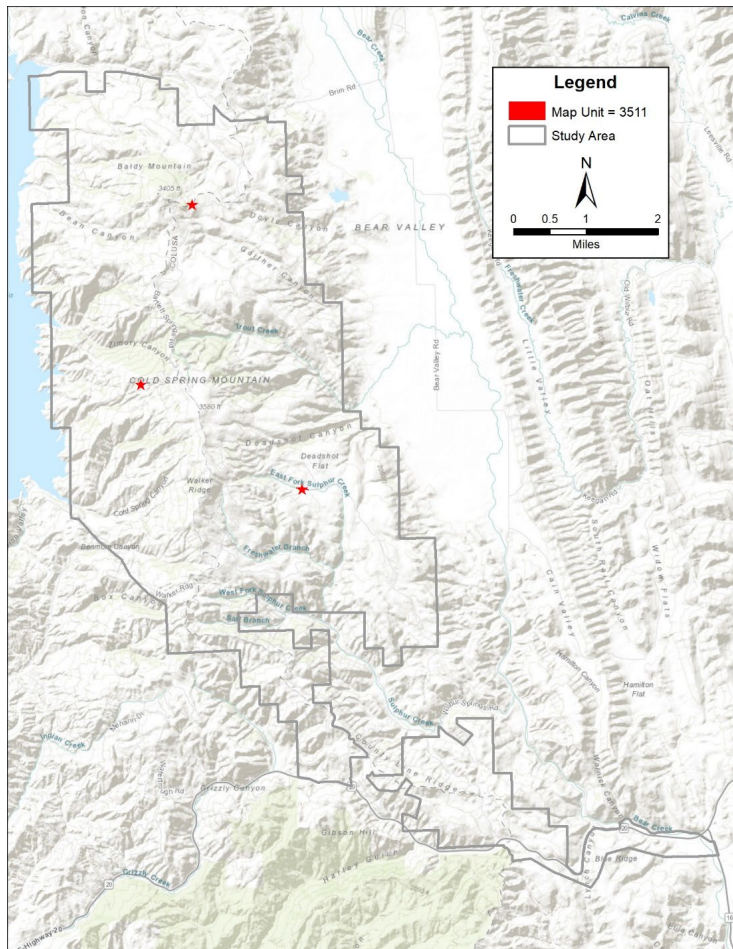
Ground view of a *Rhus trilobata* stand on a gentle slope with emergent *Pinus sabiniana*.

***Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance (3511)**

DESCRIPTION: *Rhus trilobata* (*R. aromatica*) co-dominates in the shrub overstory with *Frangula californica* ssp. *californica* and *Rosa californica*. This alliance is rare in the study area and occurs in small thickets.

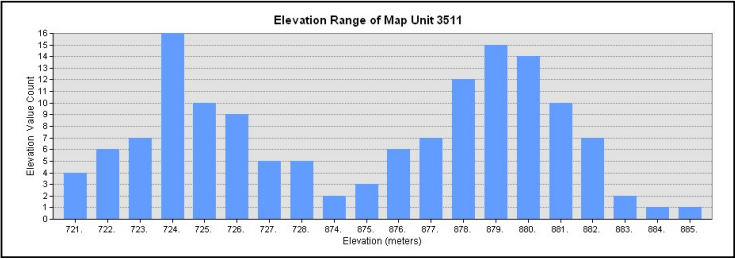
PHOTOINTERPRETATION SIGNATURE: *Rhus trilobata* dominated stands have a bright green color and typically appears in moderate to densely packed clonal clumps, on gentle slopes. The color infrared imagery shows a bright red signature. Three polygons were mapped from field data. Stands of this alliance are infrequently mapped in the study area. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

***Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance (3511)**



DISTRIBUTION: Only three polygons of the *Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance scattered through the study area. The stands are composed of *Rhus trilobata*. Elevations are 2800 to 3000 feet.

***Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance (3511)**



***Salix lasiolepis* Alliance (3613)**

Arroyo Willow Alliance



Aerial view of a stand of bright green *Salix lasiolepis* on a tributary of Cold Spring Canyon.

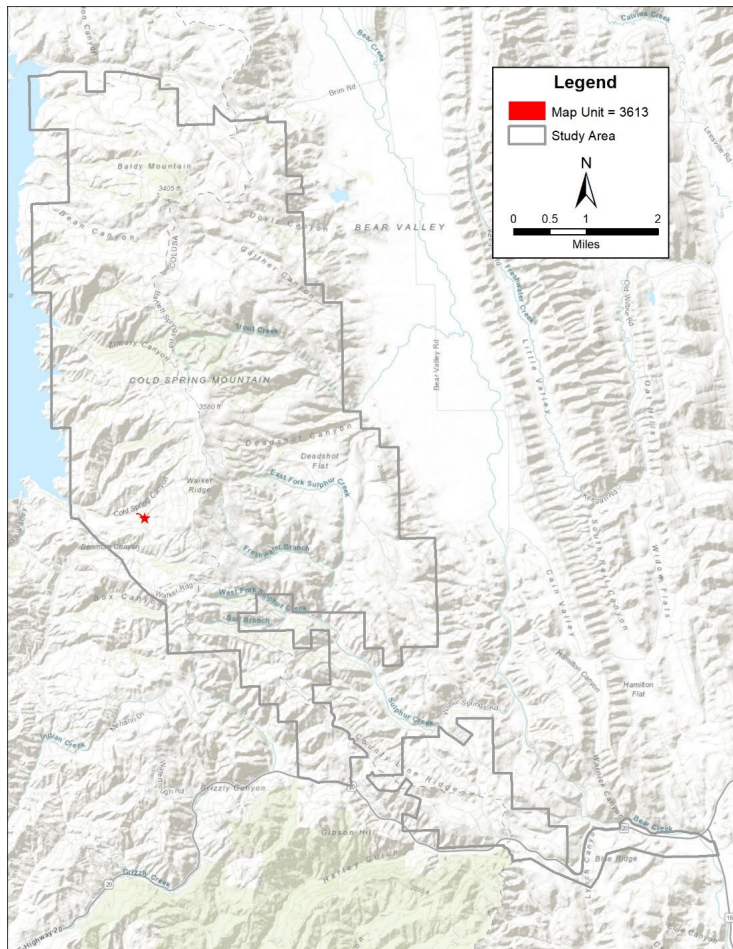
No Ground Photo Available

***Salix lasiolepis* Alliance (3613)**

DESCRIPTION: *Salix lasiolepis* dominates or co-dominates with *Rubus* along stream banks and benches, slope seeps, and drainage stringers. Emergent riparian trees are often present at low cover, such as *Acer*, *Alnus*, *Fraxinus*, *Salix*, and others. This alliance has a rare occurrence in the study area. Only one polygon was mapped. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

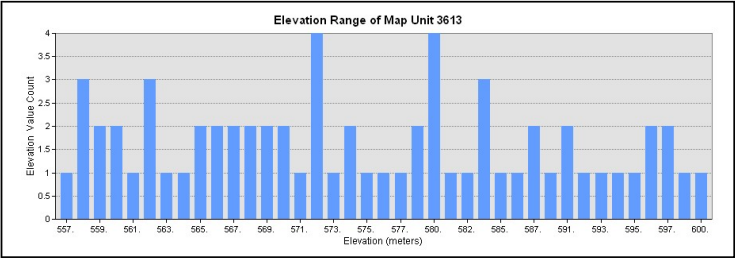
PHOTOINTERPRETATION SIGNATURE: The stand has a high shrub cover and the color is bright green. The color infrared imagery shows a bright red signature.

***Salix lasiolepis* Alliance (3613)**



DISTRIBUTION: Only one polygon of the *Salix lasiolepis* Alliance was mapped on a tributary of Cold Canyon at an elevation of 1800 to 2000 feet.

***Salix lasiolepis* Alliance (3613)**



***Tamarix* spp. Semi-natural Alliance (1411)**

Tamarisk Alliance



Aerial view of an open stand of the invasive shrub *Tamarix* spp. along Bear Creek.



Ground view of a stand of invasive *Tamarix* spp. along Bear Creek. Note the pink inflorescences.

***Tamarix* spp. Semi-natural Alliance (1411)**

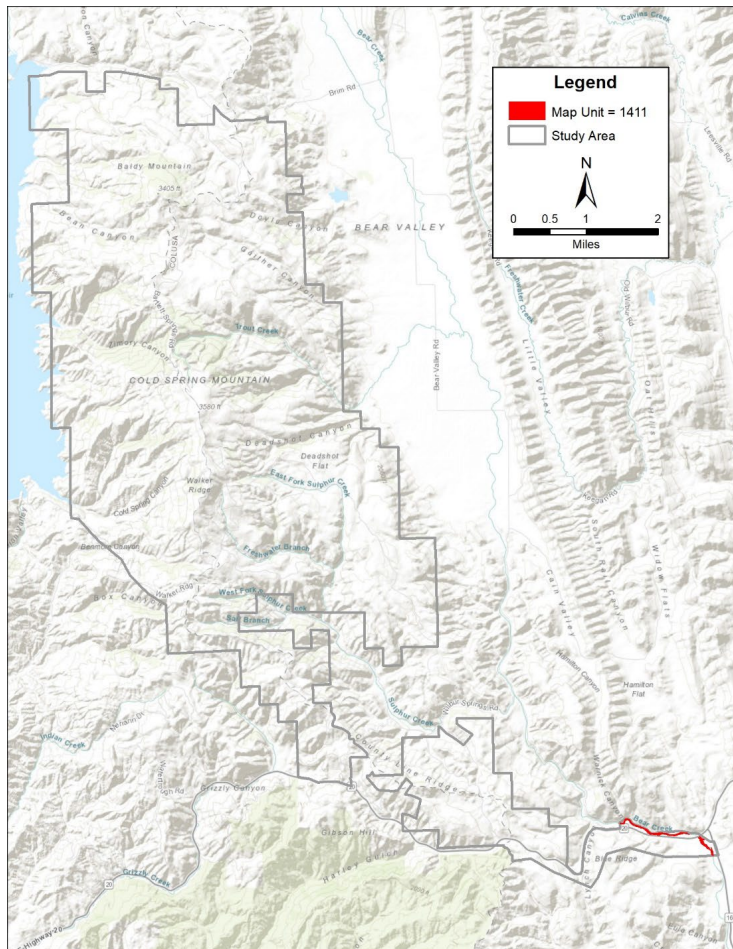
DESCRIPTION: *Tamarix* dominates in the shrub canopy. Trees may be present at low cover including *Quercus* spp. and non-native herbs such as *Lepidium latifolium* and *Centaurea solstitialis*. This alliance is rare in the study area.

PHOTOINTERPRETATION SIGNATURE: *Tamarix* spp. crowns appear as rounded to irregular in shape with a medium green color. On the color infrared imagery, they appear as pinkish red. Individuals can vary greatly in size from short shrub to a small tree and are typically found in drainages nearer to human disturbance.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

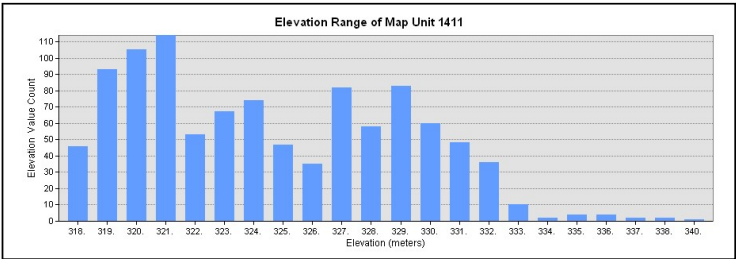
- *Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance (3511) – *Rhus trilobata* occurs as dense thickets, whereas *Tamarix* appears mostly as rounded individuals in a stand.
- *Salix lasiolepis* Alliance (3613) – *Salix lasiolepis* is brighter green in color. Color infrared signature is brighter red than that of *Tamarix*.

***Tamarix* spp. Semi-natural Alliance (1411)**



DISTRIBUTION: Five polygons of *Tamarix* spp. Semi-natural Alliance were mapped, all along Bear Creek in the southeast tip of the study area. Elevation ranges from 1000 to 1100 feet.

Tamarix spp. Semi-natural Alliance (1411)



Herbaceous

MU ¼ acre for special, wetland, riparian, rock, land use

Exotic

Bold – Mapped Macrogroups, Groups, and Alliances

3410 = Arid West Interior Freshwater Marsh Group; Wetland

3411 = Schoenoplectus (acutus, californicus) Alliance; Wetland

3412 = Typha (angustifolia, domingensis, latifolia) Alliance; Wetland

2300 = Californian Annual & Perennial Grassland Macrogroup

2310 = Californian Perennial Grassland Group

2311 = Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance

2312 = Nassella spp. – Melica spp. Alliance

2320 = Californian Annual Grassland & Forb Meadow Group

2321 = Amsinckia (menziesii, tessellata) – Phacelia spp. Alliance

2322 = Eschscholzia (californica) – Lupinus (nanus) Alliance

2323 = Holocarpha (heermannii, virgata) Alliance

2324 = Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance

2325 = Plagiobothrys nothofulvus Alliance

2410 = Californian Ruderal Grassland, Meadow & Scrub Group; Exotic

2411 = Avena spp. – Bromus spp. Semi-natural Alliance; Exotic

2412 = Brassica nigra – Centaurea (solstitialis, melitensis) Semi-natural Alliance; Exotic

2413 = Cynosurus echinatus – Arrhenatherum elatius Semi-natural Alliance; Exotic

2414 = Lolium perenne Semi-natural Alliance; Exotic

2511 = Conium maculatum – Foeniculum vulgare Semi-Natural Alliance; Exotic

6110 = Californian Cliff, Scree & Rock Vegetation Group; Special

6111 = Allium spp. – Streptanthus spp. – Hesperolinon spp. Serpentinite Alliance; Special

6112 = Dudleya cymosa – Dudleya lanceolata – Lichen/Moss Alliance; Special

6113 = Sedum spathulifolium Alliance; Special

3120 = Vancouverian Freshwater Wet Meadow & Marsh Group; Wetland

3121 = Deschampsia cespitosa – Hordeum brachyantherum – Danthonia californica Alliance; Wetland

3122 = Juncus arcticus (var. balticus, mexicanus) Alliance; Wetland

3123 = Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance; Wetland

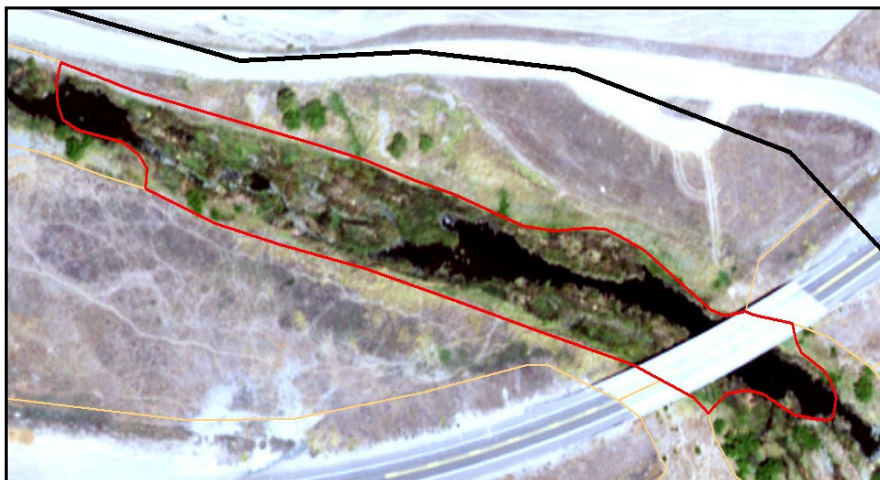
3124 = Leymus cinereus – Leymus triticoides Alliance; Wetland

3125 = Mimulus guttatus – Stachys spp. – Cirsium spp. Alliance; Wetland

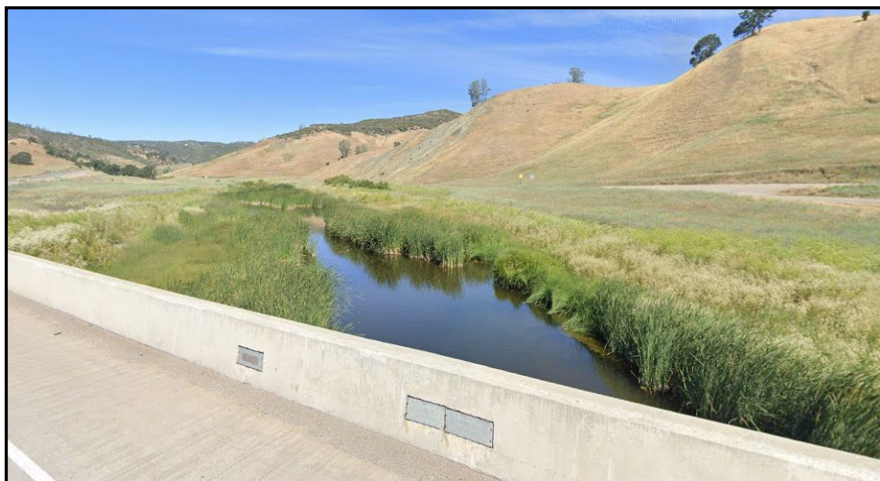
3310 = Western North American Ruderal Marsh, Wet Meadow & Shrubland Group; Wetland; Exotic

3311 = Lepidium latifolium – Lactuca serriola Semi-natural Alliance; Wetland; Exotic

Arid West Freshwater Marsh Group (3410)



Aerial view of the Arid West Freshwater Marsh Group along Bear Creek.



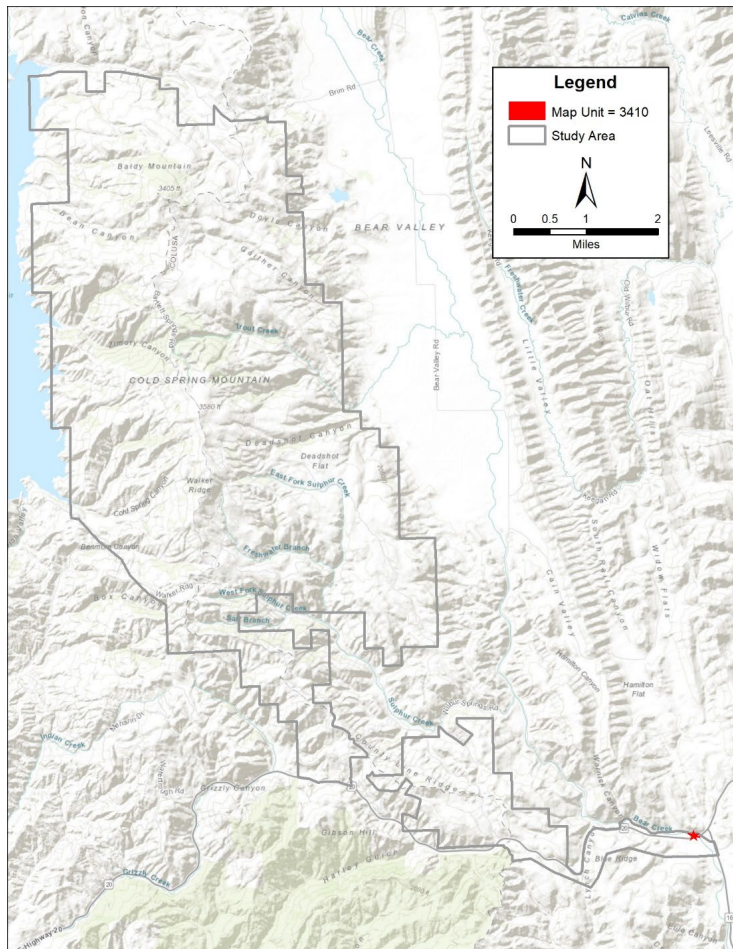
Ground view of the Arid West Freshwater Marsh Group in standing water along the edges of Bear Creek.

Arid West Freshwater Marsh Group (3410)

DESCRIPTION: Freshwater or brackish stands dominated by *Schoenoplectus* and/or *Typha*, where water is present throughout all or most of the growing season. Stands are found along streams, ditches, and pond edges. Soils have high organic content and may be poorly drained.

