FINE-SCALE VEGETATION MAP AND ACCURACY ASSESSMENT OF THE SOUTHERN SIERRA NEVADA FOOTHILLS, CALIFORNIA

Contract P1884008




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ABSTRACT

Under contract to the California Department of Fish and Wildlife (CDFW), Aerial Information Systems (AIS) created a fine-scale vegetation map of portions of the Southern Sierra Nevada Foothills in central California. AIS subcontracted the California Native Plant Society (CNPS) to conduct field reconnaissance assistance for this project, as well as accuracy assessment (AA) field data collection; and Soar Environmental Consulting to assist in the AA field data collection. CDFW's Vegetation Classification and Mapping Program (VegCAMP) provided in-kind service to allocate and score the AA.

The mapping study area, consists of approximately 1,824,939 acres, of Mariposa, Madera, Tulare, Kern, and Los Angeles counties. Work was performed on the project between 2019 and 2022. The primary purpose of the project was to further CDFW's goal of developing fine-scale digital vegetation maps as part of the California Biodiversity Initiative Roadmap of 2018.

CNPS under separate contract and in collaboration with CDFW VegCAMP developed the floristic vegetation classification used for the project. The floristic classification follows protocols compliant with the Federal Geographic Data Committee (FGDC) and National Vegetation Classification Standards (NVCS).

The vegetation map was produced applying heads-up digitizing techniques using a 2018 base of one-meter 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 2 acres; exceptions are made for wetlands and riparian types, which were mapped to a 1-acre MMU.

Field reconnaissance and accuracy assessment enhanced map quality. There was a total of 111 mapping classes. The overall Fuzzy Accuracy Assessment rating for the final vegetation map, at the Alliance and Group levels, is 89.5 percent.

Keywords: California Department of Fish and Wildlife, National Vegetation Classification Standard, NVCS, photointerpretation, Sierra Nevada, Southern Sierra Nevada, vegetation, vegetation alliance, Vegetation Classification and Mapping Program, VegCAMP

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CHAPTER 1: Introduction

1.1 The Mapping Program

Under Contract P1884008, the California Department of Fish and Wildlife (CDFW) tasked Aerial Information Systems, Inc. (AIS) to conduct mapping classification development and fine-scale vegetation mapping of approximately 1,824,939 acres within Mariposa, Madera, Fresno, Tulare, Kern, and Los Angeles counties of California. The California Native Plant Society (CNPS), as a subcontractor to AIS, assisted AIS in field reconnaissance efforts and conducted the accuracy assessment (AA) field data collection for this project. Soar Environmental Consulting (SOAR), also as a subcontractor, assisted in the AA land access and field data collection.

CDFW's goal is to develop fine-scale vegetation maps for local and regional planning purposes, as specified in the California Biodiversity Initiative roadmap of 2018. The Southern Sierra Nevada Foothills (SSNF) ecological region is one of several that are considered as having potential for the greatest increase in urban, suburban, and rural residential development within California. AIS had previously mapped the vegetation for the adjacent Northern Sierra Nevada Foothills area for CDFW from 2008 to 2011 (Menke et al., 2011).

Work performed for this effort, including the development of the mapping classification, is based on the floristic classification provided by CDFW (Ratchford 2022), and mapping standards as outlined in the Survey of California Vegetation, 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 on a few trips by VegCAMP and/or CNPS staff. AIS photointerpreters 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) for vegetation is 2 acres; exceptions are made for wetlands and riparian types, which are mapped to a 1-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 2018 one-meter 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 VegCAMP and CNPS staff. Sample allocation sites for AA were created by VegCAMP for 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 project study area consists of three geographic subareas, the Southern Sierra Nevada Foothills Proper, the Horsethief Mountain subarea north of the Tejon Ranch, and the San Emigdio Range subarea west of Tejon Ranch. Each subarea is described in the following subsections. The study area was divided into 6 Delivery Areas, 2 of which were further subdivided, for a total of 8 interim Delivery Areas. Figure 1 below shows the project study area, subareas, and the 8 Delivery Areas.