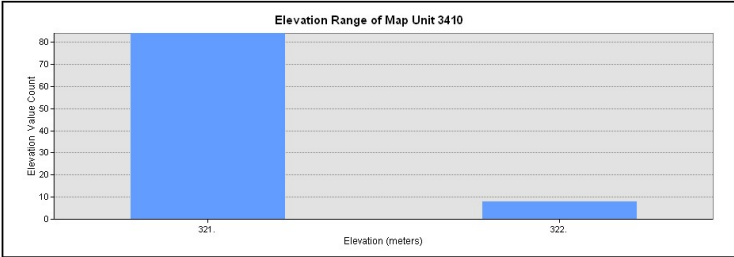
Stands of this Group are infrequently mapped in the study area. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

Arid West Freshwater Marsh Group (3410)



DISTRIBUTION: Only one polygon of Arid West Freshwater Marsh Group was mapped in the study area, on Bear Creek at State Highway 20.

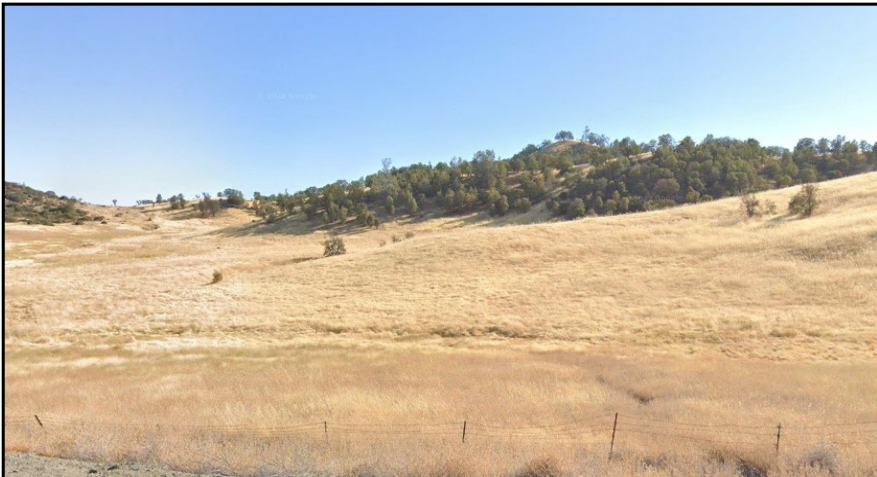
Arid West Freshwater Marsh Group (3410)



California Annual and Perennial Grassland Macrogroup (2300)



Aerial view of the light tan to mottled California Annual and Perennial Grassland Macrogroup composed of native and non-native upland grasses and forbs.



Ground view of an extensive stand of tawny colored California Annual and Perennial Grassland Macrogroup composed of native and non-native grasses and forbs on deep soils.

California Annual and Perennial Grassland Macrogroup (2300)

DESCRIPTION:

Native and non-native annual forb/grass vegetation AND native perennial grasslands. Includes vegetation characterized by, but not limited to *Amsinckia*, *Avena*, *Brassica*, *Bromus*, *Centaurea*, *Chorizanthe membranacea*, *Conium*, *Cynosurus*, *Dipsacus*, *Elymus glaucus*, *Eschscholzia*, *Festuca* spp., *Foeniculum*, *Lasthenia californica*, *Lolium*, *Lupinus*, *Melica*, *Nassella*, *Plagiobothrys nothofulvus*, *Plantago erecta*, *Pteridium aquilinum*, *Festuca microstachys* (= *Vulpia microstachys*).

Stands characterized by a grasses and forbs. This type can include a mixture of native and non-native species that can range from strongly dominant non-native species to strongly dominant native species. Non-native species tend not to favor serpentine substrate.

Photo interpreters are unable to distinguish native species from the non-native Mediterranean annuals and must model based on edaphic and topographical characteristics. Photo interpreters also evaluate concentrations of land use types and their proximity to herbaceous vegetation in deciding which Group to assign, if possible.

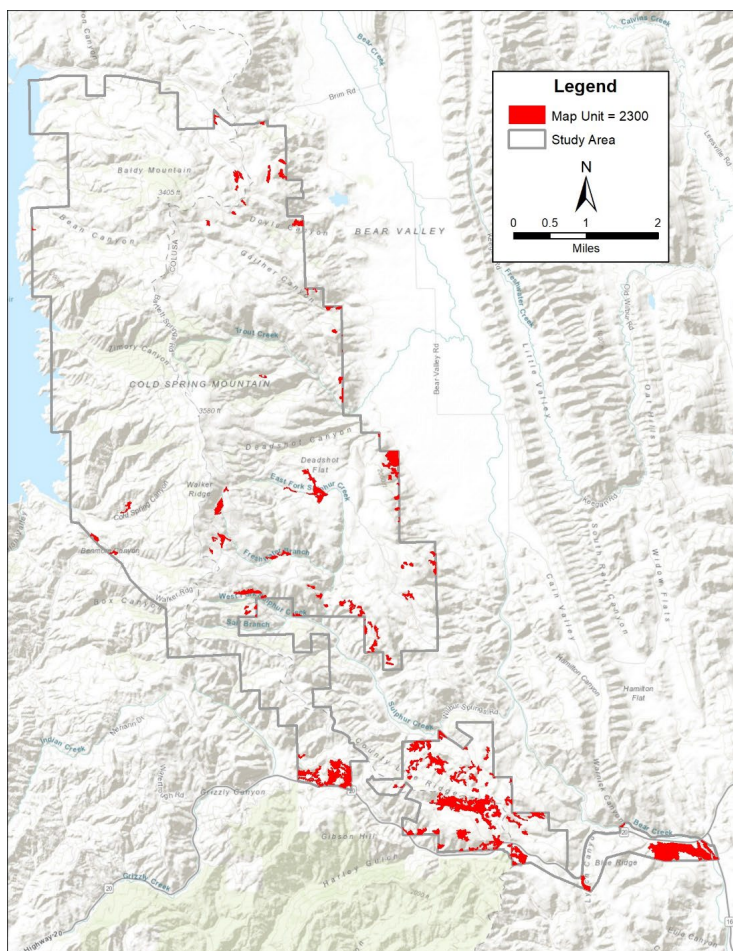
Note: stands that are assumed to contain native species especially without wildflower signatures have been mapped to this Macrogroup level.

PHOTOINTERPRETATION SIGNATURE: Grasslands of this type display varying colors of tawny to beige to brownish green with a flat low-growing texture. Complexing of different grassland signatures and types create signature recognition difficulties, containing other species of herbaceous and forbs that are below the minimum mapping unit.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

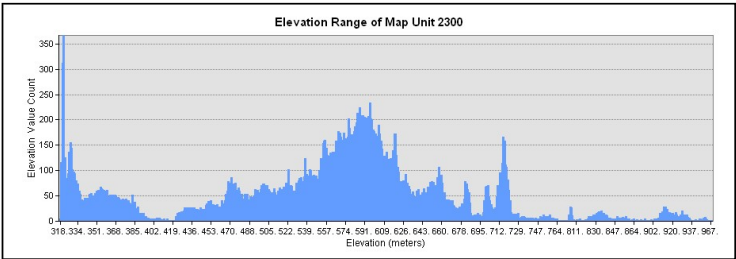
- California Annual Grassland and Forb Meadow Group (2320) – Mapped from field data.
- Californian Ruderal Grassland, Meadow & Scrub Group (2410) – Mapped from field data.
- Vancouverian Freshwater Wet Meadow & Marsh Group (3120) – Native stream channels and terraces – Mapped from field data.

California Annual and Perennial Grassland Macrogroup (2300)



DISTRIBUTION: The California Annual and Perennial Grassland Macrogroup is mapped throughout the southern and eastern portions of the study area.

California Annual and Perennial Grassland Macrogroup (2300)



Californian Annual Grassland & Forb Meadow Group (2320)



Aerial view of a stand of the Californian Annual Grass & Forb Meadow Group on dark serpentine substrate.



Ground view of a stand of Californian Annual Grass & Forb Meadow Group just above a swale.

Californian Annual Grassland & Forb Meadow Group (2320)

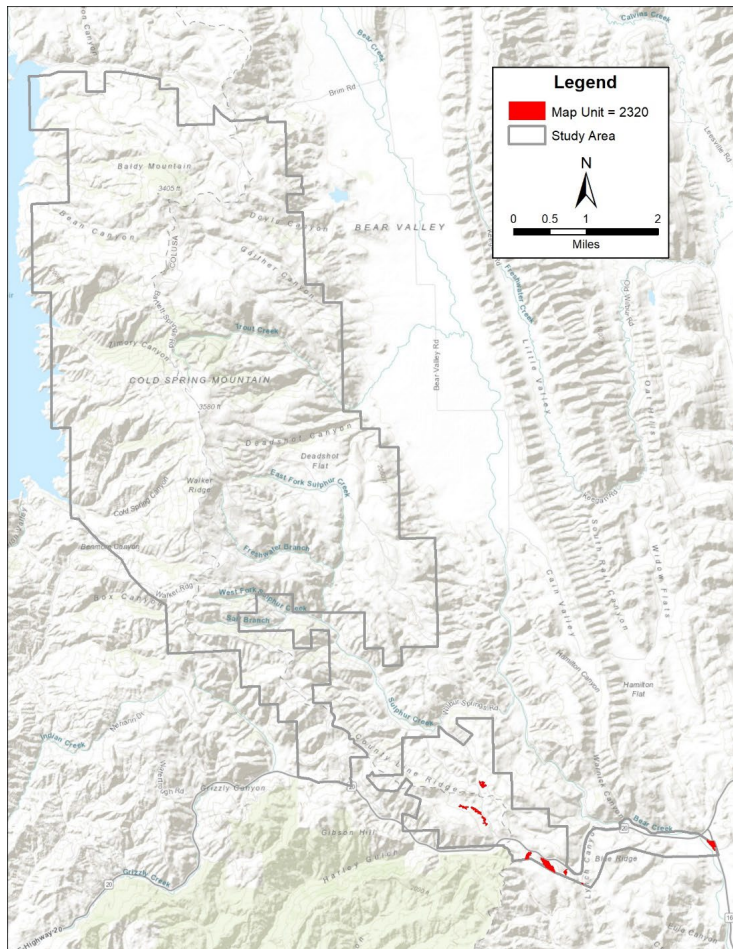
DESCRIPTION: Herbaceous vegetation dominated, co-dominated, or characterized by native annual forbs and grasses such as *Acemisson* (=Lotus), *Amsinckia*, *Chorizanthe membranacea*, *Eschscholzia*, *Lasthenia californica*, *Holocarpha*, *Lupinus*, *Madia*, *Plagiobothrys*, *Plantago erecta*, and *Festuca (Vulpia) microstachys*. Commonly occurring taxa include *Avena*, *Bromus*, *Cryptantha*, *Dichelostemma*, *Festuca* (=Lolium). Stands are found on upland slopes, flats, and ridges.

Stands characterized by a grasses and herbs. This type can include a mixture of native and non-native species that can range from dominant non-native species to strongly dominant native species. Non-native species tend not to favor serpentine substrate.

Photo interpreters are unable to distinguish native species from the non-native Mediterranean annuals and must model based on edaphic and topographical characteristics. Photo interpreters also evaluate concentrations of land use types and their proximity to herbaceous vegetation in deciding which Group to assign, if possible.

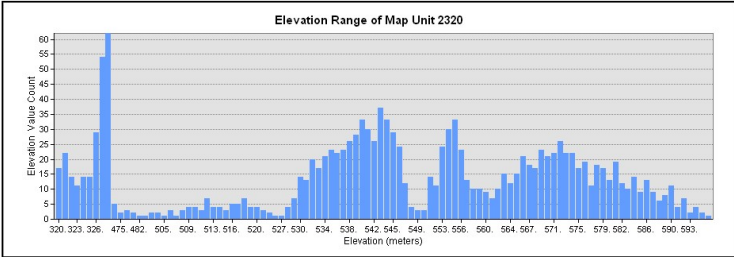
Stands of this group were infrequently mapped in the study area and based on field information. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

Californian Annual Grassland & Forb Meadow Group (2320)



DISTRIBUTION: Nine polygons of the Californian Annual Grassland & Forb Meadow Group were mapped, primarily in the southernmost part of the study area. This group is primarily mapped from field data.

Californian Annual Grassland & Forb Meadow Group (2320)



***Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance
(2324)**

California goldfields – Dwarf plantain – Small fescue flower fields Alliance



Aerial view of a light tan stand of *Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance mapped from field data.



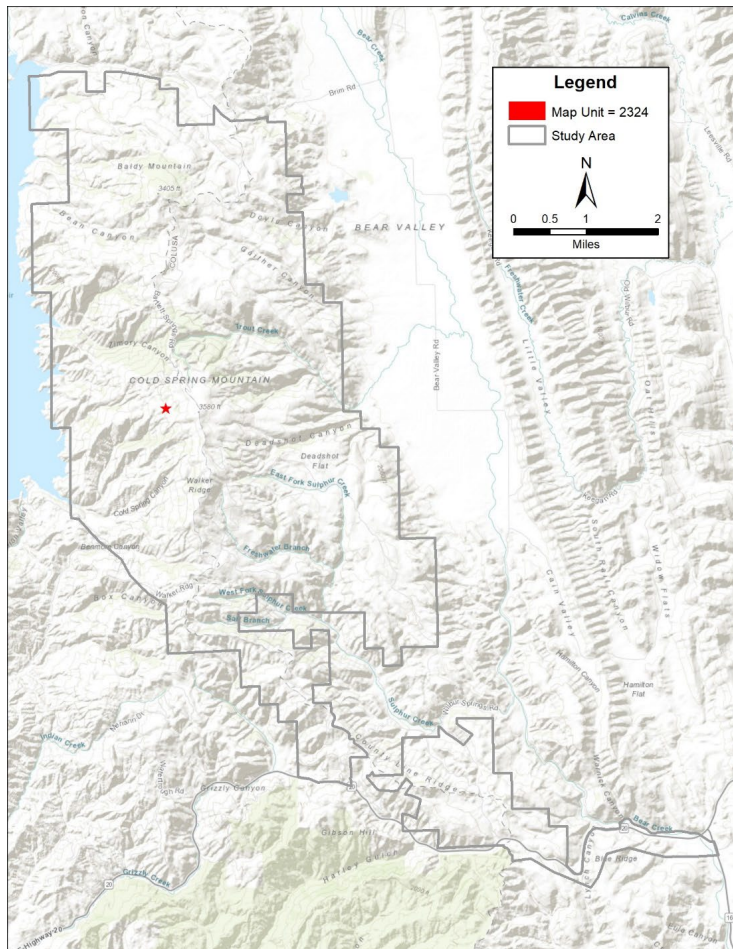
Ground view of *Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance, dominated by of *Calycadenia fremontii*.

***Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance (2324)**

DESCRIPTION: *Lasthenia californica*, *Acmispon* spp., *Ancistrocarphus filagineus*, *Calycadenia* spp., *Hemizonia congesta*, *Hesperervax sparsiflora*, *Lomatium*, *Lotus humistratus*, *Madia* spp., *Micropus californicus*, *Plantago erecta*, and/or *Vulpia microstachys* dominate individually or in combination as characteristic plants in the herbaceous layer. *Lasthenia californica*, *Plantago erecta*, and/or *Festuca microstachys* (= *Vulpia microstachys*) are often present, sometimes with sparse cover

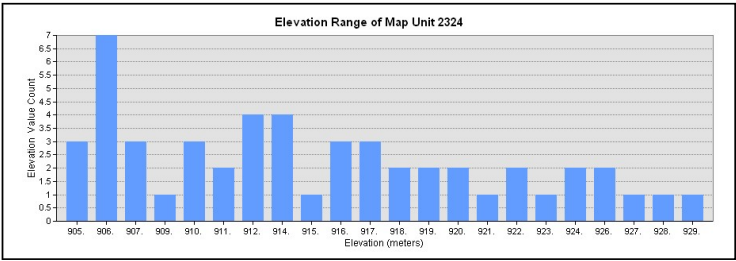
Stands of this alliance are infrequently mapped in the study area based on field data. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

***Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance (2324)**



DISTRIBUTION: Only one polygon of the *Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance was mapped in the study area, from field data. This alliance is part of the Californian Annual Grassland & Forb Meadow Group.

***Lasthenia californica* – *Plantago erecta* – *Vulpia microstachys* Alliance (2324)**



Californian Ruderal Grassland, Meadow & Scrub Group (2410)



Aerial view of a stand of the Californian Ruderal Grassland, Meadow & Scrub Group. Note the mottled signature of tans and greens.



Ground view of the Californian Ruderal Grassland, Meadow & Scrub Group, composed primarily of *Lolium perenne* and *Bromus diandrus*.

Californian Ruderal Grassland, Meadow & Scrub Group (2410)

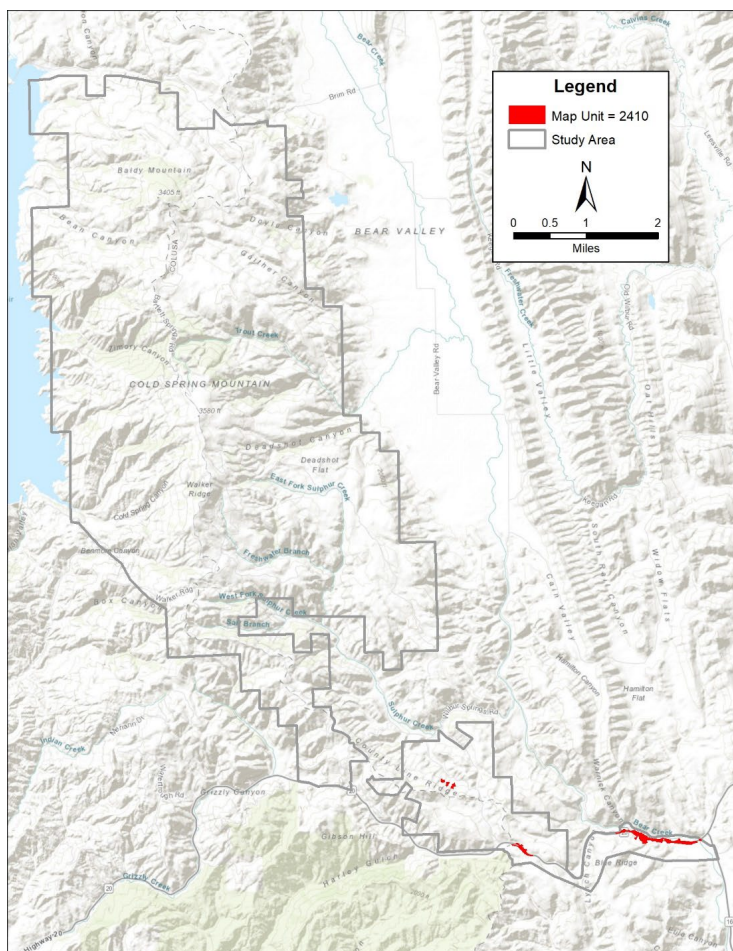
DESCRIPTION: Herbaceous vegetation strongly dominated (typically >90% relative cover) by non-native grasses and forbs such as *Aegilops*, *Avena*, *Brachypodium*, *Brassica*, *Briza*, *Bromus*, *Carduus pycnocephalus*, *Centaurea*, *Conium maculatum*, *Cynosurus*, *Dipsacus fullonum*, *D. sativus*, *Erodium*, *Festuca (Lolium)*, *Foeniculum vulgare* and *Raphanus*. Native herbaceous species have insignificant cover in these stands, especially during the active growing season. Stands are found in rangelands, fallow fields, riparian areas, and disturbed settings.

Stands characterized by strongly dominant non-native grasses and herbs. Non-native species tend not to favor serpentine substrate.

Photo interpreters are unable to distinguish native species from the non-native Mediterranean annuals and must model based on edaphic and topographical characteristics. Photo interpreters also evaluate concentrations of land use types and their proximity to herbaceous vegetation in deciding which Group to assign, if possible.