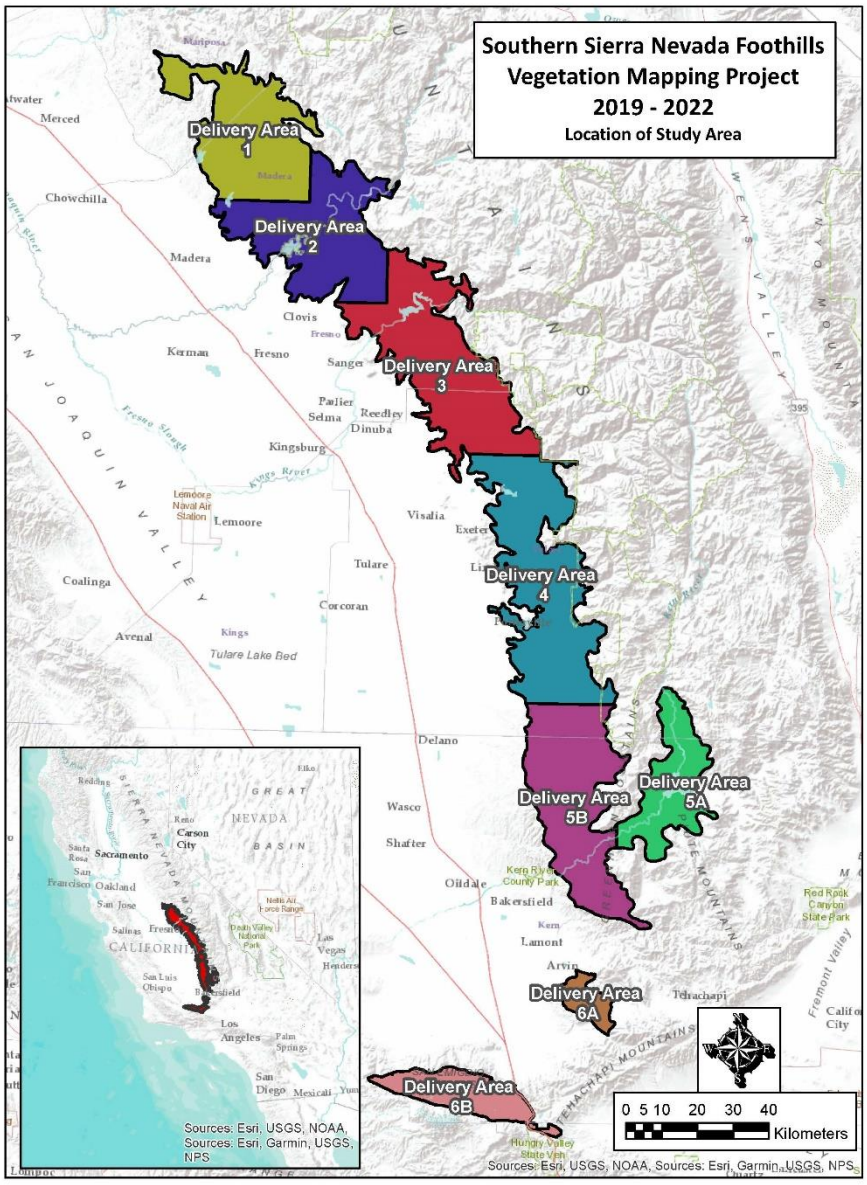


Figure 1: Location of the Study Area

The Southern Sierra Nevada Foothills Proper is consists of Delivery Areas 1, 2, 3, 4, and 5. The Horsethief Mountain subarea is entirely within Delivery Area 6A, and the San Emigdio Range subarea is entirely within Delivery Area 6B.

1.2.1 Southern Sierra Nevada Foothills Proper Subarea

The Southern Sierra Nevada Foothills Proper, in general, encompasses what is considered the blue oak zone of the southern Sierra Nevada foothill region. The western border of the study area includes the lower elevation grasslands that abut the previously mapped Great Valley Ecoregion Vegetation Map geodatabase. The Northern Sierra Nevada Foothills Ecoregion Vegetation geodatabase, also previously mapped, borders the study area on the north. On the eastern side, the study area follows the upper edge of the blue oak-interior live oak zone as it transitions to the canyon live oak-black oak and conifer zone (at approximately 3000 feet on some canyon bottoms to 8000 feet in elevation on the higher slopes). A small portion of the eastern border abuts the previously mapped Sequoia-Kings Canyon National Park vegetation geodatabase.

This subarea is home to a number of significant river systems (with corresponding vegetated riparian corridors), as well as several major reservoirs, all feeding the agricultural areas and communities of the San Joaquin Valley. They also serve recreational purposes for the state. These include the Fresno River (with Hensley Lake), the San Joaquin River (with Millerton Lake), the Kings River (with Pine Flat Lake), the Kaweah River (with Lake Kaweah), the Tule River, and the Kern River (with Lake Isabella).

The western third of the subarea consists primarily of heavily grazed annual grasslands occurring on rolling hills that rise out from the edge of the San Joaquin Valley floor. Oval patterns of vernal pools pockmark the grasslands in the shallow draws and confined basins of the northwestern portion of the subarea. Widely scattered open stands of California coffeeberry (*Frangula californica)* occur on rocky outcroppings within the grassy matrix. Sparse stands of Fremont cottonwood (*Populus fremontii)* begin to appear in the riparian corridors, along with stands of blue oak (*Quercus douglasii)* woodlands on the toe/side slopes.

Advancing to the east as one climbs further into the hills and higher in elevation (below 3000 feet), the blue oak cover and frequency increases on variable aspects where interior live oak (*Quercus wislizeni)* begins to establish in the protected concavities and north faces with California buckeye (*Aesculus californica)*. Chaparral species such as wedgeleaf ceanothus (*Ceanothus cuneatus)*, whiteleaf manzanita (*Arctostaphylos viscida)*, and birch leaf mountain mahogany (*Cercocarpus montanus)* occur as a minor component to stands and occasionally form small patches. Chaparral whitethorn (*Ceanothus leucodermis}* stands, more commonly found in the northern third of the study area, are observed on rocky/thin soil substrates and gradually sloping north faces. Riparian areas consist of mixed Fremont cottonwood and California sycamore (*Platanus racemosa)* in the upper canopy with an understory of narrowleaf willow (*Salix exigua)*, button willow (*Cephalanthus occidentalis)*, and/or mulefat (*Baccharis salicifolia)*. Oregon ash (*Fraxinus latifolia)* also begins to establish in the creeks within this subregion.

Valley oak (*Quercus lobata)* starts to occupy the drier margins of the floodplain terraces adjacent to more significant drainages that usually contain a core of riparian tree/shrub species next to the active channel. Sparse stands of either deer weed (*Lotus scoparius)*, silver bush lupine (*Lupinus albifrons)*, and/or yerba santa (*Eriodictyon* spp.) occur on human-disturbed areas recovering from fire or clearing, as well as on small rocky outcrops with grassy interludes.

Foothill pine *(Pinus sabiniana)* is absent within a large gap (almost half the study area) from Pine Flat Reservoir southward, until it picks up again in the higher elevations west of the Greenhorn Mountains and in the areas surrounding Lake Isabella. Chamise *(Adenostoma fasciculatum)* occurs in three localized areas and is limited in its distribution. The northern half of the subarea boasts a small concentration of chamise stands that occur near the Fresno River, west of the town of Coarsegold. It should be noted that chamise is largely absent from the northern half and southern third of the subarea. In the southern half, chamise stands appear again in pockets along the eastern edge of the subarea, in the higher elevations between Shadequarter Mountain in the north to the middle fork of the Tule River in the south. One other outlier patch occurs on the toe slopes along the Kern River, north of the town of Kernville.

Further east, above 3000 feet in elevation, the terrain becomes steeper and more variable, with tree and shrub dominated stands averaging higher overall covers of mixed conifer, hardwood, and chaparral types. Higher elevation conifers such as ponderosa pine (*Pinus ponderosa)* and incense cedar (*Calocedrus decurrens)* mix in the upper canopy above interior live oak and canyon live oak (*Quercus chrysolepis)*. Black oak (*Quercus kelloggii)* also occurs more in this region on gradual convexities or flats, with components of ponderosa pine, canyon live oak, interior live oak, and chaparral. Significant conifer dieback was observed in many of these stands. Chaparral stands in this region vary between whiteleaf manzanita, wedgeleaf ceanothus, California flannelbush (*Fremontodendron californicum)*, and birch leaf mountain mahogany dominance. Riparian corridors occurring in the upper elevations of this region contain stands of California sycamore and Fremont cottonwood, with a higher frequency of Oregon ash cover. Rocky/bouldery stream beds with fast moving water boast small densely homogenous sections of white alder (*Alnus rhombifolia)*.