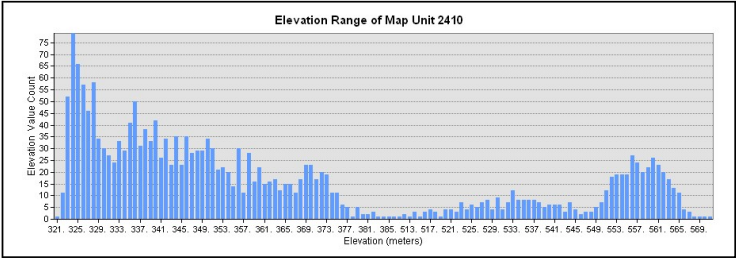
Stands of this group are infrequently mapped in the study area, based on field data. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

Californian Ruderal Grassland, Meadow & Scrub Group (2410)

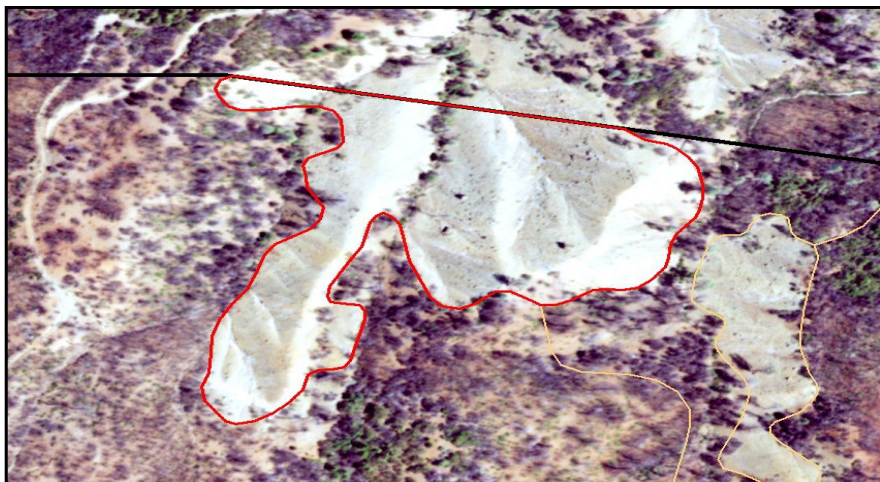


DISTRIBUTION: Only six polygons of the Californian Ruderal Grassland, Meadow & Scrub Group were mapped, based on field data, in the southern part of the study area.

Californian Ruderal Grassland, Meadow & Scrub Group (2410)



Californian Cliff, Scree & Rock Vegetation Group (6110)



Aerial view of the Californian Cliff, Scree & Rock Vegetation Group, composed of serpentine. This image shows light colored substrate.



Ground view of the Californian Cliff, Scree & Rock Vegetation Group in among *Pinus sabiniana*. Note that this ground is composed of serpentine.

Californian Cliff, Scree & Rock Vegetation Group (6110)

DESCRIPTION: *Allium falcifolium*, *Eriogonum dasyanthemum*, *Dudley* ssp., *Sedum spathulifolium*, and/or *Streptanthus breweri* characterize or dominate stands on exposed rock and scree slopes.

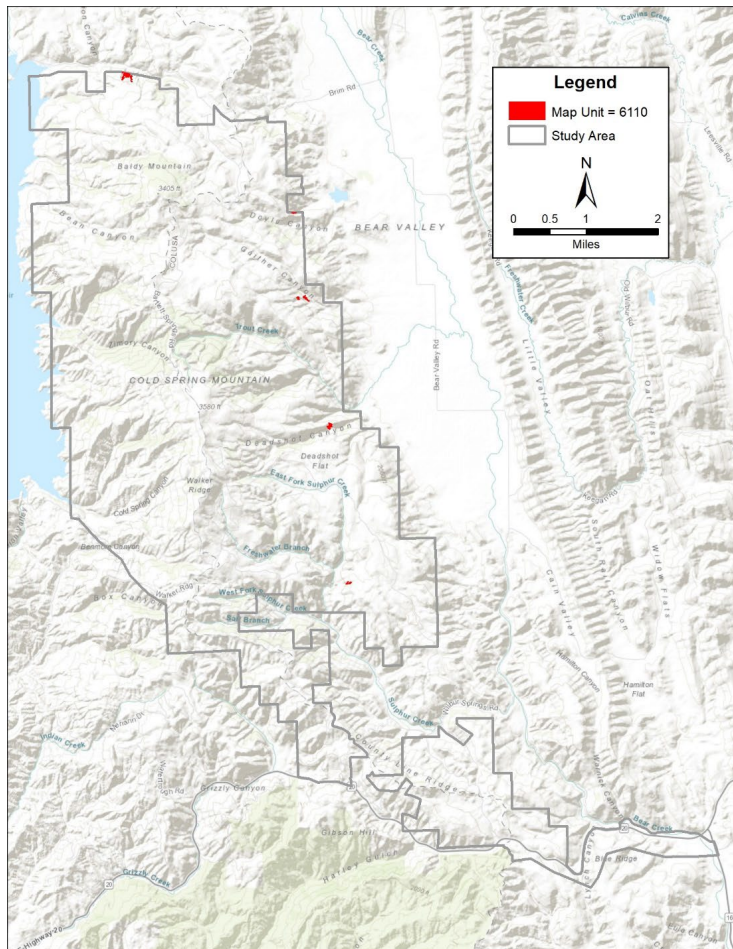
Mapped as natural features in the landscape with little or no vegetation (generally below 5-10% total cover) on rocky substrates. Includes sparsely vegetated stands occurring on steep boulder-covered slopes or on steep canyon slopes.

PHOTOINTERPRETATION SIGNATURE: Large boulders and rock outcroppings appear in striations of white to light gray to dark gray. Surface can be smooth or very uneven. Stands contain a very low cover of grasses and woody plants, but may contain a variety of endemic native forbs and herbaceous species which are undetectable from the imagery.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

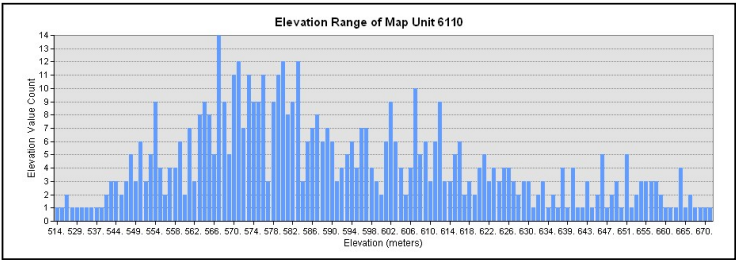
- None.

Californian Cliff, Scree & Rock Vegetation Group (6110)



DISTRIBUTION: Only seven polygons of the Californian Cliff, Scree & Rock Vegetation Group were mapped throughout the study area.

Californian Cliff, Scree & Rock Vegetation Group (6110)



Vancouverian Freshwater Wet Meadow & Marsh Group (3120)



Aerial view of two polygons mapped as the Vancouverian Freshwater Wet Meadow & Marsh Group. Note variability of tan and green signature color showing variable moisture levels of saturated meadows.



Ground view portion of the Vancouverian Freshwater Wet Meadow & Marsh Group meadow, composed of *Carex serratodens*.

Vancouverian Freshwater Wet Meadow & Marsh Group (3120)

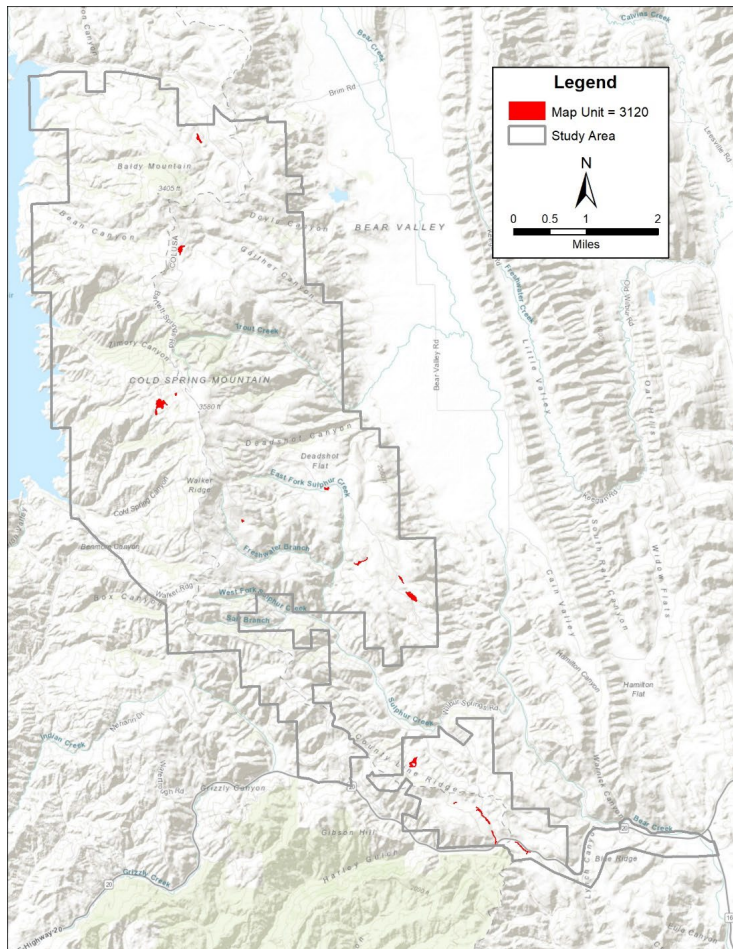
DESCRIPTION: Wetland herbaceous vegetation dominated or characterized by *Carex serratodens*, *Cirsium douglasii* var. *breweri*, *Juncus arcticus*, *Hordeum brachyantherum*, *Leymus triticoides*, or *Mimulus guttatus*. Stands occupy settings where saturated soil or standing water throughout the growing season are key characteristics. Occurs on moist and wet meadows and channel bottoms. Inclusions of non-native *Lepidium latifolium*, *Persicaria* (*Polygonum*), *Phalaris* sp. or *Xanthium strumarium* may be present.

PHOTOINTERPRETATION SIGNATURE: Signature color shows shades of green to tan, at times mottled, with a flat low growing texture. Stands are in or straddling a moist drainage, spring, or wet meadow area. Imagery of various years show moisture through the summer months. Some mapped sites include field data.

TYPES WITH SIMILAR PHOTOINTERPRETATION SIGNATURES:

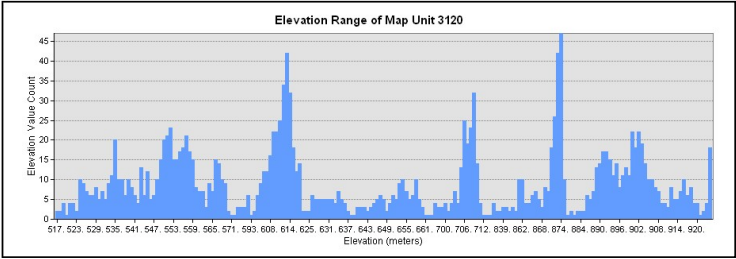
- ***Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance (3311) –** *Lepidium* has a variable signature, often mottled and occurs on dry settings on stream terraces, and mesic linear settings. The Vancouverian Freshwater Wet Meadow & Marsh Group has a smoother signature and is typically pinker on color infrared imagery.
- **Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (3310) –** If the cover of native herbaceous species is less than 10 percent then the stand may be considered as the Western North American Ruderal Marsh, Wet Meadow & Shrubland Group.

Vancouverian Freshwater Wet Meadow & Marsh Group (3120)



DISTRIBUTION: Fifteen polygons of the Vancouverian Freshwater Wet Meadow & Marsh Group were mapped throughout the study area.

Vancouverian Freshwater Wet Meadow & Marsh Group (3120)



***Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance (3121)**

Coastal tufted hair grass – Meadow barley – California oatgrass Alliance



Aerial view of *Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance downstream of Eaton Springs.



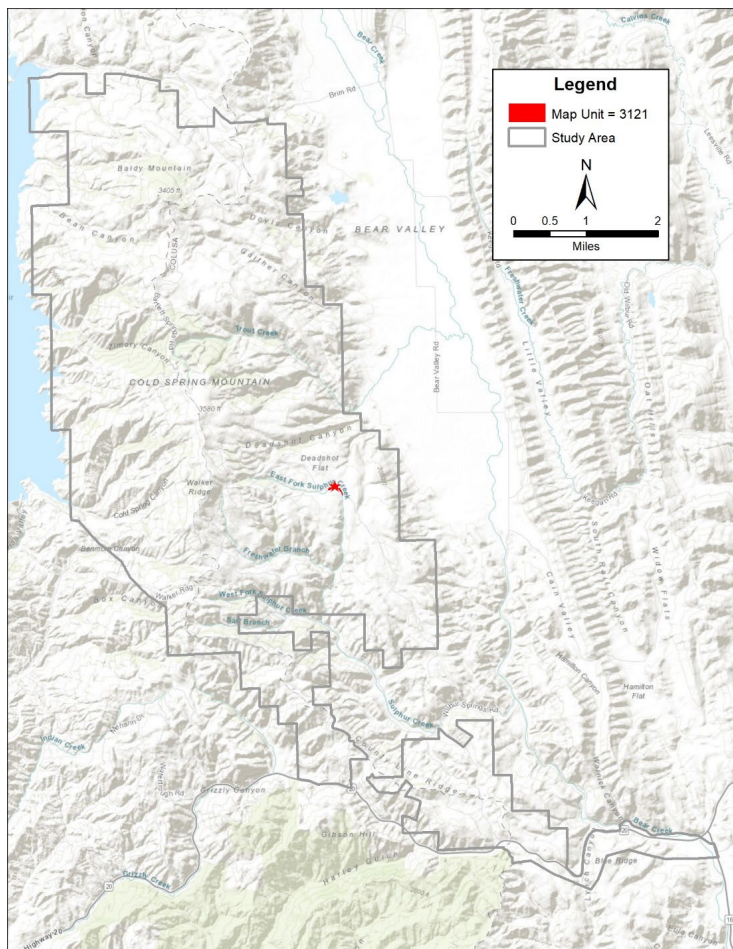
Ground view of *Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance downstream of Eaton Springs. Stand contains *Avena* spp., *Bromus diandrus*, *Hordeum brachyantherum* and *Centaurea solstitialis*.

Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica
Alliance (3121)

DESCRIPTION: *Hordeum brachyantherum* dominates or co-dominates with *Hemizonia congesta*, *Elymus triticoides*, and other forbs and graminoids in moist meadows, along streams, and near seeps and springs.

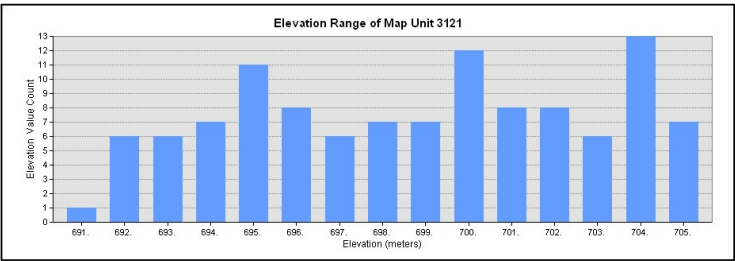
Mapped based on AA field data, split from large macrogroup poly by a small meadow. Stands of this alliance are infrequently mapped in the study area. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

***Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica*
Alliance (3121)**

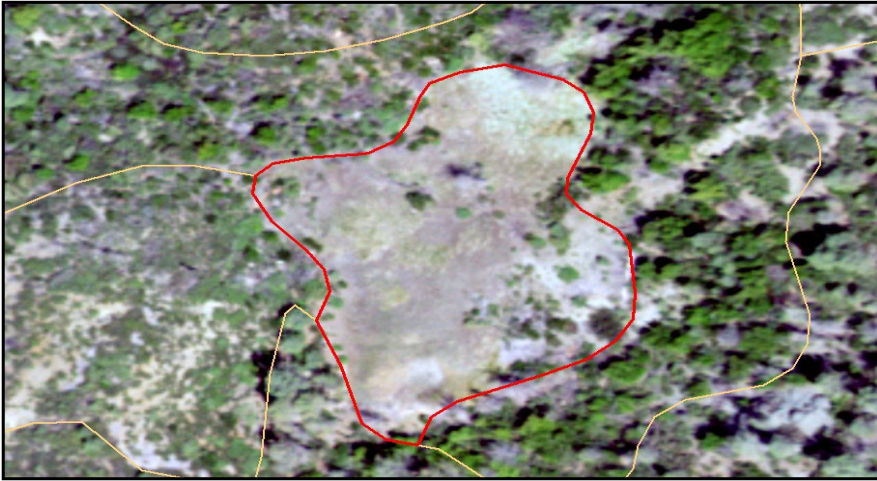


DISTRIBUTION: Only one polygon of the *Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance was mapped in the study area based on AA field data.

***Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica*
Alliance (3121)**



Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance (3123)
Soft and western rush – Sedge Alliance



Aerial view of an open meadow of the *Juncus (effusus, patens) – Carex (pansa, praegracilis)* Alliance, just west of Cold Spring Mountain.



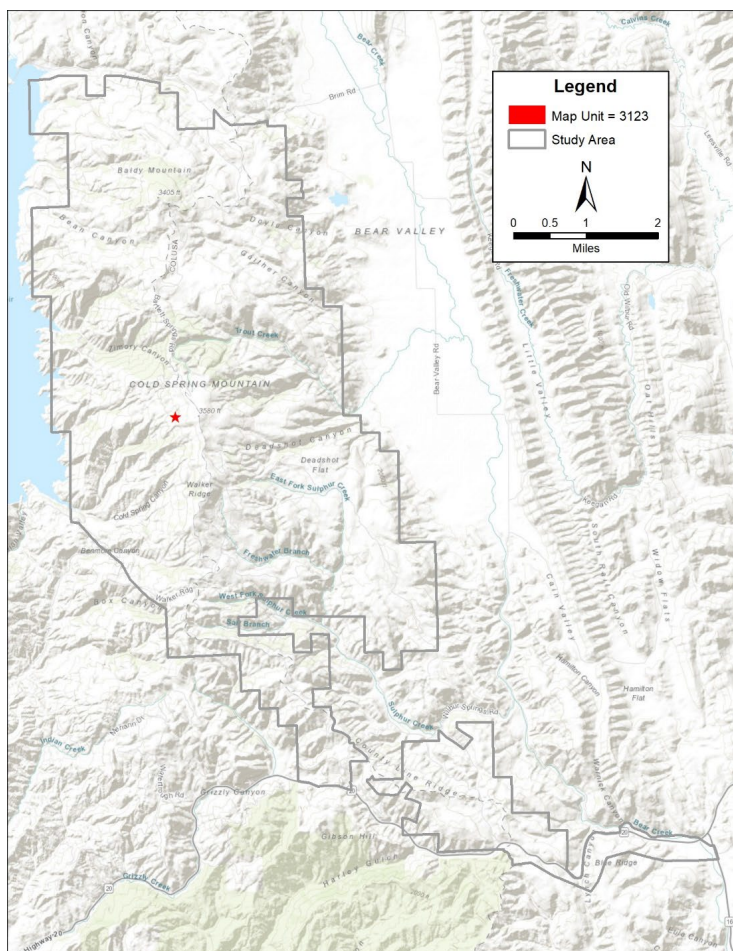
Ground view of the *Juncus (effusus, patens) – Carex (pansa, praegracilis)* Alliance. Stand contains *Carex praegracilis*, *Carex serratodens*, *Juncus xiphioides*, and *Bromus carinatus*.

Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance (3123)

DESCRIPTION: *Carex serratodens* dominates or co-dominates with *Juncus arcticus* or *Elymus* spp. in serpentine seeps and meadows, along with other graminoids and forbs including *Cirsium douglasii* var. *breweri*. If forbs such as *Cirsium* and *Stachys* dominate, key to the *Mimulus guttatus – Cirsium* spp. – *Stachys* spp. Alliance.

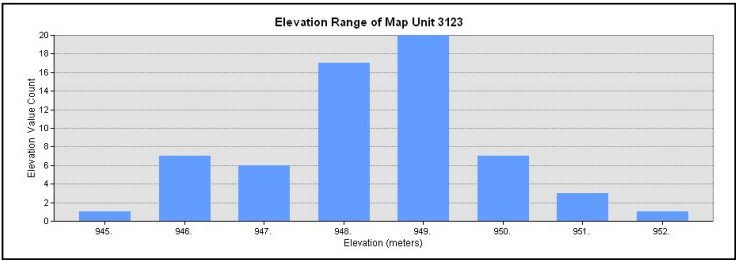
Mapped based on AA field data. Stands of this alliance are infrequently mapped in the study area. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

Juncus (effusus, patens) – Carex (pansa, praeegracilis) Alliance (3123)

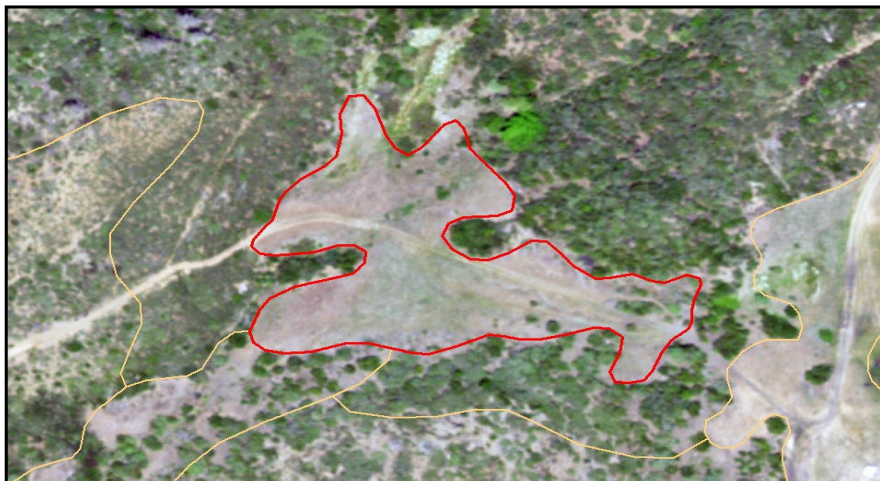


DISTRIBUTION: Only one polygon of the *Juncus (effusus, patens) – Carex (pansa, praeegracilis)* Alliance was mapped in the study area, based on AA field data.

Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance (3123)



Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (3310)



Aerial view of a stand of the Western North American Ruderal Marsh, Wet Meadow & Shrubland Group.



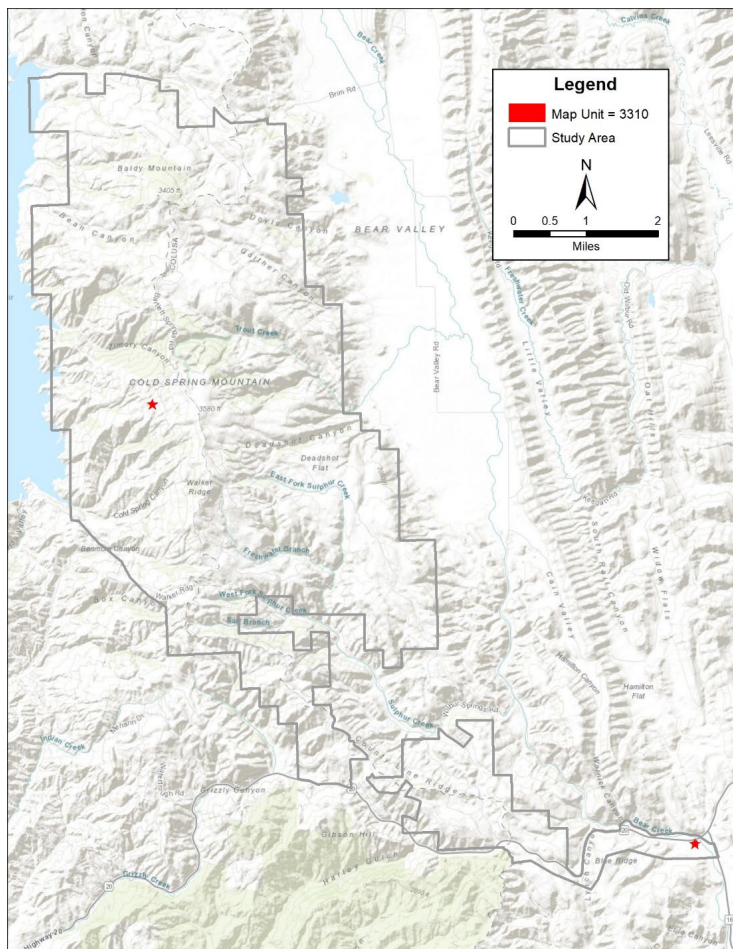
Ground view of the Western North American Ruderal Marsh, Wet Meadow & Shrubland Group. Stand is composed mainly of *Phalaris aquatica*, *Avena barbata*, *Elymus caput-medusae*, and *Bromus hordeaceus*.

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (3310)

DESCRIPTION: *Lepidium latifolium*, *Lactuca serriola*, *Chenopodium album*, *Rumex* sp., and/or *Phalaris* sp. strongly dominate as non-native herbs in the herbaceous layer along intermittently and seasonally flooded ponds and disturbed riparian terraces. In the study area this alliance occurs on upper edges of streams and higher terraces of wetlands with non-native herbs. If native herbaceous species exceed at least 10 percent cover then the stand may be considered as the Vancouverian Freshwater Wet Meadow & Marsh Group.

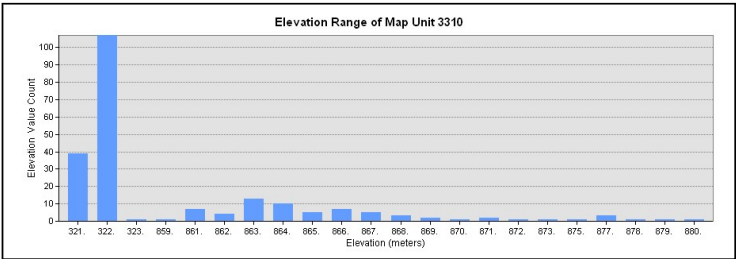
Stands of this Group are infrequently mapped in the study area, only two stands were mapped from field data. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (3310)



DISTRIBUTION: Only two polygons of the Western North American Ruderal Marsh, Wet Meadow & Shrubland Group were mapped, from field data, in the study area.

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (3310)



***Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance (3311)**
Perennial Pepperweed – Prickly Lettuce Alliance



Aerial view of a stand of light green *Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance along State Highway 20.



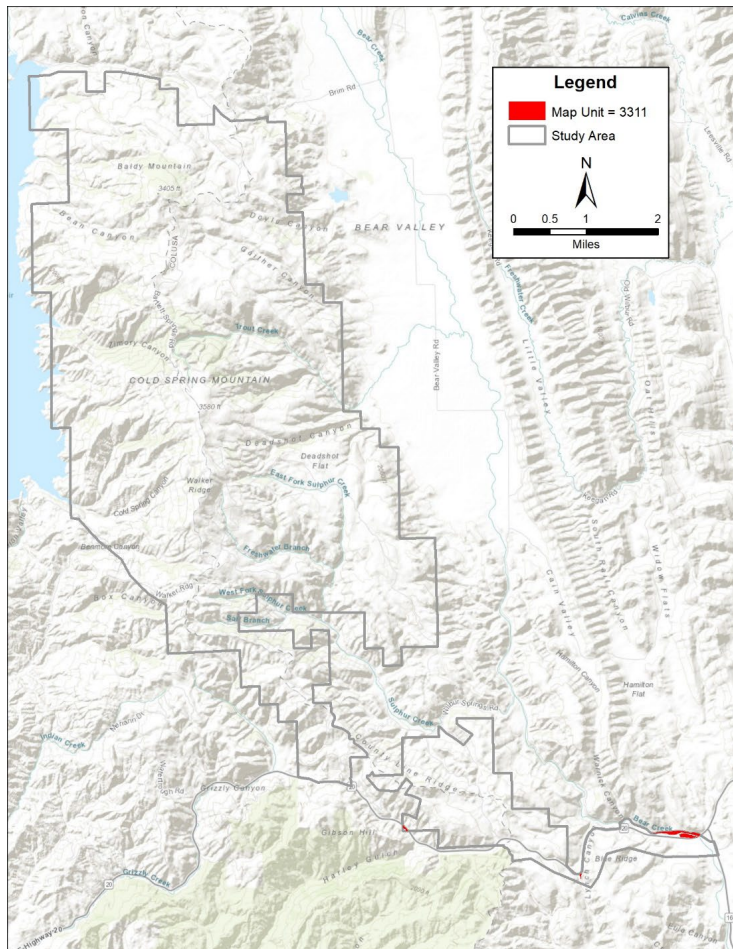
Ground view of a stand of light green *Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance along a small creek. Inflorescences area white, enhancing the lighter colors.

***Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance (3311)**

DESCRIPTION: *Lepidium latifolium*, *Lactuca serriola*, *Chenopodium album* and/or *Rumex* sp. strongly dominate as non-native herbs in the herbaceous layer along intermittently and seasonally flooded ponds and disturbed riparian terraces. In the study area this alliance occurs on upper edges of streams and higher terraces of wetlands with non-native herbs.

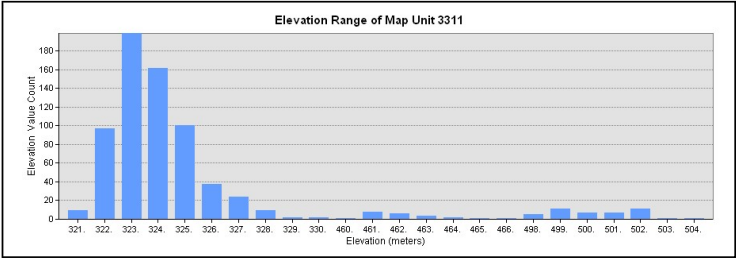
Stands of this alliance are infrequently mapped in the study area. Sites were mapped from field data. The base imagery yielded a mottled bright light green signature. Environmental correlates and/or photointerpretation signature attributes cannot be reliably established for this project.

***Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance (3311)**



DISTRIBUTION: Only four polygons of the *Lepidium latifolium* – *Lactuca serriola* Semi-natural Alliance was mapped in the southeastern end of the study area, based on field data, along State Highway 20.

***Lepidium latifolium* – (*Lactuca serriola*) Semi-natural Alliance (3311)**



Miscellaneous Classes

MU ¼ acre for special, wetland, riparian, rock, land use

9300 = Built-up & Urban Disturbance Mapping Unit

9320 = Anthropogenic Areas of Little or No Vegetation Mapping Unit

9701 = Sparsely Vegetated Recent Burned Areas Mapping Unit

9800 = Water Mapping Unit, **Wetland**

9803 = Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit, **Wetland**

Built-Up & Urban Disturbance Mapping Unit (9300)



Aerial view of a rural residential site and associated disturbed property as part of the Built-up and Urban Disturbance Mapping Unit. Property consists of two structures and scattering of planted and native trees and shrubs.



Ground view of a large parcel of residential property considered as the Built-up and Urban Disturbance Mapping Unit.

Built-Up & Urban Disturbance Mapping Unit (9300)

DESCRIPTION: Built-up areas include permanent and semi-permanent structures that are occupied/used or abandoned. Built-up areas can include residential, commercial and services, industrial, and transportation uses, as well as their associated disturbed lands. Areas under construction are also included. Associated impervious surfaces such as parking lots and playgrounds are normally included in the built-up area. Small areas of naturally occurring vegetation may be included in the built-up area. Major four-lane divided highways and freeways are included in this mapping type and are delineated to the approximate fenced right-of-way.

PHOTOINTERPRETATION SIGNATURE: Built-up areas consist of structures and the surrounding associated cleared and/or impervious surface. The boundaries often follow road centerlines and/or fence property lines. Vegetation within the polygon is limited to small naturally occurring components of adjacent stands crossing into the built-up area, and exotic plantings associated with the land use such as lawns, gardens, hedgerows, and trees.

Anthropogenic Areas of Little or No Vegetation Mapping Unit (9320)



Aerial view of a flat man-made cleared area considered as the Anthropogenic Areas of Little or No Vegetation Mapping Unit. Note the bright white signature of scraped ground.



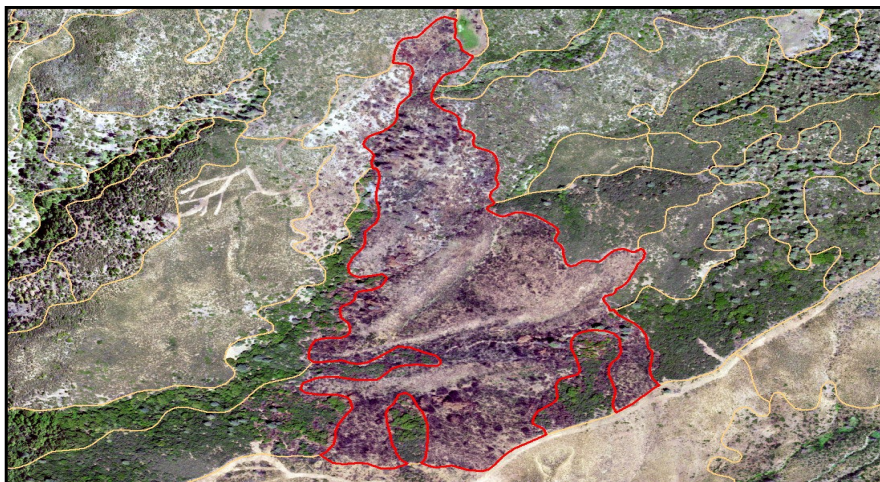
Ground view of a flat man-made cleared area considered as the Anthropogenic Areas of Little or No Vegetation Mapping Unit.

Anthropogenic Areas of Little or No Vegetation Mapping Unit (9320)

DESCRIPTION: Anthropogenically cleared areas containing less than 2% vegetative cover and have been cleared by human impact. These areas can be temporal in nature and are based on the project imagery acquisition timing. Surfaces are generally permeable and can either be covered by fill dirt from another source or contain the original soil and/or substrate layer. Small remnant impervious pavement surfaces can make up a portion of the site. Examples include areas that have recently been cleared for construction or demolition sites that have most of their impervious surface removed.

PHOTOINTERPRETATION SIGNATURE: Polygons mapped as this type typically appear as a smooth white or beige surface, usually nearby to land use or agricultural structures. Sometimes linear scraping and/or piles of debris can be seen on the imagery. They normally have a smooth texture and generally reflect the color of the substrate surface formed by its parent material. There is usually a distinct boundary where the vegetation ends and the sparse area begins. Unvegetated edges follow angular or straight lines which do not normally occur along the boundaries between vegetation types. These areas are difficult to distinguish when adjacent natural vegetation is under 5% cover.

Sparsely Vegetated Recently Burned Areas Mapping Unit (9701)



Aerial view of a recently burned very sparsely vegetated area, with a black ashy signature. Note the partially burned trees and shrubs in the adjacent polygons.

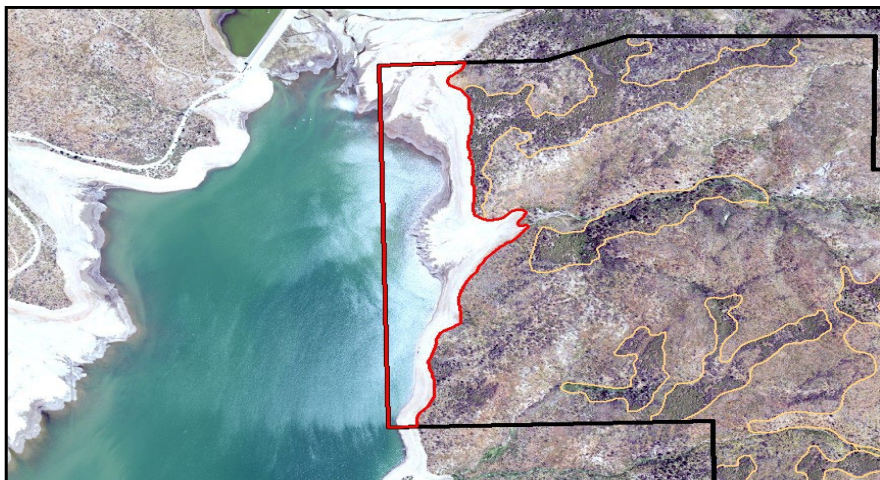
Ground photo is not available.

Sparsely Vegetated Recently Burned Areas Mapping Unit (9701)

DESCRIPTION: Sparsely Vegetated Recently Burned Areas Mapping Unit is mapped where a recent fire (within 2 years prior to the imagery) has reduced vegetation to ash or sometime burnt skeletal remnants of the plants, with subsequent recovery being very minimal, making photointerpretation of vegetation unreliable.

PHOTOINTERPRETATION SIGNATURE: Depending on what vegetation was present prior to the fire, signature may display light gray/black to brown tree and shrub snags and/or a blackened understory of ash.

Water Mapping Unit (9800)



Aerial view of the man-made Indian Valley Reservoir, considered as the Water Body Mapping Unit. Note the white maintained scraped edge of the reservoir below the high-water line is included. At the time of the photo the water level was low.



Ground view of Indian Valley Reservoir, considered as the Water Body Mapping Unit. Note the maintained tan ring around the water representing cleared and grassy areas below the high-water line.

Water Mapping Unit (9800)

DESCRIPTION: Baseline interpretation date is late spring to early summer 2020, using NAIP 60-cm imagery. Changes in vegetation or flooding regimes either seasonally or on a year-to-year basis occurs with water features, especially along lake & reservoir margins and flowing water in larger streams and rivers. Features coded as this type (9800) include water recharge/catchment basins that are not along a natural stream course; ponds or basins associated with land use; and naturally occurring pools of low-lying water within the floodplain but are separate from the main stream/river channels.

PHOTOINTERPRETATION SIGNATURE: Signatures of this type capture artificial water bodies that appear as a stark black or blue, round to irregular shape with a distinctive edge.

Small Earthen Dam Ponds & Natural Lakes Mapping Unit (9803)



Aerial view of a Small Earthen Dammed Pond, in this case a farm pond in a developed ranch setting.



A Small Earthen Dammed Pond on a developed ranch.

Small Earthen Dammed Ponds & Natural Lakes Mapping Unit (9803)

DESCRIPTION: This type captures small dammed water bodies along or adjacent to natural stream courses. In some case there may be some kind of structure or land use associated nearby.

Only four polygons of this type were mapped in the study area.

PHOTOINTERPRETATION SIGNATURE: Stands of this type occur as rounded to irregular shapes with dark-colored water and an earthen dam on the downstream edge. Often a gap in the riparian vegetation is observed on the downstream edge where the earthen dam occurs.

APPENDIX C

SUMMARIES OF ACREAGE AND POLYGON COUNT BY MAP UNIT 09/30/2023

Three tables are presented on the following pages. The first table lists each of the map units occurring in the final database of the Walker Ridge (Molok Luyuk) project, in numerical order by code value. The number of polygons is presented, followed by 4 columns relating to area: the total area covered by the map unit in the study area expressed in hectares; total area in acres; the percent of the total study area mapped as the given map unit; and the map unit's average polygon size in acres. The second table is identical to the first, except the map units are presented in alphabetical order. The third table lists the map units in order by total area from highest to lowest.

Table C-1: Map Unit Acreage, Listed Numerically

Map Unit	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
1111	Aesculus californica Alliance	46	71.8	177.5	0.8%	3.9
1112	Quercus chrysolepis (tree) Alliance	42	238.6	589.5	2.7%	14.0
1113	Quercus douglasii Alliance	135	295.4	729.9	3.3%	5.4
1114	Quercus wislizeni - Quercus parvula (tree) Alliance	4	4.4	10.8	0.0%	2.7
1115	Umbellularia californica Alliance	30	91.3	225.7	1.0%	7.5
1121	Hesperocyparis (sargentii, macnabiana) Alliance	171	2121.4	5242.0	23.8%	30.7
1122	Pinus attenuata Alliance	23	56.3	139.1	0.6%	6.0
1123	Pinus sabiniana Alliance	49	81.1	200.4	0.9%	4.1
1311	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	3	3.7	9.2	0.0%	3.1
1312	Salix gooddingii - Salix laevigata Alliance	1	1.1	2.6	0.0%	2.6
1411	Tamarix spp. Semi-natural Alliance	5	8.4	20.7	0.1%	4.1
2111	Adenostoma fasciculatum Alliance	312	1653.2	4085.2	18.5%	13.1
2112	Arctostaphylos (canescens, manzanita, stanfordiana) Alliance	1	0.7	1.8	0.0%	1.8
2113	Arctostaphylos viscida Alliance	15	82.0	202.6	0.9%	13.5
2114	Ceanothus cuneatus Alliance	100	319.2	788.9	3.6%	7.9
2121	Ceanothus (oliganthus, tomentosus) Alliance	1	2.3	5.6	0.0%	5.6
2122	Cercocarpus montanus Alliance	5	6.5	16.2	0.1%	3.2
2123	Prunus ilicifolia - Heteromeles arbutifolia - Ceanothus spinosus Alliance	7	13.6	33.6	0.2%	4.8
2124	Quercus berberidifolia Alliance	223	839.2	2073.7	9.4%	9.3
2125	Quercus durata Alliance	307	2212.2	5466.4	24.8%	17.8
2126	Quercus wislizeni - Quercus chrysolepis (shrub) Alliance	53	409.6	1012.3	4.6%	19.1
2211	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	4	12.0	29.6	0.1%	7.4
2300	Californian Annual & Perennial Grassland Macrogroup	125	246.4	608.9	2.8%	4.9
2320	Californian Annual Grassland & Forb Meadow Group	9	11.7	28.9	0.1%	3.2
2324	Lasthenia californica - Plantago erecta - Vulpia microstachys Alliance	1	0.4	1.0	0.0%	1.0
2410	Californian Ruderal Grassland, Meadow & Scrub Group	6	16.8	41.6	0.2%	6.9
3111	Frangula californica - Rhododendron occidentale - Salix breweri Alliance	17	32.1	79.3	0.4%	4.7
3120	Vancouverian Freshwater Wet Meadow & Marsh Group	15	14.7	36.3	0.2%	2.4

Table C-1: Map Unit Acreage, Listed Numerically

Map Unit	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
3121	Deschampsia cespitosa - Hordeum brachyantherum - Danthonia californica Alliance	1	0.9	2.3	0.0%	2.3
3123	Juncus (effusus, patens) - Carex (pansa, praegracilis) Alliance	1	0.5	1.2	0.0%	1.2
3310	Western North American Ruderal Marsh, Wet Meadow & Shrubland Group	2	1.8	4.4	0.0%	2.2
3311	Lepidium latifolium - Lactuca serriola Semi-natural Alliance	4	5.8	14.4	0.1%	3.6
3410	Arid West Interior Freshwater Marsh Group	1	0.8	1.9	0.0%	1.9
3511	Rhus trilobata - Crataegus rivularis - Forestiera pubescens Alliance	3	1.2	3.1	0.0%	1.0
3613	Salix lasiolepis Alliance	1	0.6	1.4	0.0%	1.4
3614	Cornus sericea Alliance	1	0.1	0.3	0.0%	0.3
6110	Californian Cliff, Scree & Rock Vegetation Group	7	4.8	11.8	0.1%	1.7
9300	Built-up & Urban Disturbance Mapping Unit	3	2.3	5.6	0.0%	1.9
9320	Anthropogenic Areas of Little or No Vegetation Mapping Unit	10	14.9	36.7	0.2%	3.7
9701	Sparsely Vegetated Recent Burned Areas Mapping Unit	1	16.2	39.9	0.2%	39.9
9800	Water Mapping Unit	6	31.5	77.8	0.4%	13.0
9803	Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit	4	0.5	1.1	0.0%	0.3
	Totals	1,755	8,927.9	22,061.4	100.0%	12.6

Table C-2: Map Unit Acreage, Listed Alphabetically

Map Unit	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
2111	Adenostoma fasciculatum Alliance	312	1653.2	4085.2	18.5%	13.1
1111	Aesculus californica Alliance	46	71.8	177.5	0.8%	3.9
9320	Anthropogenic Areas of Little or No Vegetation Mapping Unit	10	14.9	36.7	0.2%	3.7
2112	Arctostaphylos (canescens, manzanita, stanfordiana) Alliance	1	0.7	1.8	0.0%	1.8
2113	Arctostaphylos viscida Alliance	15	82.0	202.6	0.9%	13.5
3410	Arid West Interior Freshwater Marsh Group	1	0.8	1.9	0.0%	1.9
9300	Built-up & Urban Disturbance Mapping Unit	3	2.3	5.6	0.0%	1.9
2300	Californian Annual & Perennial Grassland Macrogroup	125	246.4	608.9	2.8%	4.9
2320	Californian Annual Grassland & Forb Meadow Group	9	11.7	28.9	0.1%	3.2
6110	Californian Cliff, Scree & Rock Vegetation Group	7	4.8	11.8	0.1%	1.7
2410	Californian Ruderal Grassland, Meadow & Scrub Group	6	16.8	41.6	0.2%	6.9
2121	Ceanothus (oliganthus, tomentosus) Alliance	1	2.3	5.6	0.0%	5.6
2114	Ceanothus cuneatus Alliance	100	319.2	788.9	3.6%	7.9
2122	Cercocarpus montanus Alliance	5	6.5	16.2	0.1%	3.2
3614	Cornus sericea Alliance	1	0.1	0.3	0.0%	0.3
3121	Deschampsia cespitosa - Hordeum brachyantherum - Danthonia californica Alliance	1	0.9	2.3	0.0%	2.3
3111	Frangula californica - Rhododendron occidentale - Salix breweri Alliance	17	32.1	79.3	0.4%	4.7
1121	Hesperocyparis (sargentii, macnabiana) Alliance	171	2121.4	5242.0	23.8%	30.7
3123	Juncus (effusus, patens) - Carex (pansa, praegracilis) Alliance	1	0.5	1.2	0.0%	1.2
2324	Lasthenia californica - Plantago erecta - Vulpia microstachys Alliance	1	0.4	1.0	0.0%	1.0
3311	Lepidium latifolium - Lactuca serriola Semi-natural Alliance	4	5.8	14.4	0.1%	3.6
2211	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	4	12.0	29.6	0.1%	7.4
1122	Pinus attenuata Alliance	23	56.3	139.1	0.6%	6.0
1123	Pinus sabiniana Alliance	49	81.1	200.4	0.9%	4.1
1311	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	3	3.7	9.2	0.0%	3.1
2123	Prunus ilicifolia - Heteromeles arbutifolia - Ceanothus spinosus Alliance	7	13.6	33.6	0.2%	4.8

Table C-2: Map Unit Acreage, Listed Alphabetically

Map Unit	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
2124	Quercus berberidifolia Alliance	223	839.2	2073.7	9.4%	9.3
1112	Quercus chrysolepis (tree) Alliance	42	238.6	589.5	2.7%	14.0
1113	Quercus douglasii Alliance	135	295.4	729.9	3.3%	5.4
2125	Quercus durata Alliance	307	2212.2	5466.4	24.8%	17.8
2126	Quercus wislizeni - Quercus chrysolepis (shrub) Alliance	53	409.6	1012.3	4.6%	19.1
1114	Quercus wislizeni - Quercus parvula (tree) Alliance	4	4.4	10.8	0.0%	2.7
3511	Rhus trilobata - Crataegus rivularis - Forestiera pubescens Alliance	3	1.2	3.1	0.0%	1.0
1312	Salix gooddingii - Salix laevigata Alliance	1	1.1	2.6	0.0%	2.6
3613	Salix lasiolepis Alliance	1	0.6	1.4	0.0%	1.4
9803	Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit	4	0.5	1.1	0.0%	0.3
9701	Sparsely Vegetated Recent Burned Areas Mapping Unit	1	16.2	39.9	0.2%	39.9
1411	Tamarix spp. Semi-natural Alliance	5	8.4	20.7	0.1%	4.1
1115	Umbellularia californica Alliance	30	91.3	225.7	1.0%	7.5
3120	Vancouverian Freshwater Wet Meadow & Marsh Group	15	14.7	36.3	0.2%	2.4
9800	Water Mapping Unit	6	31.5	77.8	0.4%	13.0
3310	Western North American Ruderal Marsh, Wet Meadow & Shrubland Group	2	1.8	4.4	0.0%	2.2
	Totals	1,755	8,927.9	22,061.4	100.0%	12.6

Table C-3: Map Units By Total Area

Map Unit	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
2125	Quercus durata Alliance	307	2212.2	5466.4	24.8%	17.8
1121	Hesperocyparis (sargentii, macnabiana) Alliance	171	2121.4	5242.0	23.8%	30.7
2111	Adenostoma fasciculatum Alliance	312	1653.2	4085.2	18.5%	13.1
2124	Quercus berberidifolia Alliance	223	839.2	2073.7	9.4%	9.3
2126	Quercus wislizeni - Quercus chrysolepis (shrub) Alliance	53	409.6	1012.3	4.6%	19.1
2114	Ceanothus cuneatus Alliance	100	319.2	788.9	3.6%	7.9
1113	Quercus douglasii Alliance	135	295.4	729.9	3.3%	5.4
2300	Californian Annual & Perennial Grassland Macrogroup	125	246.4	608.9	2.8%	4.9
1112	Quercus chrysolepis (tree) Alliance	42	238.6	589.5	2.7%	14.0
1115	Umbellularia californica Alliance	30	91.3	225.7	1.0%	7.5
2113	Arctostaphylos viscida Alliance	15	82.0	202.6	0.9%	13.5
1123	Pinus sabiniana Alliance	49	81.1	200.4	0.9%	4.1
1111	Aesculus californica Alliance	46	71.8	177.5	0.8%	3.9
1122	Pinus attenuata Alliance	23	56.3	139.1	0.6%	6.0
3111	Frangula californica - Rhododendron occidentale - Salix breweri Alliance	17	32.1	79.3	0.4%	4.7
9800	Water Mapping Unit	6	31.5	77.8	0.4%	13.0
2410	Californian Ruderal Grassland, Meadow & Scrub Group	6	16.8	41.6	0.2%	6.9
9701	Sparsely Vegetated Recent Burned Areas Mapping Unit	1	16.2	39.9	0.2%	39.9
9320	Anthropogenic Areas of Little or No Vegetation Mapping Unit	10	14.9	36.7	0.2%	3.7
3120	Vancouverian Freshwater Wet Meadow & Marsh Group	15	14.7	36.3	0.2%	2.4
2123	Prunus ilicifolia - Heteromeles arbutifolia - Ceanothus spinosus Alliance	7	13.6	33.6	0.2%	4.8
2211	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	4	12.0	29.6	0.1%	7.4
2320	Californian Annual Grassland & Forb Meadow Group	9	11.7	28.9	0.1%	3.2
1411	Tamarix spp. Semi-natural Alliance	5	8.4	20.7	0.1%	4.1
2122	Cercocarpus montanus Alliance	5	6.5	16.2	0.1%	3.2
3311	Lepidium latifolium - Lactuca serriola Semi-natural Alliance	4	5.8	14.4	0.1%	3.6

Table C-3: Map Units By Total Area

Map Unit	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
6110	Californian Cliff, Scree & Rock Vegetation Group	7	4.8	11.8	0.1%	1.7
1114	Quercus wislizeni - Quercus parvula (tree) Alliance	4	4.4	10.8	0.0%	2.7
1311	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	3	3.7	9.2	0.0%	3.1
9300	Built-up & Urban Disturbance Mapping Unit	3	2.3	5.6	0.0%	1.9
2121	Ceanothus (oliganthus, tomentosus) Alliance	1	2.3	5.6	0.0%	5.6
3310	Western North American Ruderal Marsh, Wet Meadow & Shrubland Group	2	1.8	4.4	0.0%	2.2
3511	Rhus trilobata - Crataegus rivularis - Forestiera pubescens Alliance	3	1.2	3.1	0.0%	1.0
1312	Salix gooddingii - Salix laevigata Alliance	1	1.1	2.6	0.0%	2.6
3121	Deschampsia cespitosa - Hordeum brachyantherum - Danthonia californica Alliance	1	0.9	2.3	0.0%	2.3
3410	Arid West Interior Freshwater Marsh Group	1	0.8	1.9	0.0%	1.9
2112	Arctostaphylos (canescens, manzanita, stanfordiana) Alliance	1	0.7	1.8	0.0%	1.8
3613	Salix lasiolepis Alliance	1	0.6	1.4	0.0%	1.4
3123	Juncus (effusus, patens) - Carex (pansa, praegracilis) Alliance	1	0.5	1.2	0.0%	1.2
9803	Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit	4	0.5	1.1	0.0%	0.3
2324	Lasthenia californica - Plantago erecta - Vulpia microstachys Alliance	1	0.4	1.0	0.0%	1.0
3614	Cornus sericea Alliance	1	0.1	0.3	0.0%	0.3
	Totals	1,755	8,927.9	22,061.4	100.0%	12.6

APPENDIX D - Field Forms for Vegetation Sampling and Accuracy Assessment

CNPS RECON FIELD FORM (March 6, 2019, with slope/aspect)

Recorder:		Other Surveyors:		Date:		Return? <input type="checkbox"/>																																																																																																	
Waypoint ID:		GPS Name _____ Projected? No / Yes / Base / Digitized If Yes, enter: Bearing (°): _____ Distance (m): _____ Inclination (°): _____ If Yes or Digitized, enter: Base Waypoint ID: _____ Location Name: Base / Projected (circle one) Record either UTM's or Decimal Degrees GPS error: ft./ m./ PDOP _____ UTM's: UTME _____ UTMN _____ Decimal degrees: LAT _____ LONG - _____																																																																																																					
Stand Size: <1 1-5 >5		Camera:		Photos:		View Radius _____																																																																																																	
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<table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th colspan="2">% Cover: Conifer</th> <th colspan="2">Hardwood</th> <th colspan="2">Total Tree</th> <th colspan="2">Regen Tree</th> <th colspan="2">Shrub</th> <th colspan="2">Herb</th> <th colspan="2">Total Veg</th> <th colspan="2">Exotics (L,M,H)</th> </tr> <tr> <th>Strata</th> <th>Species</th> <th></th> <th>% cover</th> <th>Strata</th> <th>Species</th> <th></th> <th>% cover</th> <th>Strata</th> <th>Species</th> <th></th> <th>% cover</th> <th>Strata</th> <th>Species</th> <th></th> <th>% cover</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>								% Cover: Conifer		Hardwood		Total Tree		Regen Tree		Shrub		Herb		Total Veg		Exotics (L,M,H)		Strata	Species		% cover	Strata	Species		% cover	Strata	Species		% cover	Strata	Species		% cover																																																																
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Appendix E

Vegetation Field Key for the Molok Luyuk (Walker Ridge) Map Area

This field key is for the vegetation types, including alliances and associations, found along Molok Luyuk (also referred to as Walker Ridge), based on vegetation field survey data collected in 2022-23. The key is intended as a guide to field-based and image interpretation-based identification of vegetation. This key is not dichotomous; instead, it follows the hierarchy of the United States National Vegetation Classification (USNVC), in which we are updating the state classification of *A Manual of California Vegetation* (MCV; CNPS 2023) to conform to the revised USNVC (USNVC 2023). The USNVC hierarchy is promoted by the Federal Geographic Data Committee (FGDC), the Ecological Society of America's Vegetation Panel (FGDC 2008, Faber-Langendoen et al. 2012, 2014), and the California Department of Fish & Wildlife's Survey of California Vegetation (SCV).

This field key lists vegetation types starting with the current or recently updated version of the USNVC Macrogroup level and proceeding down to the Association level. The complete hierarchy for this classification is listed in Appendix G, Floristic Vegetation Classification Hierarchy.

Follow the instructions in a section carefully and sequentially to arrive at the determined vegetation type. You will need to collect or refer to plant composition data that includes species that are dominant and also those "indicator" or characteristic/diagnostic species, whose presence may cause a stand to key to a particular vegetation type. If it seems that a stand of vegetation could key to more than one type, review the descriptions (e.g., stand tables, environmental information) for each type to determine which one fits best. Note that this vegetation key may include types that may not be accurately detectable in remotely-sensed imagery.

Terms, Concepts, and Symbols used throughout the Key

Stand: The basic physical unit of plant communities in a landscape. It has no set size. Some vegetation stands are very small, such as certain wetland types, and some may be several square kilometers in size, such as certain forest types. A stand is defined by two main unifying characteristics:

1. It has compositional integrity. Throughout the stand, the combination of species is similar. The stand is differentiated from adjacent stands by a discernible boundary that may be abrupt or occur indistinctly along an ecological gradient.
2. It has structural integrity. It has a similar history or environmental setting that affords relatively similar horizontal and vertical spacing of plant species. For example, a hillside forest originally dominated by the same species that burned on the upper part of the slopes but not the lower would be divided into two stands. Likewise, a sparse woodland occupying a slope with very shallow rocky soils would be considered a different stand from an adjacent slope with deeper, moister soil and a denser woodland or forest of the same species.

The compositional and structural features of a stand are often combined into a term called homogeneity. For an area to meet the definition of a stand, it must be homogeneous at the scale being considered.

United States National Vegetation Classification (USNVC): A central organizing framework for how all vegetation in the United States is inventoried and studied, from broad scale formations (biomes) to fine-scale plant communities. The purpose of the NVC is to produce uniform statistics about vegetation resources across the nation, based on vegetation data gathered at local, regional, or national levels. The latest classification standard was published by the FGDC (2008).

The hierarchy units in the USNVC from highest to lowest (i.e., broadest to finest) are:

1. Formation Class
2. Formation Subclass
3. Formation
4. Division
5. Macrogroup
6. Group
7. Alliance
8. Association

Alliance: Plant communities based on dominant/diagnostic species of the uppermost or dominant stratum. Accepted alliances are part of the USNVC hierarchy. For the Molok Luyuk vegetation mapping effort, map classes are typically at the alliance level of the USNVC hierarchy (though sometimes at the Group or Macrogroup levels).

Association: The most botanically detailed or finest-scale plant community designation based on dominant species and multiple co-dominant or sub-dominant indicator species from any stratum. Associations are also part of the USNVC hierarchy. Molok Luyuk map classes are not typically defined to the association level, but they are noted in the key below the Alliance to represent the variation within each alliance that has been identified during the project.

Asterisks ()* – Types not currently known from or sampled in the study area, but that have a high potential to occur, are sometimes included in the key with an * after the alliance or association name.

Botanical nomenclature: We use the PLANTS database (USDA NRCS 2023) as our standard for botanical names, including scientific names, so this information can be shared nationally with our USNVC partners. However, when a more current name has been assigned in *The Jepson Manual, second edition* (Jepson Flora Project 2023), we may substitute names by the TJM2 and a species code beginning with “2JM” is assigned. General vegetation types, such as moss and lichen, have database codes beginning with the number 2 (e.g., 2MOSS).

Plant community nomenclature: Taxa separated by “-” are typically within the same stratum; taxa separated by “/” are in different strata.

Cover: The primary metric used to quantify the importance/abundance of a particular species or a particular vegetation layer within a stand. Cover is measured by estimating the aerial extent of the living plants, or the bird's-eye view looking from above, for each category. Cover in this project uses the concept of “porosity” or foliar cover rather than

"opacity" or crown cover. Thus, field crews are trained to estimate the amount of light versus shade produced by the canopy of a plant or a stratum by taking into account the amount of shade it casts excluding the openings it may have in the interstitial spaces (e.g., between leaves or branches). This is assumed to provide a more realistic estimate of the actual amount of shade cast by the individual or stratum which, in turn, relates to the actual amount of light available to individual species or strata beneath it. However, as a result, cover estimates can vary substantially between leaf-on versus leaf-off conditions. Stands dominated by deciduous species (e.g., *Aesculus californica*, *Toxicodendron diversilobum*) should be sampled during *leaf-on* since they will have substantially less cover when leaves are absent and may key to another type.

Absolute cover: The actual percentage of the surface area at a survey area covered by a species or physiognomic group (trees, shrubs, herbaceous), as in "tan oak covers 10% of the area being surveyed." Absolute cover of all species or physiognomic groups, when added together, may total greater than 100%, because this is not a proportional number and plants can overlap with each other. For example, a stand could have 25% tree cover in the upper layer, 40% shrub cover in the middle layer, and 50% herbaceous cover when surveyed on the ground. However, when aerial interpretation is being used, the maximum absolute value is 100%, since lower levels of vegetation cannot be seen through the overstory on aerial photographs.

Relative cover: The percentage of surface area at a survey area covered by one species relative to other species within the same physiognomic stratum (tree, shrub, herbaceous) or by one stratum relative to the total vegetation cover in an area (or polygon). Thus, 50% relative cover of *Quercus douglasii* in the tree layer means that *Q. douglasii* comprises half the cover of all tree species within a stand, while 50% relative shrub cover means that shrubs make up half the cover of all vegetation within a stand. Relative cover values are proportional numbers that, when added together, total 100% for each species within a stratum or each stratum within a stand of vegetation.

Dominance: Dominance refers to the preponderance of vegetation cover in a stand of uniform composition and site history. It may refer to cover of an individual species as in "dominated by tan oak," or it may refer to dominance by a physiognomic group, as in "dominated by shrubs." When we use the term in the key, a species is dominant if it is in relatively high cover in each stand (e.g., relative cover exceeds 50% of a layer's total cover). See "dominance by layer," below, for further explanation.

Strongly dominant: A species in the dominant lifeform stratum has 60% or greater relative cover.

Co-dominant: Co-dominance refers to two or more species in a stand with similar cover. Specifically, each species has between 30% and 60% relative cover. For example, in a scrub stand with 5% *Adenostoma fasciculatum*, 4% *Ceanothus cuneatus*, and 3% *Pickeringia montana* (total 12% shrub cover), technically only the *Adenostoma* ($5/12 = 42\%$ relative cover) and the *Ceanothus* ($4/12 = 33\%$ relative cover) would be co-dominant because *Pickeringia* would only have 25% relative cover ($3/12 = 25\%$).