The southern third of the subarea is influenced by more xeric conditions and is within close proximity to the Mojave Desert. Southern California and desert species such as singleleaf pinyon (*Pinus monophylla)*, California juniper (*Juniperus californica)*, Joshua tree (*Yucca brevifolia)*, cup leaf ceanothus (*Ceanothus greggii)*, California flannelbush, big sagebrush (*Artemisia tridentata)*, California buckwheat (*Eriogonum fasciculatum)*, Wright's buckwheat (*Eriogonum wrightii)*, chaparral yucca (*Hesperoyucca whipplei)*, scale broom (*Lepidospartum squamatum)*, California joint fir (*Ephedra californica)*, Acton's brittle brush (*Encelia actonii)*, and rubber rabbitbrush (*Ericameria nauseosa)* occur primarily along the Kern River corridor. Rare stands of Paiute cypress (*Hesperocyparis nevadensis)* also occur on protected slopes above 4000 feet in elevation within the Kern River corridor.

1.2.2 Horsethief Mountain Subarea

The Horsethief Mountain subarea lies at the western end of the Tehachapi Mountains, west of Cummings Valley and north of Tejon Ranch. It is in the blue oak-interior live oak zone. The grasslands on the west abut the Great Valley Ecoregion Vegetation Map geodatabase. A portion of the northern border is adjacent to the Tehachapi Rail Corridor Vegetation geodatabase and borders the Bear Valley and the Bear Valley Springs development. The eastern boundary is adjacent to Cummings Valley. The southern border follows the Rancho El Tejon cadastral line.

The southwestern portion of the subarea features extensive steep southwest-trending slopes dominated by California annual grasslands. At the higher elevations on more protected slopes, stands of blue oak dominate. On larger slopes California buckeye and canyon live oak are prevalent, with some stands of interior live oak and some patches of big sagebrush. As the terrain flattens out near the community of Stallion Springs, at the southern end of the Cummings Valley, valley oaks become prominent in the developed areas. Cummings Valley drains into Chanac Creek which features stands of Fremont cottonwood, and some valley oak (riparian) and red willow.

The gentle hills dotted with homes northwest of Stallion Springs proper are dominated by blue oak, with some stands of interior live oak and California buckeye in the protected draws. As the hills become steeper further north, the blue oak and interior live oak stands continue, with canyon live oak and California buckeye on the protected slopes. Valley oak dominates Oak Flat with a stand of cup leaf ceanothus and California flannelbush on an adjacent north slope. The highest elevation slopes, northwest of Oak Flat, feature stands of birch leaf mountain mahogany, some foothill pine, and more extensive areas of interior live oak.

Over the ridge, on the north-facing slopes above the private community of Bear Valley Springs, there are extensive stands of cup leaf ceanothus, Californica flannel bush, birch leaf mountain mahogany, and big sagebrush, along with blue oak stands and interior live oak and canyon live oak in the steeper protected canyons.

The northwestern part of the subarea, features west-trending grasslands coming up the slopes of the Tejon Mountains from the valley below. These grasslands are broken up by areas of narrowleaf goldenbush (*Ericameria linearifolia)* on protected north-trending facets on the lower elevations, and blue oak woodlands at the higher elevations. The north slopes in this area feature broader stands of California buckeye, dense stands of both interior live oak shrub and tree types, and some stands of foothill pine and wedgeleaf ceanothus as well. At the bottom of the broad north slope is Sycamore Canyon which contains canyon live oak, California sycamore, and Fremont cottonwood. North of this canyon is a steep south slope, at the very northern edge of the subarea, which features an extensive California buckwheat stand.

1.2.3 San Emigdio Range Subarea

The San Emigdio Range subarea consists of the mountains at the southern end of the San Joaquin Valley. The northern boundary abuts the Great Valley Ecoregion

Vegetation Map geodatabase. The southern border lies along the San Andreas Rift Zone from Bitter Creek on the west to just west of Quail Lake on the east. A small portion of the eastern boundary abuts the Desert Renewable Energy Conservation Plan (DRECP) Vegetation geodatabase. Another portion of the eastern border follows the Interstate 5 (I-5) corridor. The remainder of the eastern border steps its way from the I-5 freeway to the DRECP study area. This portion east of the I-5 forms an appendage of the study area within the Tehachapi Mountains.

The southern edge of this subarea follows along the steep, south-facing slope of the San Emigdio Mountains, between the Blue Ridge-Tecuya Ridge and the San Andreas Rift Zone. On the west end of the subarea, these south-facing slopes start out dominated by grasslands with areas of allscale saltbush *(Atriplex polycarpa)* and California buckwheat on the lower elevation slopes, while stands of birch leaf mountain mahogany and Tucker oak *(Quercus john-tuckeri)* dominate the more extensive, higher elevation slopes. Further east, stands of canyon live oak, Jeffrey pine (*Pinus jeffreyi)* and singleleaf pinyon occur where the upper slope is more undulating. These three types also occur along the ridge, and continued to dominate to the east along the south face above the Pine Mountain Club.

Further east, near the Pinon Pines Estates, where the south face is not as extensive, the canyon live oak and Jeffrey pine drop out and interior live oak, Tucker oak, and California buckwheat stands occur with the singleleaf pinyon stands. The lower slopes have big sagebrush and rubber rabbitbrush stands in this area.

This south-facing slope of the San Emigdio Mountains becomes more undulating and the diversity increases near Frazier Park. Upper slopes have stands of canyon live oak, singleleaf pinyon, and mormon tea *(Ephedra viridis)* while lower slopes are dominated by stands of bigberry manzanita (*Arctostaphylos glauca)*, Tucker oak, birch leaf mountain mahogany*,* and singleleaf pinyon. The south face begins to diminish as the range nears Lebec, at the eastern end of the San Emigdio Mountains. The south-trending, gentler slopes above Lebec feature stands of big sagebrush, California buckwheat, rubber rabbitbrush, with Tucker oak as well as some blue oak on the upper slopes.

South of Lebec, the subarea extends east of I-5 and includes a portion of the Tehachapi Mountains just north of Gorman. This area is predominately grassland with canyon live oak, Tucker oak, and interior live oak stands in the concavities, with some areas of rubber rabbitbrush.

North of Lebec, the eastern limit of the San Emigdio Range reaches the I-5 corridor. These lower slopes are dominated by grasslands, Tucker oak, and bigberry manzanita, with some stands of rubber rabbitbrush and California buckwheat. At the higher elevations, the steeper slopes are dominated by dense stands of Tucker oak and canyon live oak with some California buckwheat and singleleaf pinyon.