Characteristic/Diagnostic species: Should be present in at least 80% of the stands of the type, with no restriction on cover. Relatively even spacing throughout the stand is

important, particularly in vegetation with low total cover, since an even distribution of the diagnostic species is a much better indicator than overall cover. Characteristic species that are evenly distributed are better indicators of a type than species with higher cover and patchy distribution.

Dominance by layer/stratum: Tree, shrub, and herbaceous layers are considered *physiognomically* distinct. Alliances are usually named by the dominant and/or characteristic species of the *tallest characteristic layer* (see tree-characterized, shrub-characterized, and herb-characterized vegetation definitions below). Average covers within the dominant layer reflect the "modal" concept of the health/age/environment of a particular vegetation type. For example, a higher average cover of woody plants within a stand not recently affected by disturbance reflects a mode of general availability of water, nutrition, and equitable climate, while lower average cover under similar conditions would reflect lower availability of these things.

Woody plant: A vascular plant species that has a noticeably woody stem (e.g., shrubs and trees). It does not include herbaceous species with woody underground portions such as tubers, roots, or rhizomes.

Tree: A one-stemmed woody plant that normally grows to be greater than 5 meters tall. In some cases, trees may be multi-stemmed (ramified due to fire or other disturbance) but the height of mature plants typically exceeds 5 meters. If less than 5 meters tall, undisturbed individuals of these species are usually single-stemmed. Certain species that sometimes resemble shrubs but may be trees in other areas (e.g., *Aesculus californica*) are, out of statewide tradition or by the USNVC, called trees. It behooves one to memorize which species are "traditionally" placed in one life-form or another. We use the accepted lifeforms in the USNVC or the PLANTS Database (USDA NRCS 2023) to do this.

Tree-characterized vegetation: Trees are evenly distributed throughout the stand. In the Mediterranean climate of the North Coast, tree-dominated alliances typically have >10% absolute tree cover, providing a consistent structural component.

Forest: In the USNVC, a forest is defined as a tree-dominated stand of vegetation with 60% or greater absolute cover of trees. Most forest alliances tend to have average cover of trees >60%, but individual stands under certain conditions may drop lower than 60%.

Woodland: In the USNVC, a woodland is defined as a tree-dominated stand of vegetation with between 25% and 60% absolute cover of trees. Most woodland alliances tend to have average cover of trees with 25-60%, but individual stands under certain conditions may drop higher or lower than this range.

Emergent: A plant (or vegetation layer) is considered emergent if it has low cover and rises above a layer with more cover in the stand. For example, individual *Pinus sabiniana* trees may comprise an emergent tree layer of 2% cover over dense *Adenostoma fasciculatum* in the shrub understory; the stand would be considered within the *Adenostoma fasciculatum* Shrubland Alliance because the total tree cover is <10% and the shrub cover is >10%. Medium to tall shrubs are not considered emergent over shorter shrubs, but short trees are considered emergent over tall shrubs.

Shrub: A multi-stemmed woody plant that is usually 0.2-5 meters tall. Definitions are blurred at the low and high ends of the height scales. At the tall end, shrubs may

approach tree-size based on disturbance frequencies (e.g., old-growth re-sprouting chaparral species such as *Cercocarpus betuloides*, *Prunus ilicifolia*, and so forth, may frequently attain "tree size", but are still typically multi-stemmed and are considered shrubs in this key). At the short end, woody perennial herbs or sub-shrubs of various species are often difficult to categorize into a consistent life-form (e.g., *Corethrogyne filaginifolia*, *Eriophyllum lanatum*); in such instances, we refer to the PLANTS Database or "pick a lane" based on best available definitions.

Sub-shrub: A multi-stemmed plant with noticeably woody stems less than 0.5 meter tall. May be easily confused with a perennial herb or small shrub. We lump them into the "shrub" category in stand tables and descriptions of vegetation types.

Shrub-characterized vegetation: Shrubs, including sub-shrubs, are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component; the stand cannot be characterized as a tree stand; and one or both of the following criteria are met: 1) shrubs influence the distribution or population dynamics of other plant species; 2) shrubs play an important role in ecological processes within the stand. Shrub alliances typically have at least 10% absolute shrub cover.

Herbaceous plant: Any species of plant that has no main woody stem development; includes grasses, forbs, and perennial species that die back each year.

Herb-characterized vegetation: Herbs are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component and playing an important role in ecological processes within the stand. The stand cannot be characterized as a tree or shrub stand.

Nonvascular vegetation: Nonvascular organisms characterize a stand, providing a consistent (even if sparse) structural component and playing an important role in ecological processes within the stand.

KEY TO NATURAL AND SEMI-NATURAL VEGETATION OF MOLOK LUYUK (WALKER RIDGE)

Class A. Vegetation dominated, co-dominated, or characterized by an even distribution of overstory trees. The tree canopy is generally greater than 10%, but may occasionally be less than 10% over a denser understory of shrubs and/or herbs = **Tree-Overstory (Woodland & Forest) Vegetation (Page 6)**

Class B. Vegetation dominated, co-dominated, or characterized by woody shrubs in the canopy. Shrubs usually have at least 10% cover, or rarely slightly lower in post-fire setting where seral scrub is regenerating and close to or > 10%. Tree species, if present, generally total less than 10% absolute cover. Herbaceous species may have higher cover than shrubs = **Shrubland Vegetation (Page 10)**

Class C. Vegetation dominated, co-dominated, or characterized by non-woody, herbaceous species in the canopy, including grasses, graminoids, and broad-leaved herbaceous species. Shrubs and Trees, if present, usually comprise less than 10% of the vegetation cover. However, sometimes vegetation is sparse (<10%) or variable in herbaceous cover on rock outcrops, open sand, and other substrates, and will key here. = **Herbaceous & Sparse Vegetation (Page 15)**

Class A. Tree-Overstory (Woodland & Forest) Vegetation

Section I: Woodlands and forests dominated or characterized by needle or scale-leaved conifer trees including *Hesperocyparis* spp. and *Pinus* spp.

1. A closed-cone or xerophyllous conifer, including *Hesperocyparis* spp., *Pinus attenuata*, or *Pinus sabiniana*, is dominant, co-dominant or characteristic in the overstory.

Californian Forest & Woodland Macrogroup

Californian Conifer Forest & Woodland Group

1a. *Hesperocyparis macnabiana* or *H. sargentii* dominates or characterizes stands on slopes, ridges, or along stream benches and terraces of serpentine, volcanic, or other ultramafic substrates. *Arctostaphylos* spp., *Ceanothus* spp. and shrubby *Quercus* spp. are commonly found in stands.

Hesperocyparis (sargentii, macnabiana) Alliance

1a1. *Hesperocyparis macnabiana* dominates the tree canopy or characterizes a regenerating layer of trees post-fire with shrubs including *Arctostaphylos viscida* ssp. *pulchella*, *Ceanothus jepsonii*, and *Quercus durata* in the understory.

Hesperocyparis macnabiana / *Arctostaphylos viscida* Association

1a2. *Hesperocyparis sargentii* dominates on slopes, ridges and terraces of serpentine, volcanic or other ultramafic substrates. *Quercus durata* is characteristically present and often co-dominant, though other shrubs may occur in the understory in more mesic settings (e.g., northerly slopes).

Hesperocyparis sargentii / *Quercus durata* (Mesic) Association

1a3. *Hesperocyparis sargentii* dominates on upper slopes and ridges of serpentine, volcanic or other ultramafic substrates. *Ceanothus jepsonii* and/or *Arctostaphylos viscida* ssp. *pulchella* are characteristically present and often co-dominant, though other shrubs may occur in the understory.

Hesperocyparis sargentii / *Ceanothus jepsonii* – *Arctostaphylos* spp. Association

1b. *Pinus attenuata* dominates or co-dominates with one or more *Quercus* spp. in the tree overstory or is strongly regenerating after fire.

***Pinus attenuata* Alliance**

1b1. *Pinus attenuata* dominates or co-dominates the tree overstory with *Quercus chrysolepis* or *Q. wislizeni* over shrubs such as *Arctostaphylos viscida*, *Ceanothus integerrimus*, and *Quercus berberidifolia*.

Pinus attenuata – mixed oak / *Arctostaphylos viscida* Association

1b2. *P. attenuata* is strongly regenerating post-fire along with re-sprouting shrubs such as *Adenostoma fasciculatum*.

Pinus attenuata / *Adenostoma fasciculatum* Association

1c. *Pinus sabiniana* is the sole dominant tree in the overstory with mature trees generally >10% absolute cover, shrubs may exceed pine in cover.

***Pinus sabiniana* Alliance**

1c1. *Pinus sabiniana* occurs over *Rhamnus ilicifolia* and/or *Ceanothus cuneatus* in draws and on steep slopes. Other shrubs such as *Quercus berberidifolia*, *Heteromeles arbutifolia* and *Toxicodendron diversilobum* are present and may be codominant. The herbaceous layer may be sparse to intermittent including natives and non-natives.

Pinus sabiniana / *Ceanothus cuneatus* – (*Rhamnus ilicifolia*) Association

1c2. *Pinus sabiniana* dominates or co-dominates in the tree overstory with *Umbellularia californica*. *Quercus durata* and other shrubs may exceed *P. sabiniana* in cover.

Pinus sabiniana / *Quercus durata* Association

Section II. Woodlands, forests, and riparian vegetation characterized and/or dominated mainly by native and non-native broad-leaved evergreen and deciduous trees. Includes species of *Aesculus*, *Populus*, *Quercus*, *Salix*, and *Umbellularia*.

2. Vegetation dominated or co-dominated by the following broadleaf, primarily upland tree species: *Aesculus californica*, *Q. chrysolepis*, *Q. douglasii*, *Q. wislizeni*, and/or *Umbellularia californica*.

Californian Forest & Woodland Macrogroup

Californian Broadleaf Forest & Woodland Group

2a. *Aesculus californica* is strongly dominant in open to moderately dense woodlands. If *Aesculus* is co-dominant with oak, see the *Quercus douglasii* and *Quercus wislizeni* Alliances. A variety of shrubs and herbs may be found in the understory.

***Aesculus californica* Alliance**

2a.1 *Aesculus californica* is dominant in the tree layer, tree oaks may be present but not abundant. Shrubs may include *Fraxinus dipetala*, *Sambucus nigra*, *Quercus berberidifolia*, and *Toxicodendron diversilobum*, while herbs, lichen and moss are characteristically present in the understory.

Aesculus californica / *Toxicodendron diversilobum* / Moss Association

2b. *Umbellularia californica* is dominant in the tree layer or is regenerating post-fire in mesic slopes and drainages. If *U. californica* is co-dominant with *Pinus sabiniana* in a serpentine setting, key to the *Pinus sabiniana* alliance.

2b.2 *Umbellularia californica* is dominant in the tree layer of mesic slope draws and drainages with *Quercus wislizeni*, *Q. berberidifolia*, and *Heteromeles arbutifolia* in the shrub layer.

***Umbellularia californica* Alliance**

Umbellularia californica – *Quercus wislizeni* Association

2b.1 *Umbellularia californica* is dominant in the tree layer of mesic serpentine drainages with *Calycanthus occidentalis*, *Frangula californica*, and *Salix breweri* in the shrub layer.

Calycanthus occidentalis – *Salix breweri* / (*Umbellularia californica*) Provisional Association

in the ***Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance**

2c. *Quercus douglasii* dominates in the tree overstory and *Pinus sabiniana* may be present and co-dominant. Shrubs may include *Arctostaphylos* spp. and *Cercocarpus betuloides* (*C. montanus*) with a dense understory herbaceous layer consisting of a mix of native and non-native forbs and grasses.

***Quercus douglasii* Alliance**

2c.1 *Arctostaphylos manzanita* is characteristically present in the understory at >2% cover, and the herb layer is usually intermittent to dense.

Quercus douglasii / *Arctostaphylos manzanita* / Herbaceous Association

2c.2 *Cercocarpus betuloides* (*C. montanus*) dominates the shrub understory.

Quercus douglasii – *Pinus sabiniana* / *Ceanothus cuneatus* – *Cercocarpus montanus* Association

2c.3 Grasses, forbs, and bulbs dominate the understory, and shrubs are low in cover. Common species include natives such as *Madia gracilis*, *Plectritis macrocera*, and *Festuca microstachys* and non-natives such as *Avena fatua*, *Bromus diandrus*, and *Torilis arvensis*. However, annual species vary both seasonally and annually.

Quercus douglasii / Mixed herbaceous Association

2d. *Quercus chrysolepis* is dominant as a tree on north-facing slopes and steep draws with *Umbellularia californica* or emergent *Pinus sabiniana* at low cover. If *Q. chrysolepis* is co-dominant with *Pinus attenuata*, key to that alliance. *Quercus wislizeni* can be present with high cover in the shrub layer. If *Q. chrysolepis* and *Q. wislizeni* are co-dominant as shrubs, key to the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance.

***Quercus chrysolepis* (tree) Alliance**

2d.1 *Quercus chrysolepis* is strongly dominant to co-dominant as a tree on north slopes, and *Pinus sabiniana* may be emergent at low cover.

2d1.i. *Quercus chrysolepis* dominant in the overstory, and shrubs (if present) are usually low or trace in cover.

Quercus chrysolepis tree Association

2d1.ii. *Quercus chrysolepis* dominates in the overstory, and shrubs are present at >5% overall cover, including *Arctostaphylos viscida* among other shrubs.

Quercus chrysolepis / *Arctostaphylos viscida* Association

2d1.ii. *Quercus chrysolepis* dominates or co-dominates with *Pinus sabiniana* as a sub- to co-dominant in the overstory, and shrubs may present including *Arctostaphylos canescens*, *Heteromeles arbutifolia* and *Quercus* spp.

Quercus chrysolepis – *Pinus sabiniana* Association

2d.2 *Quercus chrysolepis* is dominant as a tree on north slopes with *Umbellularia californica* as a sub- or co-dominant tree. *Quercus wislizeni*, *Toxicodendron diversilobum* and *Heteromeles arbutifolia* can be present in the shrub layer.

Quercus chrysolepis / *Quercus (wislizeni, parvula)* Association

2f. *Quercus wislizeni* dominates in the tree canopy with scattered shrubs including *Frangula californica* ssp. *californica* and *Toxicodendron diversilobum*. If *Q. wislizeni* has a shrubby habit or is regenerating and intermixing with a variety of other shrub species, key to the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance.

***Quercus wislizeni* – *Quercus parvula* (tree) Alliance**
Quercus wislizeni / *Toxicodendron diversilobum* Association

3. *Populus fremontii*, *Salix gooddingii* and/or *S. laevigata* are dominant, co-dominant or characteristic in permanently moist or riparian settings, where sub-surface water is available all year.

Interior Warm & Cool Desert Riparian Forest Macrogroup

Western Interior Riparian Forest & Woodland Group

3a. *Salix laevigata* dominates along streams, rivers, and pond edges. Associated trees and shrubs include *Populus fremontii*, *Rubus*, *Salix*, and others.

Salix gooddingii* – *Salix laevigata* Alliance

3b. *Populus fremontii* dominates the overstory with sometimes as little as 5% absolute cover, usually as a dominant or co-dominant in the overstory with willows or other riparian tree species...

***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance**

4. A tree species of *Eucalyptus*, *Robinia pseudoacacia* or *Ailanthus altissima* dominates in planted or naturalized stands. Often found in groves, windbreaks and along stream courses.

Californian Ruderal Forest Macrogroup and Group

***Eucalyptus* spp. – *Ailanthus altissima* – *Robinia pseudoacacia* Semi-Natural Alliance**

Ailanthus altissima Semi-Natural Association

Class B. Shrubland Vegetation

Section I. Riparian or moist hillside settings with vegetation dominated or co-dominated by the following shrubs: *Frangula californica* (including all subspecies), *Rhus aromatica* (*R. trilobata*), *Rhododendron occidentale*, *Rosa californica*, *Rubus armeniacus*, *Salix breweri*, *S. exigua*, *S. lasiolepis* and/or *Tamarix* spp.

1. Non-native shrubs including *Rubus armeniacus*, *Ficus carica* or *Tamarix* spp. are strongly dominant in riparian sites, mesic clearings, disturbed areas and stock ponds.

1a. Shrub stands in riparian settings dominated by non-native *Rubus armeniacus*.

Western Arid Ruderal Riparian Forest & Scrub Macrogroup

Western Arid Ruderal Lowland Riparian Forest & Scrub Group

Rubus armeniacus* – *Sesbania punicea* – *Ficus carica* Semi-Natural Alliance
Rubus armeniacus Semi-Natural Association*

1b. *Tamarix* spp. dominates in the shrub canopy. Trees may be present at low cover including *Quercus* spp. and non-native herbs such as *Lepidium latifolium* and *Centaurea solstitialis*.

***Tamarix* spp. Semi-Natural Alliance**
Tamarix spp. Semi-Natural Association

2. *Salix breweri* and/or *Frangula californica* dominant or co-dominant along springs, seeps and ravines, on serpentine-derived alluvium. Commonly found with other moisture-loving plants, such as *Carex serratodens*, *Solidago velutina*, and *Stachys albens*.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Wet Shrubland Group

***Frangula californica* – *Rhododendron occidentale* – *Salix breweri* Alliance**

2a. *Salix breweri* dominates in the shrub canopy with other subdominant shrubs including *Frangula californica* ssp. *crassifolia* and *Heteromeles arbutifolia*.

Salix breweri Association

2b. *Frangula californica* ssp. *crassifolia* dominates in the shrub canopy with other subdominant shrubs including *Heteromeles arbutifolia* and an understory of mesic forbs and graminoids including *Carex serratodens*, *Juncus* spp., among others.

Frangula californica (ssp. *crassifolia*, ssp. *tomentella*) Provisional Association

2c. *Umbellularia californica* is dominant or sub-dominant in the tree layer or regenerating post-fire in mesic serpentine drainages with *Calycanthus occidentalis*, *Frangula californica*, and *Salix breweri* in the shrub layer.

Calycanthus occidentalis – *Salix breweri* / (*Umbellularia californica*) Provisional Association

3. *Cornus glabrata*, *Rosa californica*, *Salix exigua*, and/or *S. lasiolepis* dominates or co-dominates along streams banks and benches, rivers, or close to springs.

**Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland
Macrogroup**

North American Warm Desert Riparian Low Bosque & Shrubland Group

3a. *Salix exigua* dominates along rivers and streams, or close to springs.

Salix exigua* Alliance

3b. *Salix lasiolepis* dominates or co-dominates with *Rubus* along stream banks and benches, slope seeps, and drainage stringers. Emergent riparian trees are often present at low cover, such as *Acer*, *Alnus*, *Fraxinus*, *Salix*, and others.

Salix lasiolepis* Alliance

3c. *Rosa californica* dominates in the shrub canopy with other shrubs including *Rhus aromatica* (*R. trilobata*) and *Frangula californica* ssp. *tomentella*.

***Cephalanthus occidentalis* – *Rosa californica* Alliance**

Rosa californica Association

3d. *Cornus glabrata* or *C. sericea* dominates in the shrub canopy with a diverse mix of other shrubs including *Ceanothus integerrimus*, *Cercis occidentalis*, and *Salix lasiolepis*.

***Cornus sericea* Alliance**

4. *Rhus aromatica* (*R. trilobata*) co-dominates in the shrub overstory with *Frangula californica* ssp. *californica* and *Rosa californica*.

**Western North American Montane Marsh, Wet Meadow & Shrubland
Macrogroup**

Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland Group

***Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance**

Rhus trilobata Association

Section II. Disturbance-following vegetation dominated or co-dominated by drought-deciduous or seral (both deciduous and evergreen) shrubs. Includes *Baccharis pilularis*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *Lupinus albifrons* and *Toxicodendron diversilobum*.

Californian Coastal Scrub Macrogroup

Californian Coastal-Foothill Seral Scrub Group

5. *Eriodictyon californicum*, *Acmispon glaber* (*Lotus scoparius*), *Pickeringia montana*, or *Lupinus albifrons* dominates or co-dominates with other seral scrub, often in stands that are open and/or display recent evidence of fire or other disturbance such as road cuts. Other scrub may be present at lower cover including *Toxicodendron diversilobum*. The understory may be composed of mixed native and non-native herbs including

Calystegia collina and *Cryptantha intermedia* which sometimes have higher cover than the overstory shrubs.

***Lotus scoparius* – *Lupinus albifrons* – *Eriodictyon* spp. Alliance**

5a. *Eriodictyon californicum* dominates the shrub canopy with open to intermittent cover over annual grasses and forbs. Other shrubs may intermix at relatively low cover. Found often in disturbed sites including those recently burned and on serpentinite substrates.

Eriodictyon californicum / Herbaceous Association

5b. *Lupinus albifrons* dominates the shrub layer on steep rocky convex slopes. The herbaceous layer may be diverse with native species including *Eriogonum nudum* and *Stipa* sp. and non-natives such as *Erodium cicutarium* and *Avena barbata*.

Lupinus albifrons Association

5c. *Calystegia collina* dominates the herbaceous layer in post-fire settings.

Calystegia collina / *Eriodictyon californicum* Provisional Association

Section III. Shrub vegetation dominated by evergreen sclerophyll-leaved species, including many that have developed growth strategies driven by a Mediterranean climate. Most of the core diagnostic species are endemic to California, including *Adenostoma*, *Arctostaphylos*, *Ceanothus cuneatus*, *C. integerrimus*, *C. oliganthus*, *Cercocarpus betuloides* (*C. montanus*), *Quercus berberidifolia*, *Q. palmeri*, *Q. durata*, and shrubby *Q. wislizeni*.

Californian Chaparral Macrogroup

6. *Cercocarpus betuloides* (*C. montanus*), *Heteromeles arbutifolia*, *Quercus berberidifolia* and/or *Quercus durata* dominate or co-dominate with *Adenostoma fasciculatum*. Stands are often composed of large shrubs occupying mesic sites such as north-facing slopes, concavities, and toe slopes with well-drained soils.

Californian Mesic & Pre-Montane Chaparral Group

6a. *Cercocarpus betuloides* (*C. montanus*) dominates with other shrubs including *Heteromeles arbutifolia*.

***Cercocarpus montanus* Alliance**

Cercocarpus montanus var. *glaber* Association

6b. *Quercus berberidifolia* dominates or co-dominates in a mesic setting with *Adenostoma fasciculatum*, *Cercocarpus betuloides* (*C. montanus*) and/or other chaparral shrubs including *Heteromeles arbutifolia*, *Fraxinus dipetala*, and *Ceanothus cuneatus*. Trees such as *Aesculus californica* may emerge at low cover relative to shrubs.

***Quercus berberidifolia* Alliance**

6b1. *Quercus berberidifolia* is dominant in the shrub canopy and other shrubs may be present to sub-dominant including *Q. wislizeni* and *Q. durata*.

Quercus berberidifolia Association

6b2. *Quercus berberidifolia* and *Adenostoma fasciculatum* are co-dominant in the shrub canopy.

Quercus berberidifolia – *Adenostoma fasciculatum* Association

6b3. *Quercus berberidifolia*, *Heteromeles arbutifolia*, and *Toxicodendron diversilobum* form an intermittent to continuous shrub canopy on north-facing slopes. *Fraxinus dipetala* may also be present and sometimes codominant.

Quercus berberidifolia – *Heteromeles arbutifolia* Association

6b2. *Quercus berberidifolia* and *Cercocarpus betuloides* (*C. montanus*) are co-dominant in the shrub canopy.

Quercus berberidifolia – *Cercocarpus montanus* Association

6c. *Heteromeles arbutifolia* dominates or co-dominates with a diverse mixture of shrubs including *Cercis occidentalis*, *Cercocarpus betuloides* (*C. montanus*), *Fraxinus dipetala*, *Rhus aromatica* (*R. trilobata*), and/or *Toxicodendron diversilobum*. Stands found primarily in mesic post-fire settings on serpentinite substrate.

***Prunus ilicifolia* – *Heteromeles arbutifolia* – *Ceanothus spinosus* Alliance**
Heteromeles arbutifolia Serpentine Association

6d. *Quercus durata* dominates or co-dominates with *Heteromeles arbutifolia*, *Arctostaphylos viscida* and/or *Adenostoma fasciculatum* on ultramafic soils (e.g., serpentine, gabbro).

***Quercus durata* Alliance**

6d1. *Quercus durata* strongly dominates or co-dominates the shrub layer with *Heteromeles arbutifolia*.

Quercus durata Association

6d2. *Quercus durata* dominates the shrub layer with *Ceanothus jepsonii*, *Garrya condonii* and/or *Arctostaphylos viscida* ssp. *pulchella* and other shrubs.

6d2.i. *Ceanothus jepsonii* is subdominant to co-dominant in the shrub layer with *Quercus durata*.

Quercus durata – *Ceanothus jepsonii* Association

6d2.ii. *Adenostoma fasciculatum* is subdominant to co-dominant with *Quercus durata*. Other shrubs may be present including *Arctostaphylos viscida*.

Quercus durata – *Adenostoma fasciculatum* – *Quercus wislizeni* Association

7. *Quercus wislizeni* var. *frutescens*, *Quercus palmeri*, and/or *Ceanothus oliganthus* dominate or co-dominate in the shrub overstory.

Californian Mesic & Pre-Montane Chaparral Group

7a. *Quercus wislizeni* or *Q. palmeri* dominates or co-dominates as a shrub or regenerating tree with *Umbellularia*, *Adenostoma fasciculatum*, *Ceanothus* spp., *Quercus berberidifolia* and a variety of other shrubs that prefer more mesic, northerly exposures. *Umbellularia californica* is often emergent, while a variety of other shrubs intermix as sub-dominants. When *Q. wislizeni* dominates or co-dominates as an overstory tree, key to the *Quercus wislizeni* – *Quercus parvula* (tree) Alliance.

7a1. *Quercus wislizeni* dominates or co-dominates the shrub layer with *Heteromeles arbutifolia*.

***Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance**
Quercus wislizeni var. *frutescens* Association

7b2. *Quercus wislizeni* co-dominates the shrub layer with *Quercus berberidifolia* and other shrubs.

Quercus wislizeni – *Quercus berberidifolia* Association

7b3. *Quercus palmeri* dominates or co-dominates in the shrub layer with other *Quercus* sp., *Cercocarpus betuloides*, and/or other shrubs.

***Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance**
Quercus palmeri Association

7b. *Ceanothus oliganthus* dominates in shrublands that are often found in localized patches following fires. If *Quercus wislizeni* is co-dominant, key to the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance.

Ceanothus (oliganthus, tomentosus) Alliance
Ceanothus oliganthus Association

8. Sclerophyll (i.e., thick-leaved) shrublands dominated by one or more of the following taxa: *Adenostoma fasciculatum*, *Arctostaphylos manzanita*, *A. viscida* or *Ceanothus cuneatus*. Most stands occur on well-drained soils along exposures that are in full sun much of the growing season, including upper slopes, spur ridges, and convexities.

Californian Xeric Chaparral Group

8a. *Arctostaphylos manzanita* dominates or co-dominates with *Eriodictyon californicum*. One alliance is recognized for multiple manzanita vegetation types, with associations specific to various species.

Arctostaphylos (canescens, manzanita, stanfordiana) Alliance
Arctostaphylos manzanita Association

8b. *Arctostaphylos viscida* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*. Other shrubs may be present to sub-dominant including *Ceanothus cuneatus*, *C. jepsonii*, *Heteromeles arbutifolia*, and *Q. wislizeni*. If *Arctostaphylos viscida* co-dominates with *Quercus durata* key to that alliance.

***Arctostaphylos viscida* Alliance**

8b1. *Arctostaphylos viscida* ssp. *pulchella* dominates or co-dominates with *Ceanothus jepsonii* on serpentine substrates. *Quercus durata* may be present to sub-dominant.

Arctostaphylos viscida – *Ceanothus jepsonii* Association

8b2. *Arctostaphylos viscida* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*. Other shrubs may be present to sub-dominant including *A. manzanita*, *Ceanothus cuneatus*, and *Quercus berberidifolia*.

Arctostaphylos viscida – *Adenostoma fasciculatum* Association

8c. *Ceanothus cuneatus* dominates or co-dominates with *Adenostoma fasciculatum* and a variety of shrubs may intermix, including *Arctostaphylos* spp., *Heteromeles arbutifolia*, *Quercus wislizeni*, and others.

***Ceanothus cuneatus* Alliance**

8c1. *Ceanothus cuneatus* dominates the shrub canopy and a variety of shrubs may intermix at low cover, including *Arctostaphylos* spp., *Heteromeles arbutifolia*, *Quercus wislizeni*, and others.

Ceanothus cuneatus Association

8c2. *Ceanothus cuneatus* co-dominates with *Adenostoma fasciculatum* in the shrub canopy and other shrubs may intermix, including *Eriodictyon californicum* and others.

Ceanothus cuneatus – *Adenostoma fasciculatum* Association

8d. *Adenostoma fasciculatum* is dominant in the overstory with lower cover of other chaparral species such as *Ceanothus cuneatus*. *A. fasciculatum* may be co-dominant with disturbance related species such as *Eriodictyon californicum* and *Acmispon glaber* (*Lotus scoparius*). If *A. fasciculatum* co-dominates with *Arctostaphylos viscida*, *Ceanothus cuneatus*, or a shrubby oak species, key to those alliances. Or if another *Arctostaphylos* sp. is present, then *A. fasciculatum* is > 60% relative cover.

***Adenostoma fasciculatum* Alliance**

8d1. *Adenostoma fasciculatum* is strongly dominant in the shrub canopy and other chaparral species if present, are relatively low in cover, including *Arctostaphylos viscida*, *Ceanothus cuneatus*, and/or *Eriodictyon californicum*. Found typically on sedimentary and igneous substrates, and occasionally on ultramafic substrate.

Adenostoma fasciculatum Association

8d2. *Adenostoma fasciculatum* is strongly dominant in the shrub canopy and *Ceanothus cuneatus* is present at higher cover than other shrubs but sub-dominant to *Adenostoma*.

Adenostoma fasciculatum – (*Ceanothus cuneatus*) Association

8d3. *Eriodictyon californicum*, *Acmispon glaber* (*Lotus scoparius*), and/or other fire-following shrubs form an open to intermittent shrub canopy with *Adenostoma fasciculatum* in post-fire settings. Herbs can be relatively high in cover, too.

Adenostoma fasciculatum – (*Lotus scoparius* – *Eriodictyon* spp.) Association

8d4. *Arctostaphylos glandulosa*, *A. viscida*, *Ceanothus jepsonii*, and/or *Heteromeles arbutifolia* present and sub-dominant with *Adenostoma fasciculatum* dominant in the shrub layer, while various native herbs are present and often quite diverse. Found on serpentine substrates.

Adenostoma fasciculatum – (*Arctostaphylos glandulosa* – *Ceanothus jepsonii*) Association

Class C. Herbaceous & Sparse Vegetation

Section I. Vegetation of: a) freshwater wetland or riparian settings with water or wet ground present temporarily, seasonally, or throughout the growing season, b) saline or alkaline lowlands where water accumulates in the winter, and c) alkali springs on serpentine coated with precipitate. Includes herbaceous vegetation dominated, co-dominated, or characterized by: *Bolboschoenus*, *Carex*, *Distichlis*, *Eleocharis macrostachya*, *Elymus* (*Leymus*) *triticoides*, *Hordeum brachyantherum*, *Hydrocotyle*, *Juncus arcticus*, *J. effusus*, *J. patens*, *Lasthenia glaberrima*, *Lemna*, *Lepidium latifolium*, *Ludwigia*, *Erythranthe guttata* (*Mimulus guttatus*), *Persicaria*, *Phalaris*, *Pleuropogon*, *Ruppia*, *Schoenoplectus*, *Suaeda*, *Typha*, and/or *Xanthium*.

1. Freshwater or brackish stands dominated by *Schoenoplectus* and/or *Typha*, where water is present throughout all or most of the growing season. Stands are found along streams, ditches and pond edges. Soils have high organic content and may be poorly aerated.

Arid West Interior Freshwater Marsh Macrogroup

Arid West Freshwater Marsh Group

1a. *Schoenoplectus acutus* dominates or co-dominates with other herbs including *Typha* spp. Occurs in freshwater marshes and along pond edges and drainages.

Schoenoplectus (acutus, californicus) Alliance
Schoenoplectus acutus Association

1b. *Typha latifolia*, *T. angustifolia*, and/or *T. domingensis* dominate in semi-permanently flooded stands. If *Schoenoplectus acutus* or *S. californicus* is co-dominant, key to the *Schoenoplectus* Alliance.

Typha (angustifolia, domingensis, latifolia) Alliance*

2. Wetland herbaceous vegetation dominated or characterized by *Carex serratodens*, *Cirsium douglasii* var. *breweri*, *Elymus* (*Leymus*) *triticoides*, *Erythranthe* (*Mimulus*) *guttata*, *Hordeum brachyantherum*, *Juncus arcticus*, *Lepidium latifolium*, *Persicaria*

(*Polygonum*), *Phalaris* sp. or *Xanthium strumarium*. Stands occupy settings where saturated soil or standing water throughout the growing season are key characteristics.

2a. Stands dominated or characterized by species of *Carex*, *Hordeum*, *Juncus*, *Elymus* (*Leymus*), *Erythranthe* (*Mimulus*), *Cirsium*, *Stachys*, and/or other wetland herbs.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Freshwater Wet Meadow & Marsh Group

2a1. *Carex serratodens* dominates or co-dominates with *Juncus arcticus* or *Elymus* spp. in serpentine seeps and meadows, along with other graminoids and forbs including *Cirsium douglasii* var. *breweri*. If forbs such as *Cirsium* and *Stachys* dominate, key to the *Mimulus guttatus* – *Cirsium* spp. – *Stachys* spp. Alliance.

Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance *Carex serratodens* Association

2a2. *Juncus arcticus* (var. *balticus* or *mexicanus*) dominates in freshwater, brackish, or alkaline settings. *Carex* spp., *Mentha pulegium* and other hydrophytes may intermix as sub-dominants.

Juncus arcticus (var. balticus) – J. mexicanus Alliance *Juncus arcticus* var. *balticus* – (*J. mexicanus*) Association

2a3. *Erythranthe guttata* (*Mimulus guttatus*) or another wetland *Erythranthe* species dominates or co-dominates in the herbaceous layer with *Juncus* spp. or non-native grasses such as *Festuca perennis* and *Polypogon monspeliensis*. Stands are found in moist or saturated settings along streams, ephemeral cascades, ditches, seeps, and springs often with high cover of moss.

Mimulus guttatus – Cirsium spp. – Stachys spp. Alliance *Mimulus guttatus* Association

2a4. *Stachys albens* and/or *Cirsium douglasii* var. *breweri* dominates or co-dominates with other wetland species such as *Erythranthe guttata* (*Mimulus guttatus*), *Hemizonia congesta* ssp. *luzulifolia*, *Carex* and/or *Juncus* spp. in the herbaceous layer. Stands are found in seeps, springs, and drainages. If graminoids are dominant, key to the *Juncus (effusus, patens) – Carex (pansa, praegracilis)* Alliance. Peak or late phenology of forbs is important in determining this type.

Mimulus guttatus – Cirsium spp. – Stachys spp. Alliance *Cirsium douglasii* – *Stachys albens* Provisional Association

2a5. *Elymus (Leymus) triticoides* dominates or co-dominates with *Festuca perennis* or other non-native grasses or forbs. Stands are found on poorly drained floodplains and valley bottoms.

Leymus cinereus – Leymus triticoides Alliance *Leymus triticoides* Association

2a6. *Hordeum brachyantherum* dominates or co-dominates with *Hemizonia congesta*, *Elymus triticoides*, and other forbs and graminoids in moist meadows, along streams, and near seeps and springs.

***Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance**

Hordeum brachyantherum Lowland Association

2b. Stands dominated or characterized by non-native, ruderal, or disturbance-adapted taxa including *Lepidium latifolium*, *Persicaria*, *Phalaris* and/or *Xanthium*.

2b1. *Xanthium strumarium* and/or *Persicaria* (= *Polygonum*) spp. co-dominate or dominate in marshes and regularly disturbed vernal wet ponds, fields, and stream terraces.

Temperate Pacific Freshwater Wet Mudflat Group

***Polygonum lapathifolium* – *Xanthium strumarium* Alliance**

Xanthium strumarium Association

2b2. *Lepidium latifolium*, *Lactuca serriola*, *Chenopodium album* and/or *Rumex* sp. strongly dominate as non-native herbs along intermittently and seasonally flooded ponds and disturbed riparian terraces.

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group

***Lepidium latifolium* – *Lactuca serriola* Semi-Natural Alliance**

2b2i. *Lepidium latifolium* dominates or co-dominates with *Lactuca serriola*, and other forbs and graminoids.

Lepidium latifolium Semi-Natural Association

2b2ii. *Chenopodium album* dominates or co-dominates with *Rumex* sp. and other forbs.

Chenopodium album – *Rumex* spp. Provisional Semi-Natural Association

2b3. *Phalaris aquatica* and/or other *Phalaris* sp. dominates in naturalized or planted stands along disturbed riparian terraces. Other non-native perennial grasses may also be present.

***Phalaris aquatica* – *Phalaris arundinacea* Semi-Natural Alliance**

3. Shallow swales and vernal pools with diagnostic vernal pool species including *Achyrrachaena mollis*, *Layia* spp., *Plagiobothrys stipitatus*, *Juncus bufonius*, *Trifolium depauperatum*, etc.

Layia fremontii* – *Achyrrachaena mollis* Alliance

4. Alkali springs, seeps and brackish flats dominated or co-dominated by *Distichlis spicata* or *Suaeda nigra* (*S. moquinii*).

North American Desert Alkaline-Saline Marsh & Playa Macrogroup

4a. Stands dominated or characterized by *Distichlis spicata*.

North American Desert Alkaline-Saline Marsh & Playa Group

***Distichlis spicata* Interior Alliance**

4b. Stands dominated by the perennial fleshy-leafed herb *Suaeda nigra* (*S. moquinii*), typically found in small stands along alkali seeps and drainages.

North American Desert Alkaline-Saline Wet Scrub Group

***Suaeda moquinii* Alliance**

Section II. Vegetation dominated or characterized by herbaceous species that occupy dry, seasonally moist, and usually well-drained sites. Stands are not wet or inundated as in Section I above. This group includes native and non-native annual and perennial grasslands, seral herbaceous stands, and dry cliff and canyon vegetation. Dominant, co-dominant, and characteristic taxa include: *Allium falcifolium*, *Avena*, *Brachypodium*, *Brassica*, *Briza*, *Bromus*, *Centaurea*, *Cynosurus*, *Danthonia*, *Deschampsia*, *Dudleya*, *Elymus elymoides*, *E. glaucus*, *E. multisetus*, *Eriogonum nudum*, *Erodium*, *Eschscholzia*, *Festuca perennis*, *F. microstachys*, *Hesperolinon*, *Heterotheca*, *Hordeum*, *Lasthenia californica*, *Melica*, *Phalaris*, *Plagiobothrys nothofulvus*, *Plantago erecta*, *Pteridium*, *Raphanus*, *Sedum*, and/or *Stipa*.

3. *Allium falcifolium*, *Eriogonum dasyanthemum*, *Dudley* ssp., *Sedum spathulifolium*, and/or *Streptanthus breweri* characterize or dominate stands on exposed rock and scree slopes.

Western North American Cliff, Scree & Rock Vegetation Macrogroup

Californian Cliff, Scree & Rock Vegetation Group

3a. Sparsely vegetated herbaceous stands (generally less than 10% absolute cover though may be higher in cover depending on rainfall) characterized by *Allium falcifolium*, *Cryptantha intermedia*, *Eriogonum dasyanthemum*, *E. nudum*, *Fritillaria purdyi*, *Lewisia rediviva*, and/or other native herbs and grasses growing on serpentine and shale barrens with exposed gravel and bedrock.

***Allium* spp. – *Streptanthus* spp. – *Hesperolinon* spp. Serpentinite Alliance**
Allium falcifolium – *Eriogonum dasyanthemum* – *Streptanthus breweri* Provisional Association

3b. *Sedum spathulifolium* dominates on steep north-facing rock outcrops, canyon walls and vertical cliff faces. Moss and lichen species often have high cover.

***Sedum spathulifolium* Provisional Alliance**
Sedum spathulifolium – *Polypodium californicum* / Lichen – Moss Provisional Association

3c. *Dudleya cymosa* is characteristic, dominant or co-dominant with herbs such as *Eriogonum nudum*, *Phacelia heterophylla*, *Streptanthus* sp. and others. Lichen and mosses are characteristic and often dominant. Often found on rocky cliffs and bedrock outcrops.

***Dudleya cymosa* – *Dudleya lanceolata* / Lichen – Moss Alliance**
Dudleya cymosa / Lichen – Moss Provisional Association

4. *Eriogonum nudum* dominates or co-dominates with other herbs in stands with recent or seasonal disturbance.