Near Fort Tejon, stands of red willow and valley oak (riparian) are found along Grapevine Creek. North of Fort Tejon, in the northeastern corner of the subarea, there

is an extensive area of grasslands with blue oak woodlands that were burned in 2003. West of this burned area, along the northern boundary are the Pleito Hills, which has extensive grasslands with patches of California buckwheat, rubber rabbitbrush, and some California juniper on the more exposed slopes, with Tucker oak and blue oak on the more protected slopes. There is also a unique, exposed south face dominated by bigberry manzanita in the area.

Between the Pleito Hills and the previously mentioned Blue Ridge-Tecuya Ridge of the San Emigdio Mountains, is the core of the subarea. The lower slopes are dominated by Tucker oak, with some areas of blue oak, as well as a few stands dominated by California juniper. These stands give way to large dense stands of singleleaf pinyon and canyon live oak at the higher elevations. Some of the higher exposed slopes are dominated by Jeffrey pine, while some of the deeper canyons and protected slopes are dominated by big cone Douglas fir (*Pseudotsuga macrocarpa)*. Moving west through the core of the San Emigdio Mountains, there is significantly less singleleaf pinyon, Jeffrey pine, and big cone Douglas fir. Canyon live oak dominates the overall north-trending upper slopes with blue oak, Tucker oak and grasslands on the lower hills.

The northwest portion of the subarea features an extensive grassland that makes up over 12,000 acres. Patches of blue oak, California buckwheat, narrowleaf goldenbush, rubber rabbitbrush, and even some allscale saltbush are scattered throughout.

CHAPTER 2: Methodology

2.1 Overview

The mapping effort began with the compilation of a preliminary mapping classification provided by CDFW based on the existing Northern and Southern Sierra Nevada Foothills floristic classifications. The project team made up of experienced photointerpreters from AIS and field ecologists from CDFW and CNPS, then conducted field reconnaissance visits to prepare for the photointerpretation effort. Using GIS technology, the photointerpreters applied their knowledge and observations of California vegetation to create a map of vegetation types. Codes representing a suite of other attributes were assigned to the vegetation polygons. Several quality control and AA 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 1-meter 2018 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 photointerpreters 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.

However, in some instances, photointerpreters mapped to more recent conditions than shown on the base imagery. This was done only where field observations indicated large areas of change, such as cleared land, new urbanization, etc., that had been created after the base imagery was flown. These areas were flagged in the field and subsequently evaluated back in the office. Polygons for these situations were mapped if the boundaries could be seen on post-base dated imagery (usually Google Earth) or determined by using visible features on the landscape such as fence lines or roads.

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 photointerpreters 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. CalFIRE – downloaded from http://frap.cdf.ca.gov/data/frapgisdata-subset.php
2. CA State Geology Maps – downloaded from http://datagateway.nrcs.usda.gov
3. SSNF Classification Plots – provided by CDFW and CNPS
4. Digital Elevation Models – via ArcGIS Online
5. USGS Topo Maps Digital Raster Graphic – via ArcGIS Online
6. Federal Lands – downloaded from http://www.nationalatlas.gov/atlasftp.html
7. Indian Lands – downloaded from for http://www.nationalatlas.gov/atlasftp.html
8. Roads GTLF – Provided by BLM
    - Fresno County
    - Kern County
    - Los Angeles County
    - Madera County
    - Mariposa County
    - Tulare County
    - Ventura County
9. Surface Management Area – provided by BLM
10. Wetlands CONUS BLM Areas – downloaded from http://www.fws.gov/wetlands/Data/State-Downloads.html
11. Wilderness – downloaded from http://www.blm.gov/wo/st/en.html
12. California Electric Transmission Line shapefile https://data.cnra.ca.gov/dataset/california-electric-transmission-lines
13. Existing Vegetation Databases from CDFW – downloaded from https://apps.wildlife.ca.gov.bios
    - Vegetation – Great Valley Ecoregion Vegetation Database [ds2632]
    - Vegetation – McKenzie Preserve [ds703]
    - Vegetation – Sequoia-Kings Canyon National Parks Vegetation Mapping Project [ds984]
    - Vegetation – Western Madera County [ds1057]
    - Vegetation – Northern Sierra Nevada Foothills [ds566]
    - Vegetation – Tehachapi Rail Corridor (not in BIOS)
    - Vernal Pool Complexes – Central Valley, 1989-1998 [ds36]

2.3 Floristic Classification

The floristic vegetation classification developed for the Sierra Nevada foothills region is a means to organize and catalog the vegetation alliance, association, or plant community stands that occur within a given area. Because of the close proximity of the northern and southern Sierra Nevada foothills study areas, both a part of the Foothills ecological region, the classification development was conducted as a full ecoregional analysis. While the data collection occurred as separate efforts, classification analysis from Klein et al. (2007) in the northern Foothills region was reproduced to present work across both the southern and northern Foothills area by Ratchford et al. (2022) as a combined endeavor over the entire region to develop one cohesive classification of the ecoregion from data collected between 2005 and 2015.

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 (Klein et al. 2007, Ratchford et al. 2022). 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 System (NVCS) and the state Manual of California Vegetation (per Sawyer et al. 2009).

The Floristic Vegetation Classification is presented in **Table 1** below. Also refer to Appendix E for the floristic vegetation key, and **Figures 3-5** for classification plot locations (Survey Type).

Table 1: Vegetation Classification in the Southern Sierra Nevada Foothills, Organized by Lifeform

Count is number of classification survey.

Lifeform	Alliance	Association	Count
Woodland & Forest			**Count**
	Abies concolor		**1**
		Abies concolor – Calocedrus decurrens – Quercus kelloggii	1
	Acer macrophyllum – Alnus rubra		**3**
		Acer macrophyllum – Pseudotsuga menziesii / Dryopteris arguta	1
		Acer macrophyllum / (Rubus ursinus)	2
	Aesculus californica		**72**
		Aesculus californica	21
		Aesculus californica – Umbellularia californica	4

Lifeform	Alliance	Association	Count
		Aesculus californica / Toxicodendron diversilobum / Moss	44
	Alnus rhombifolia		**93**
		Alnus rhombifolia	37
		Alnus rhombifolia – Platanus racemosa	3
		Alnus rhombifolia – Salix laevigata	10
		Alnus rhombifolia – Umbellularia californica – (Quercus chrysolepis)	14
		Alnus rhombifolia / Carex (nudata)	13
		Alnus rhombifolia / Darmera peltata	1
		Alnus rhombifolia / Salix exigua – (Rosa californica)	9
		Calocedrus decurrens – Alnus rhombifolia	3
	Arbutus menziesii		**1**
		Arbutus menziesii – Umbellularia californica	1
	Calocedrus decurrens		**2**
		Calocedrus decurrens – Quercus chrysolepis – Quercus kelloggii	2
	Fraxinus latifolia		**33**
		Fraxinus latifolia	8
		Fraxinus latifolia – Alnus rhombifolia	14
		Fraxinus latifolia – Salix laevigata	9
	Hesperocyparis (sargentii, macnabiana)		**2**
		Hesperocyparis macnabiana / Arctostaphylos viscida	2
	Hesperocyparis forbesii – Hesperocyparis nevadensis		**2**
		Hesperocyparis nevadensis	2
	Juglans hindsii and Hybrids		**3**
		Juglans hindsii	3
	Juniperus californica		**17**
		Juniperus californica – (Cercocarpus montanus – Fraxinus dipetala)	5
		Juniperus californica / herbaceous	12
	Pinus jeffreyi		**14**
		Pinus jeffreyi – Pinus monophylla	14

Lifeform	Alliance	Association	Count
	Pinus monophylla – (Juniperus osteosperma)		**17**
		Pinus monophylla – (Juniperus osteosperma) / Cercocarpus ledifolius	1
		Pinus monophylla – (Juniperus osteosperma) / Sparse Understory	4
		Pinus monophylla / Eriogonum fasciculatum	1
		Pinus monophylla / Quercus john-tuckeri	9
	Pinus ponderosa		**3**
		Pinus ponderosa / Arctostaphylos viscida	2
	Pinus ponderosa – Calocedrus decurrens – Pseudotsuga menziesii		**21**
		Pinus ponderosa – (Calocedrus decurrens) stream terrace	5
		Pinus ponderosa – Calocedrus decurrens – Quercus kelloggii	11
		Pinus ponderosa – Pseudotsuga menziesii – Quercus chrysolepis / Galium bolanderi	5
	Pinus sabiniana		**46**
		Pinus sabiniana / Adenostoma fasciculatum	7
		Pinus sabiniana / Arctostaphylos viscida	6
		Pinus sabiniana / Ceanothus cuneatus – (Rhamnus ilicifolia)	17
		Pinus sabiniana / Ceanothus cuneatus / Plantago erecta	2
		Pinus sabiniana / herbaceous	12
	Platanus racemosa – Quercus agrifolia		**60**
		Platanus racemosa – Aesculus californica	15
		Platanus racemosa – Populus fremontii / Salix lasiolepis	4
		Platanus racemosa – Quercus lobata	16
		Platanus racemosa – Salix laevigata / Salix lasiolepis – Baccharis salicifolia	10
		Platanus racemosa / annual grass	12

Lifeform	Alliance	Association	Count
		Platanus racemosa / Baccharis salicifolia	1
		Umbellularia californica – Platanus racemosa	1
	Populus fremontii – Fraxinus velutina – Salix gooddingii		**51**
		Populus fremontii – Salix gooddingii	4
		Populus fremontii – Salix laevigata	37
		Populus fremontii – Salix lasiolepis	2
		Populus fremontii / Salix exigua	4
		Populus fremontii / Vitis californica	1
	Quercus chrysolepis		**147**
		Quercus chrysolepis	47
		Quercus chrysolepis – Pinus jeffreyi	2
		Quercus chrysolepis – Pinus ponderosa	3
		Quercus chrysolepis – Pinus sabiniana	1
		Quercus chrysolepis – Quercus kelloggii	10
		Quercus chrysolepis – Umbellularia californica	12
		Quercus chrysolepis / Arctostaphylos viscida	21
		Quercus chrysolepis / Calycanthus occidentalis – Vitis californica	35
		Quercus chrysolepis / Quercus (wislizeni, parvula)	13
	Quercus douglasii		**347**
		Quercus douglasii – Aesculus californica / grass	17
		Quercus douglasii – Juniperus californica / Ceanothus cuneatus – Cercocarpus montanus	5
		Quercus douglasii – Juniperus californica / Ericameria linearifolia	1

Lifeform	Alliance	Association	Count
		Quercus douglasii – Pinus sabiniana / Arctostaphylos viscida	11
		Quercus douglasii – Pinus sabiniana / Ceanothus cuneatus – Cercocarpus montanus	4
		Quercus douglasii – Pinus sabiniana / Grass	14
		Quercus douglasii / (Achnatherum lemmonii – Nassella pulchra)	18
		Quercus douglasii / Amsinckia (intermedia, menziesii) – Plagiobothrys nothofulvus	14
		Quercus douglasii / Arctostaphylos manzanita / herbaceous	7
		Quercus douglasii / Bromus spp. – (Daucus pusillus)	203
		Quercus douglasii / Ceanothus cuneatus	24
		Quercus douglasii / Selaginella hansenii – Navarretia pubescens	7
		Quercus douglasii / Toxicodendron diversilobum / grass	14
	Quercus kelloggii		**137**
		Quercus kelloggii – Pinus ponderosa	6
		Quercus kelloggii – Pinus ponderosa / Arctostaphylos viscida	35
		Quercus kelloggii – Pseudotsuga menziesii – Umbellularia californica	5
		Quercus kelloggii – Quercus chrysolepis / Toxicodendron diversilobum	9
		Quercus kelloggii / annual grass-herb	11
		Quercus kelloggii / Ceanothus integerrimus	14
		Quercus kelloggii / Ribes roezlii provisional	6
		Quercus kelloggii / Toxicodendron diversilobum	27
		Quercus kelloggii / Toxicodendron diversilobum – Styrax redivivus / Triteleia laxa	3
		Quercus wislizeni – Quercus kelloggii / Heteromeles arbutifolia – Toxicodendron diversilobum	16
	Quercus lobata		**21**
		Quercus douglasii – Quercus lobata	3
		Quercus lobata – Quercus kelloggii	6
		Quercus lobata / grass	11

Lifeform	Alliance	Association	Count
	Quercus lobata Riparian		**115**
		Quercus lobata – Alnus rhombifolia	13
		Quercus lobata – Fraxinus latifolia / Vitis californica	9
		Quercus lobata – Quercus chrysolepis / Vitis californica	12
		Quercus lobata – Quercus wislizeni	29
		Quercus lobata – Salix lasiolepis	6
		Quercus lobata / Herbaceous Semi-Riparian	18
		Quercus lobata / Rubus armeniacus	23
	Quercus wislizeni – Quercus parvula (tree)		**478**
		Quercus (wislizeni, parvula) – Arbutus menziesii / Toxicodendron diversilobum	5
		Quercus wislizeni – (Pinus sabiniana) / Arctostaphylos viscida	21
		Quercus wislizeni – Aesculus californica	92
		Quercus wislizeni – Pinus ponderosa	6
		Quercus wislizeni – Pinus sabiniana / annual grass – herb	28
		Quercus wislizeni – Pinus sabiniana / Arctostaphylos manzanita	10
		Quercus wislizeni – Quercus chrysolepis tree	10
		Quercus wislizeni – Quercus douglasii / herbaceous	70
		Quercus wislizeni – Salix laevigata / Frangula californica	44
		Quercus wislizeni / Eriodictyon californicum	9
		Quercus wislizeni / Heteromeles arbutifolia	65
		Quercus wislizeni / Toxicodendron diversilobum	110
	Salix gooddingii – Salix laevigata		**64**
		Salix gooddingii	17
		Salix laevigata	40
		Salix laevigata – Salix lasiolepis	6