Californian Annual & Perennial Grassland Macrogroup

Californian Perennial Grassland Group

***Corethrogyne filaginifolia* – *Eriogonum (elongatum, nudum)* Alliance**

4a. *Eriogonum nudum* dominates or characterizes herbaceous stands with *Grindelia hirsutula*, *Pellaea mucronata*, *Plantago erecta* and/or other forbs.

Eriogonum nudum Association

5. Native and non-native annual forb/grass vegetation AND native perennial grasslands. Includes vegetation characterized by, but not limited to *Amsinckia*, *Avena*, *Brassica*, *Bromus*, *Calycadenia*, *Centaurea*, *Chorizanthe membranacea*, *Conium*, *Cynosurus*, *Dipsacus*, *Elymus glaucus*, *Eschscholzia*, *Festuca* spp., *Foeniculum*, *Lasthenia californica*, *Lolium*, *Lupinus*, *Madia*, *Melica*, *Nassella*, *Plagiobothrys nothofulvus*, *Plantago erecta*, *Pteridium aquilinum*, *Festuca (Vulpia) microstachys*.

Californian Annual & Perennial Grassland Macrogroup

5a. Herbaceous vegetation dominated, co-dominated or characterized by native annual forbs and grasses such as *Acmispon*, *Amsinckia*, *Chorizanthe membranacea*, *Eschscholzia*, *Lasthenia californica*, *Holocarpha*, *Lupinus*, *Madia*, *Plagiobothrys*, *Plantago erecta*, and *Festuca (Vulpia) microstachys*. Commonly occurring taxa include *Avena*, *Bromus*, *Cryptantha*, *Dichelostemma*, *Festuca (Lolium)*. Stands are found on upland slopes, flats, and ridges.

Californian Annual Grassland & Forb Meadow Group

5a1. *Eschscholzia californica*, *Lupinus bicolor*, *L. nanus*, and/or *Chorizanthe membranacea* dominate or characterize the herbaceous layer with and a variety of native and non-native forbs and grasses. One provisional association was sampled that includes *Chorizanthe membranacea*, though other associations are likely to occur.

Eschscholzia (californica) – Lupinus (nanus) Alliance
Chorizanthe membranacea Provisional Association

5a2. *Plagiobothrys nothofulvus* dominates and intermixes with a variety of native and non-native forbs and grasses.

Plagiobothrys nothofulvus Alliance*

5a3. *Lasthenia californica*, *Acmispon* spp., *Ancistrocarphus filagineus*, *Calycadenia* spp., *Festuca (Vulpia) microstachys*, *Hemizonia congesta*, *Hesperervax sparsiflora*, *Lomatium*, *Madia* spp., *Micropus californicus*, *Plantago erecta*, and/or dominate individually or in combination as characteristic plants in the herbaceous layer. *Lasthenia californica*, *Plantago erecta*, and/or *Festuca (Vulpia) microstachys* are often present, though sometimes with sparse cover.

Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance

5a3i. *Hemizonia congesta* spp. *luzulifolia* is co-dominant or characterizes the herb layer with and a variety of native and non-native forbs and grasses.

Hemizonia congesta – Lolium perenne Association

5a3ii. *Acmispon brachycarpus* (= *Lotus humistratus*), *Acmispon wrangelianus*, *Lagophylla* spp., and a variety of other herbs are co-dominant or characterize the herbaceous layer.

Lotus humistratus – *Plantago erecta* – *Lomatium* spp. Provisional Association

5a3ii. *Micropus californicus* is co-dominant or characterizes the herb layer with a variety of other forbs and grasses.

Micropus californicus Provisional Association

5a3iv. *Festuca (Vulpia) microstachys* and *Calycadenia* sp. including *C. fremontii* co-dominate or characterize the herb layer with a variety of other forbs and grasses.

Vulpia microstachys – *Plantago erecta* – *Calycadenia (truncata, multiglandulosa)* Association

5a3iv. *Lasthenia californica* co-dominates or characterizes the herb layer with a variety of other forbs and grasses.

Lasthenia (californica, gracilis) Association*

5a4. *Amsinckia* spp. and/or *Phacelia* spp. dominate and characterize stands with a variety of native and non-native forbs and grasses.

Amsinckia (menziesii, tessellata)* – *Phacelia* spp. Alliance

5a5. *Holocarpha virgata* characteristically present to co-dominant in the herbaceous layer; native herbs typically > 10% relative cover.

Holocarpha (heermannii, virgata)* Alliance

Holocarpha virgata Association*

5b. *Elymus elymoides*, *E. multisetus*, *Melica* spp., *Poa secunda* and/or *Stipa* spp., all native perennial grasses, are co-dominant or characteristic in stands, sometimes with equal or greater cover of non-native herbs.

Californian Perennial Grassland Group

5b1. *Stipa (Nassella) pulchra* or *Elymus multisetus* dominates or co-dominates in stands on serpentine soils, often on southerly exposures. Stands can include *Eschscholzia californica*, *Plantago erecta*, *Dichelostemma capitatum*, *Eriogonum nudum*, *Acmispon brachycarpus* (*Lotus humistratus*), and *Minuartia douglasii*.

***Nassella* spp. – *Melica* spp. Alliance**

Elymus multisetus – (*Eschscholzia californica* – *Plantago erecta*) Association*

5b2. *Melica californica*, *M. torreyana*, and/or *Stipa (Nassella)* spp. are dominant, co-dominant or characteristic in stands. *Avena*, *Bromus*, *Hemizonia congesta*, *Festuca perennis* (*Lolium perenne*), *Plantago erecta*, *P. lanceolata*. and/or *Trifolium* spp. intermix as dominant, co-dominant or characteristic taxa in associations of this alliance.

***Nassella* spp. – *Melica* spp. Alliance**

Nassella pulchra – *Hemizonia congesta* Association

5b2. *Poa secunda*, *Elymus elymoides* or *E. multisetus* characterizes stands while other perennials including *Wyethia angustifolia* are dominant or co-dominate with other forbs and grasses.

Californian Perennial Grassland Group

5c. Herbaceous vegetation strongly dominated (typically >90% relative cover) by non-native grasses and forbs such as *Aegilops*, *Avena*, *Brachypodium*, *Brassica*, *Briza*, *Bromus*, *Carduus pycnocephalus*, *Centaurea*, *Conium maculatum*, *Cynosurus*, *Dipsacus fullonum*, *D. sativus*, *Erodium*, *Festuca (Lolium)*, *Foeniculum vulgare* and *Raphanus*. Native herbaceous species have insignificant cover in these stands, especially during the active growing season. Stands are found in rangelands, fallow fields, riparian areas, and disturbed settings.

Californian Ruderal Grassland, Meadow & Scrub Group

5c1. *Avena*, *Brachypodium*, *Briza*, *Bromus*, *Erodium* and/or *Hypochaeris* dominate individually or in combination. If *Elymus caput-medusa* is co-dominant with *Avena* and/or *Bromus* spp., those stands can also key here. If *Festuca perennis (Lolium perenne)* is co-dominant key to that alliance.

***Avena* spp. – *Bromus* spp. Semi-Natural Alliance**
Avena barbata – *Bromus hordeaceus* Semi-Natural Association

5c2. *Brassica nigra*, *Carduus pycnocephalus*, *Centaurea melitensis*, *C. solstitialis*, *Cirsium vulgare*, *Raphanus sativus*, and/or *Silybum marianum* dominate in the herbaceous layer, often along roadsides and other disturbed areas. Can include dominant stands of *C. solstitialis* as one association in the region.

***Brassica nigra* – *Centaurea (solstitialis, melitensis)* Semi-Natural Alliance**
Centaurea solstitialis Semi-Natural Association

5c3. *Cynosurus echinatus* dominates or co-dominate in the herbaceous layer. *Anagallis*, *Avena*, *Festuca perennis*, *Plantago lanceolata*, *Rumex*, and *Festuca bromoides* are often present.

Cynosurus echinatus* – *Arrhenatherum elatius* Semi-Natural Alliance

5c4. *Festuca perennis (Lolium perenne)* dominates or co-dominates with *Avena* spp., *Bromus* spp., *Hordeum marinum*, *H. murinum*, *Medicago*, *Trifolium subterraneum*, *Elymus caput-medusae*, and other non-natives in the herbaceous layer. Native species are typically less than 10% relative cover. These invaded stands are often found on moist or poorly drained sites, on or off serpentine.

***Lolium perenne* Semi-Natural Alliance**

5c5. *Aegilops triuncialis* dominates or co-dominates with *Avena barbata*, *Bromus hordeaceus*, *Festuca perennis (Lolium perenne)*, and other non-natives in herbaceous stands. Often found on dry grasslands with serpentinite parent material.

***Lolium perenne* Semi-Natural Alliance**

Aegilops triuncialis – *Hemizonia congesta* Provisional Semi-Natural Association*

5c6. *Conium maculatum*, *Dipsacus fullonum*, *D. sativus*, and/or *Foeniculum vulgare* dominates herbaceous stands, though various other taxa are likely present.

Western North American Ruderal Grassland & Shrubland Macrogroup

Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

Conium maculatum* – *Foeniculum vulgare* Semi-Natural Alliance

Conium maculatum Semi-Natural Association*

Foeniculum vulgare Semi-Natural Association*

Dipsacus (*fullonum*, *sativus*) Provisional Semi-Natural Association*

APPENDIX F - Glossary

The following terms with their respective definitions have been established in developing the vegetation classification, keys, and descriptions.

- **Constancy, Cover-Abundance, and Related Terms** – Used in the key, descriptions and the vegetation constancy tables (codes from tables in parentheses):
 - **Constancy (Con)** – Number of occurrences divided by the number of samples X 100%
 - **Diagnostic** – A species or group of species whose relative constancy or abundance differentiates one vegetation type from another; the term can include character, constant, differential, and indicator species (Jennings et al. 2006).
 - **Strongly dominant** – A species in the dominant lifeform stratum has 60% or greater relative cover.
 - **Dominant** – A species in the dominant lifeform stratum has 50% or greater relative cover.
 - **Co-dominant** – Each species has between 30% and 60% relative cover.
 - **Characteristic** – Present in at least 80% of the samples for that vegetation type, with no restriction on cover.
 - **Abundant** – Present in 50 to 75% of the samples, with at least 50% relative cover.
 - **Usually/Often** – Present in 50 to 75% of the samples, with no restriction on cover.
 - **Sometimes** – Present in 25 to 50% of the samples, with no restriction on cover.
 - **Average (Avg) and Relative Cover** – Average cover for a taxon in a vegetation type is calculated as the sum of its 'absolute' cover values divided by the total sample size; relative cover is calculated as the comparative sum of cover values for one taxon compared to the sum of cover values of other taxa, in which proportional numbers are derived (see **Cover** section for more details).
 - **Minimum (Min) and Maximum (Max)** – The minimum and maximum cover values that a taxon had from the surveys of a vegetation type. Values could be an absolute cover value (e.g., 1%) and/or a mid-point value of a cover class (e.g., 2.5% for a cover class of 1–5 %) depending on data available
- **Cover** – The primary metric used to quantify the abundance of a particular species or a particular vegetation layer within a plot. It was measured by estimating the aerial extent of the living plants, or the "bird's-eye view" looking from above for each category. Cover in this mapping project uses the concept of "porosity" or foliar cover rather than "opacity" or crown cover. Thus, field crews are trained to estimate the amount of light versus shade produced by the canopy of a plant or a stratum by taking into account the amount of shade it casts excluding the openings it may have in the interstitial spaces (e.g., between leaves or branches). This is assumed to provide a more realistic estimate of the actual amount of shade cast by the individual or stratum which, in turn, relates to the actual amount of light available to individual species or strata beneath it. However, as a result, cover estimates can vary substantially between leaf-on versus leaf-off conditions. Stands dominated by deciduous species (e.g., *Populus tremuloides*, *Toxicodendron diversilobum*) should be sampled during leaf-on since they will have substantially less cover when leaves are absent and may key to another type. Various subcategories of cover for species and vegetation are defined as follows:

- **Absolute cover** – Refers to the actual percentage of the ground (surface of the plot or stand) that is covered by a species or group of species. For example, *Pinus jeffreyi* covers between 5% and 10% of the stand. Absolute cover of all species or groups if added in a stand or plot may total greater or less than 100% because it is not a proportional number.
- **Relative cover** – Refers to the amount of the surface of the plot or stand sampled that is covered by one species (or physiognomic group) as compared to (relative to) the amount of surface of the plot or stand covered by all species (in that group). Thus, 50% relative cover means that half of the total cover of all species or physiognomic groups is composed of the single species or group in question. Relative cover values are proportional numbers and, if added, total 100% for each stand (sample).
- **Dense/Continuous cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is greater than 66 percent absolute cover.
- **Intermittent cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is 33-66 percent absolute cover.
- **Open cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is less than 33 percent absolute cover.
- **Sparse cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the *average* cover value is <2% absolute cover (though the range in cover could be <1-9% cover).
- **Emergent** – A plant (or vegetation layer) is considered emergent if it includes plants that rises above a predominant vegetation layer, but that are sparse in cover. It is considered as a member of the next tallest layer, but typically has an absolute cover < 10%.
- **Lifeform terms:**
 - **Tree** – Is a one-stemmed woody plant that normally grows to be greater than 5 meters tall. In some cases trees may be multiple-stemmed (ramifying) after fire or other disturbance, but size of mature plants is typically greater than 5 m and undisturbed individuals of these species are usually single stemmed.
 - **Shrub** – Is normally a multi-stemmed woody plant that generally has several erect, spreading, or prostrate stems and that is usually between 0.2 meters and 5 meters tall, giving it a bushy appearance. Definitions are blurred at the low and the high ends of the height scales. At the tall end, shrubs may approach trees based on disturbance frequencies (e.g., old-growth re-sprouting shrub species such as *Cercocarpus ledifolius*, etc., may frequently attain “tree size”). At the low end, woody perennial herbs or sub-shrubs of various species are often difficult to categorize into a single life-form; usually sub-shrubs (per USDA-NRCS 2011) were categorized in the “shrub” category.
 - **Subshrub (or Dwarf shrub)**: A multi-stemmed plant with noticeably woody stems less than 0.5 meter tall. May be easily confused with a perennial herb or small shrub. We lump them into the “shrub” category in stand tables and descriptions of vegetation types.
 - **Herb** – Is any vascular plant species that has no main woody stem-development, and includes grasses, forbs, and perennial species that die-back seasonally.
 - **Cryptogam** - Is a nonvascular plant or plant-like organism without specialized water or fluid conducting vascular tissue (i.e., xylem and phloem). Includes mosses, lichens, liverworts, hornworts, and algae.
- **Stand** – Is the basic physical unit of vegetation in a landscape. It has no set size. Some vegetation stands are very small such as wetland seeps, and some may be several square kilometers in size such as desert or forest types. A stand is defined by two main unifying characteristics:

- It has *compositional* integrity. Throughout the site, the combination of species is similar. The stand is differentiated from adjacent stands by a discernable boundary that may be abrupt or gradual.
 - It has *structural* integrity. It has a similar history or environmental setting, affording relatively similar horizontal and vertical spacing of plant species. For example, a hillside forest formerly dominated by the same species, but that has burned on the upper part of the slope and not the lower is divided into two stands. Likewise, a sparse woodland occupying a slope with shallow rocky soils is considered a different stand from an adjacent slope of a denser woodland/forest with deep moist soil and the same species.
- **Dominance by layer/stratum:** Tree, shrub, and herbaceous layers are considered physiognomically distinct. Alliances are usually named by the dominant and/or characteristic species of the tallest characteristic layer (see tree-characterized, shrub-characterized, and herb-characterized vegetation definitions below). Average covers within the dominant layer reflect the "modal" concept of the health/age/environment of a particular vegetation type. For example, a higher average cover of woody plants within a stand not recently affected by disturbance reflects a mode of general availability of water, nutrition, and equitable climate, while lower average cover under similar conditions would reflect lower availability of these things.
- **Vegetation:**
 - **Woodland and forest vegetation:** In the National Vegetation Classification, a woodland is defined as a tree-dominated stand of vegetation with between 25 and 60 percent cover of trees and a forest is defined as a tree-dominated stand of vegetation with 60 percent or greater cover of trees.
 - **Shrubland vegetation:** Shrubs (including dwarf-shrubs) are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component, and one or both of the following criteria are met: (1) Shrubs influence the distribution or population dynamics of other plant species; (2) Shrubs play an important role in ecological processes within the stand. Shrub alliances typically have at least 10% absolute shrub cover.
 - **Herbaceous vegetation:** Herbs are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component, and play an important role in ecological processes within the stand, and the stand cannot be characterized as a tree or shrub stand.
 - **Nonvascular vegetation:** Nonvascular organisms provide a consistent (even if sparse) structural component and play an important role in ecological processes within the stand.
 - **Semi-natural/ruderal vegetation:** Stands characterized by naturalized non-native species. Examples include *Tamarix* spp., and *Brassica* spp. Note: the terminology for semi-natural versus ruderal plant communities is still under discussion with ESA Vegetation Panel and Hierarchy Review Working Group, and in the last 5 years the classification names have gone back and forth between these two terms.
- **National Vegetation Classification Hierarchy Levels:**
 - **Class** – A vegetation classification unit of high rank (1st level) defined by a broad combination of dominant general growth forms adapted to basic moisture, temperature, and/or substrate or aquatic conditions (FGDC 2008).

- **Subclass** – A vegetation classification unit of high rank (2nd level) defined by a combination of general dominant and diagnostic growth forms that reflect global mega- or macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate or aquatic conditions (FGDC 2008).
- **Formation** – A vegetation classification unit of high rank (3rd level) defined by a combination of dominant and diagnostic growth forms that reflect global macroclimatic conditions as modified by altitude, seasonality of precipitation, substrates, and hydrologic conditions (FGDC 2008).
- **Division** – A vegetation classification unit of intermediate rank (4th level) defined by a combination of dominant and diagnostic growth forms and a broad set of diagnostic plant species that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
- **Macrogroup** – A vegetation classification unit of intermediate rank (5th level) defined by a moderate set of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
- **Group** – A vegetation classification unit of intermediate rank (6th level) defined by combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
- **Alliance** – A classification unit of vegetation of low rank (7th level), containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover. Alliances reflect physiognomy as well as regional to subregional climates, substrates, hydrology, and disturbance regimes (Jennings et al. 2006, FGDC 2008).
- **Association** – A vegetation classification unit of low rank (8th level) defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions (Jennings et al. 2006). Associations reflect local topo-edaphic climates, substrates, hydrology, and disturbance regimes.
- **Other Classification Terms:**
 - **Provisional Type** – A vegetation type that is not yet formally described, but expected to be an addition to the existing list of USNVC types for a project area. The type may be represented by plot samples (e.g., <10 samples), while it may or may not be particularly common or because it is localized in extent; however, it could be documented in additional location(s) outside of the study area.
- **Conservation Rank** – Listed by the state Nature Conservancy Heritage Programs, including the California Department of Fish and Wildlife's Vegetation Classification and Mapping Program, these are the "Global" and "State" ranks, as seen below:
 - **G1 and S1** – Critically Imperiled—At very high risk of extinction due to extreme rarity. Often 5 or fewer viable occurrences and/or up to 518 hectares.
 - **G2 and S2** – Imperiled—At high risk of extinction due to very restricted range, very few occurrences, steep declines, or other factors. Often 6–20 viable occurrences, and/or 518–2,590 hectares
 - **G3 and S3** – Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors. Often 21–100 viable occurrences and/or 2,590–12,950 hectares.

- **G4 and S4** – Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors. Often greater than 100 viable occurrences and/or more than 12,950 hectares.
- **G5 and S5** – Secure—Common; widespread and abundant.
- **Abbreviations and Other Characters:**
 - **Parentheses “()”** – When parentheses are used around a species name within a vegetation type name, it indicates that the species is often present as an indicator of that association or alliance, but it does not meet a threshold of 75% or more constancy. The parentheses may be used around the full scientific name or only around the species epithet. An example is the *Juniperus occidentalis* / (*Poa secunda* – *Festuca idahoensis* – *Pseudoroegneria spicata*) Woodland Association. If parentheses are only around the species epithet, it means that the genus is consistently present but another species could also be present from that genus. An example is the *Artemisia arbuscula* – *Eriogonum* (*microthecum*, *sphaerocephalum*) Shrubland Association, where the genus may be represented by one or more species found within the parentheses.
 - **Em dash “–”** – Separates taxa in a community name that are within the same stratum.
 - **Slash “/”** – Separates taxa in a community name that are in different strata