Lifeform	Alliance	Association	Count
	Umbellularia californica		**25**
		Umbellularia californica	12
		Umbellularia californica – Quercus chrysolepis	1
		Umbellularia californica – Quercus wislizeni	12
	Yucca brevifolia		**1**
Shrubland			
	Californian mesic chaparral Group		**2**
	Central and south coastal California seral scrub Group		**1**
	Adenostoma fasciculatum		**66**
		Adenostoma fasciculatum	43
		Adenostoma fasciculatum – (Lotus scoparius – Eriodictyon spp.)	15
		Adenostoma fasciculatum – Arctostaphylos manzanita	6
	Ambrosia salsola – Bebbia juncea		**1**
	Arctostaphylos (canescens, manzanita, stanfordiana)		**2**
		Arctostaphylos manzanita	2
	Arctostaphylos glandulosa		**2**
		Arctostaphylos glandulosa – Adenostoma fasciculatum	2
	Arctostaphylos glauca		**4**
		Arctostaphylos glauca	4
	Arctostaphylos pungens – Arctostaphylos pringlei		**9**
		Arctostaphylos parryana Provisional	9
	Arctostaphylos viscida		**110**
		(Arctostaphylos viscida – Adenostoma fasciculatum) / Salvia sonomensis	30
		Arctostaphylos viscida	31
		Arctostaphylos viscida – Adenostoma fasciculatum	35
		Arctostaphylos viscida – Quercus wislizeni	5

Lifeform	Alliance	Association	Count
		Arctostaphylos viscida / Salvia sonomensis – Carex (brainerdii, xerophila)	7
	Artemisia tridentata		**25**
		Artemisia tridentata – Ceanothus cuneatus	14
		Artemisia tridentata – Ericameria nauseosa	5
		Artemisia tridentata – Eriogonum wrightii	6
	Atriplex canescens		**1**
		Atriplex canescens Desert Wash	1
	Atriplex polycarpa		**3**
		Atriplex polycarpa / Annual Herbaceous	3
	Baccharis pilularis		**2**
		Baccharis pilularis	2
	Baccharis salicifolia		**9**
		Baccharis salicifolia	9
	Ceanothus cuneatus		**156**
		Ceanothus cuneatus	118
		Ceanothus cuneatus – Adenostoma fasciculatum	4
		Ceanothus cuneatus – Eriodictyon californicum – (Fremontodendron californicum)	12
		Ceanothus cuneatus / Plantago erecta	20
	Ceanothus greggii – Fremontodendron californicum		**14**
		Fremontodendron californicum	13
	Ceanothus integerrimus		**11**
		Ceanothus integerrimus	2
		Ceanothus integerrimus – Quercus garryana var. fruticosa	9
	Ceanothus leucodermis		**10**
		Ceanothus leucodermis	10
	Cephalanthus occidentalis – Rosa californica		**21**
		Calycanthus occidentalis	4
		Cephalanthus occidentalis	13
		Rosa californica	4

Lifeform	Alliance	Association	Count
	Cercocarpus ledifolius		**1**
	Cercocarpus montanus		**34**
		Cercocarpus montanus – Adenostoma fasciculatum	1
		Cercocarpus montanus – Ceanothus cuneatus	6
		Cercocarpus montanus – Ceanothus cuneatus – Quercus john-tuckeri	2
		Cercocarpus montanus – Fremontodendron californicum	4
		Cercocarpus montanus var. glaber	18
	Cornus sericea – Rosa woodsii – Ribes spp.		**1**
		Cornus sericea	1
	Cytisus scoparius – Genista monspessulana – Cotoneaster spp.		**1**
		Cytisus scoparius	1
	Diplacus aurantiacus		**3**
		Diplacus (aurantiacus, puniceus)	3
	Encelia (actonii, virginensis) – Viguiera reticulata		**1**
		Encelia actonii	1
	Ephedra viridis		**5**
		Ephedra viridis	5
	Ericameria linearifolia – Cleome isomeris		**9**
		Cleome isomeris	6
		Ericameria linearifolia	3
	Ericameria nauseosa		**16**
		Ericameria nauseosa	16
	Ericameria teretifolia		**1**
		Ericameria teretifolia	1
	Eriogonum fasciculatum		**57**
		Eriogonum fasciculatum	28

Lifeform	Alliance	Association	Count
		Eriogonum fasciculatum var. foliolosum – Hesperoyucca whipplei	15
		Hesperoyucca whipplei	13
	Eriogonum fasciculatum – Viguiera parishii		**3**
		Eriogonum fasciculatum – Ericameria (laricifolia, linearifolia)	1
		Eriogonum fasciculatum (Wash)	2
	Eriogonum wrightii – Eriogonum heermannii – Buddleja utahensis		**13**
		Eriogonum wrightii – Eriophyllum confertiflorum / Monardella antonina ssp. Benitensis	1
		Eriogonum wrightii (ssp. subscaposum, ssp. wrightii)	11
	Frangula californica – Rhododendron occidentale – Salix breweri		**1**
		Frangula californica ssp. tomentella / Hoita macrostachya	1
	Lepidospartum squamatum		**9**
		Lepidospartum squamatum – Baccharis salicifolia	2
		Lepidospartum squamatum – Eriodictyon trichocalyx – Hesperoyucca whipplei	2
		Lepidospartum squamatum / ephemeral annuals	5
	Lotus scoparius – Lupinus albifrons – Eriodictyon spp.		**91**
		Eriodictyon californicum / Herbaceous	42
		Eriodictyon crassifolium	4
		Eriodictyon parryi provisional	1

Lifeform	Alliance	Association	Count
		Lotus scoparius	11
		Lupinus albifrons	24
		Lupinus albifrons – Senecio flaccidus var. douglasii	5
	Malacothamnus fasciculatus – Malacothamnus spp.		**1**
	Prunus fasciculata – Salazaria mexicana		**1**
	Lotus scoparius – Lupinus albifrons – Eriodictyon spp.		**1**
		Prunus fasciculata	
	Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus		**7**
		Heteromeles arbutifolia Serpentine	7
	Prunus virginiana		**4**
		Prunus subcordata	1
		Prunus virginiana	3
	Quercus berberidifolia		**26**
		Quercus berberidifolia	5
		Quercus berberidifolia – Adenostoma fasciculatum	1
		Quercus berberidifolia – Ceanothus cuneatus	11
		Quercus berberidifolia – Cercocarpus montanus	3
		Quercus berberidifolia – Heteromeles arbutifolia	4
	Quercus durata		**4**
		Quercus durata – Adenostoma fasciculatum / Salvia sonomensis	4
	Quercus garryana (shrub)		**21**

Lifeform	Alliance	Association	Count
		Quercus garryana – Cercocarpus montanus	6
		Quercus garryana shrub	14
	Quercus john-tuckeri		**11**
		Quercus john-tuckeri	11
	Quercus wislizeni – Quercus chrysolepis (shrub)		**38**
		Quercus wislizeni – Carpenteria californica	4
		Quercus wislizeni – Ceanothus leucodermis	7
		Quercus wislizeni – Cercocarpus montanus	17
		Quercus wislizeni var. frutescens	10
	Rhus trilobata – Crataegus rivularis – Forestiera pubescens		**3**
		Forestiera pubescens – Sambucus nigra	2
		Rhus trilobata	1
	Ribes quercetorum – Rhus trilobata – Frangula californica		**52**
		Cercis occidentalis Provisional	6
		Frangula californica ssp. tomentella	12
		Rhus trilobata Sierran	10
		Ribes quercetorum	21

Lifeform	Alliance	Association	Count
		Sambucus nigra	1
	Rubus armeniacus – Sesbania punicea – Ficus carica		**10**
		Rubus armeniacus	9
	Salix exigua		**31**
		Salix exigua	20
		Salix exigua – (Salix lasiolepis) – Rubus armeniacus	10
		Salix exigua – Brickellia californica	1
	Salix lasiolepis		**8**
		Salix lasiolepis – Rubus spp.	6
		Salix lasiolepis / Artemisia douglasiana	1
	Suaeda moquinii		**1**
		Isocoma acradenia Alkaline Wet	1
	Tamarix sp.		**1**
	Toxicodendron diversilobum		**42**
		Toxicodendron diversilobum / Herbaceous	38
	Vitis arizonica – Vitis girdiana		**6**
		Vitis californica	6
Herbaceous & Sparsely Vegetated			
	California Annual and Perennial Grassland Macrogroup		**3**
	California annual herb / grass Group		**7**
	Vancouverian and Rocky Mountain naturalized perennial grassland Group		**1**
	Californian Cliff, Scree & Rock Vegetation Group		**4**
	Achnatherum speciosum		**4**
		Achnatherum speciosum	2

Lifeform	Alliance	Association	Count
	Amsinckia (menziesii, tessellata) – Phacelia spp.		**30**
		Amsinckia (intermedia, menziesii)	14
		Phacelia cicutaria Provisional	9
		Phacelia tanacetifolia	6
	Anemopsis californica – Helianthus nuttallii – Solidago spectabilis		**2**
		Anemopsis californica	2
	Aristida purpurea – Elymus elymoides – Poa secunda		**15**
		Poa secunda – (Elymus sp.) – Clarkia cylindrica	15
	Artemisia dracunculus		**4**
		Artemisia dracunculus	4
	Avena spp. – Bromus spp.		**109**
		Avena barbata – Avena fatua	12
		Avena barbata – Bromus hordeaceus	2
		Brachypodium distachyon	6
		Bromus diandrus	1
		Bromus diandrus – Mixed herbs	15
		Bromus hordeaceus – (Vicia villosa – Lolium perenne) – Trifolium hirtum	15
		Bromus hordeaceus – Erodium botrys	43
		Bromus hordeaceus – Hordeum spp. – Medicago polymorpha	3
		Bromus hordeaceus – Taeniatherum caput-medusae	12
	Bidens cernua – Euthamia occidentalis – Ludwigia palustris		**2**
		Artemisia douglasiana	2
	Brassica nigra – Centaurea (solstitialis, melitensis)		**12**

Lifeform	Alliance	Association	Count
		Brassica nigra	4
		Centaurea solstitialis	8
	Bromus carinatus – Elymus glaucus		**4**
		Elymus glaucus	1
		Pteridium aquilinum – Grass	3
	Bromus tectorum – Taeniatherum caput-medusae		**3**
		Bromus tectorum	3
	Carex barbarae		**2**
		Carex barbarae	2
	Carex nudata		**2**
		Carex nudata	2
	Carex utriculata – Calamagrostis canadensis		**22**
		Eleocharis macrostachya	22
	Centromadia (pungens)		**3**
	Corethrogyne filaginifolia – Eriogonum (elongatum, nudum)		**17**
		Corethrogyne filaginifolia	9
		Eriogonum elongatum	1
		Eriogonum nudum	3
		Lupinus excubitus – Mentzelia albicaulis – Eriogonum spp.	3
	Cynodon dactylon – Crypsis spp. – Paspalum spp.		**1**

Lifeform	Alliance	Association	Count
		Cynodon dactylon	1
	Distichlis spicata		**4**
		Distichlis spicata	4
	Equisetum (arvense, variegatum, hyemale)		**1**
	Eschscholzia (californica) – Lupinus (nanus)		**60**
		Bromus hordeaceus – Lupinus nanus – Trifolium spp.	7
		Eschscholzia californica	11
		Lupinus benthamii – Chorizanthe membranacea	32
		Lupinus bicolor	6
	Heterotheca (oregona, sessiliflora)		**4**
		Heterotheca sessiliflora	4
	Holocarpha (heermannii, virgata)		**55**
		Holocarpha heermannii	39
		Holocarpha virgata	13
	Juncus (effusus, patens) – Carex (pansa, praegracilis)		**7**
		Carex densa	2
		Carex praegracilis	1
		Juncus effusus	3
		Carex serratodens	1
	Juncus (oxymeris, xiphioides)		**4**
		Juncus oxymeris	2
		Juncus xiphioides	1

Lifeform	Alliance	Association	Count
	Juncus arcticus (var. balticus, mexicanus)		**23**
		Juncus arcticus var. balticus – (var. mexicanus)	16
		Juncus arcticus var. balticus – Carex praegracilis	4
	Lasthenia californica – Plantago erecta – Vulpia microstachys		**190**
		Lasthenia (californica, gracilis)	26
		Layia pentachaeta – Plagiobothrys (canescens)	2
		Lepidium nitidum – Trifolium gracilentum – Vulpia microstachys	2
		Vulpia microstachys	5
		Vulpia microstachys – Elymus elymoides – Achnatherum lemmonii	8
		Vulpia microstachys – Navarretia tagetina	28
		Vulpia microstachys – Plantago erecta	20
		Vulpia microstachys – Sedella pumila – Lasthenia californica	23
		Vulpia microstachys – Selaginella hansenii	71
	Lasthenia fremontii – Downingia (bicornuta)		**37**
		Downingia (bicornuta, cuspidata)	10
		Eryngium (vaseyi, castrense)	12
		Lasthenia fremontii	6

Lifeform	Alliance	Association	Count
		Lasthenia fremontii – Downingia bicornuta	2
		Lasthenia fremontii – Downingia ornatissima	7
	Lasthenia glaberrima		**9**
		Eleocharis acicularis – Eryngium castrense	6
		Eleocharis macrostachya Vernal Pool	3
	Layia fremontii – Achyrachaena mollis		**29**
		Layia fremontii – Achyrachaena mollis	24
		Zigadenus fremontii – Lolium perenne	4
	Lemna (minor) and Relatives		**1**
		Lemna (minor)	1
	Leymus cinereus – Leymus triticoides		**10**
		Leymus cinereus	5
		Leymus triticoides	4
		Leymus triticoides – Bromus spp. – Avena spp.	1
	Lolium perenne		**21**
		Lolium perenne	2
		Lolium perenne – (Centaurium muehlenbergii)	14
		Lolium perenne – Hordeum marinum – Ranunculus californicus	5
	Lotus unifoliolatus		**16**
		Lotus unifoliolatus	16
	Ludwigia (hexapetala, peploides) – Eichhornia crassipes		**2**
		Ludwigia (hexapetala, peploides)	2
	Mimulus guttatus – Cirsium spp. – Stachys spp.		**20**

Lifeform	Alliance	Association	Count
		Mimulus guttatus	10
		Mimulus guttatus – Vulpia microstachys	7
	Monolopia (lanceolata) – Coreopsis (calliopsidea)		**1**
		Coreopsis calliopsidea – Mentzelia pectinata	1
	Montia fontana – Sidalcea calycosa		**1**
		Montia fontana – Sidalcea calycosa	1
	Muhlenbergia rigens		**10**
		Muhlenbergia rigens	9
	Nassella spp. – Melica spp.		**24**
		Melica californica	1
		Nassella cernua	7
		Nassella pulchra	14
		Nassella pulchra – Avena spp. – Bromus spp.	2
	Phalaris aquatica – Phalaris arundinacea		**3**
		Phalaris aquatica – Bromus hordeaceus – Centaurea solstitialis	3
	Plagiobothrys nothofulvus		**61**
		Madia elegans – Plagiobothrys nothofulvus	16
		Plagiobothrys nothofulvus – Castilleja exserta – (Lupinus nanus)	3
		Plagiobothrys nothofulvus – Daucus pusillus – Trifolium microcephalum	41
	Poa pratensis – Agrostis gigantea – Agrostis stolonifera		**2**
	Poa secunda – Muhlenbergia richardsonis – Carex douglasii		**2**
		Poa secunda Moist	1
	Polygonum lapathifolium – Xanthium strumarium		**8**

Lifeform	Alliance	Association	Count
		Xanthium strumarium	4
	Ranunculus aquatilis – Callitriche palustris – Callitriche heterophylla		**2**
		Ranunculus aquatilis	2
	Schoenoplectus (acutus, californicus)		**7**
		Schoenoplectus acutus	5
		Schoenoplectus acutus – Typha domingensis	2
	Schoenoplectus americanus		**1**
		Schoenoplectus americanus	1
	Sporobolus airoides – Muhlenbergia asperifolia – Spartina gracilis		**2**
		Sporobolus airoides	2
	Trifolium variegatum		**47**
		(Trifolium variegatum – Vulpia bromoides) – Hypochaeris glabra – Leontodon saxatilis	8
		Trifolium variegatum	21
		Trifolium variegatum – Juncus bufonius	18
	Typha (angustifolia, domingensis, latifolia)		**7**
		Typha latifolia	7

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 minimum mapping unit (MMU) resolution 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 units. The mapping classification contains mappable 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 MMU constraints 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).

For the current project, the map classification was generally based on the existing Northern Sierra Nevada Foothills vegetation mapping effort conducted by AIS, CNPS, and VegCAMP (Menke et al., 2011). CNPS and VegCAMP, under separate contract, developed a new floristic classification for the entire Sierra Nevada Foothills ecoregion. The floristic classification was based on the original Northern Sierra Nevada Foothills floristic classification (2009) with newer plot data collected for the Southern Sierra Nevada Foothills region (2015) and data analyses for the entire region. Based on the new floristic classification the existing Northern Sierra Nevada Foothills mapping classification was augmented to reflect the new differences at the alliance level while retaining the upper levels of the older hierarchy (2009).

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. At the completion of the project, the mapping classification for the Sierra Nevada Foothills ecoregion were all reconciled to one comprehensive classification for the entire region.

2.5 Field Reconnaissance

Field reconnaissance/verification visits serve multiple functions. First, they enable photointerpreters 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 photointerpreters 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 photointerpreters' perspective about assessing vegetation through the framework of map creation.

From May 2019 through June 2021, AIS conducted seven field reconnaissance/ verification trips dispersed throughout the mapping area with one crew per trip. The trips are summarized in **Table 2**.

Table 2: Summary of Field Reconnaissance Trips

Trip No.	Dates	Staff from:	Location
1	May 13-17, 2019	AIS/CDFW	Reconnaissance: Mariposa, Madera, Fresno Counties (Delivery Areas 1, 2, 3)
2	July 30-August 2, 2019	AIS/CDFW	Reconnaissance: Los Angeles, Ventura Counties (Delivery Area 6B)
3	January 6-10, 2020	AIS/CNPS	Verification: Mariposa, Madera Counties (Delivery Area 1)
4	March 2-6, 2020	AIS	Verification: Madera, Fresno Counties (Delivery Area 2)
5	June 27-July1, 2020	AIS/CDFW	Reconnaissance: Kern, Los Angeles, Kern Counties (Areas 5A) Verification: Los Angeles, Ventura Counties (Delivery Areas 6A, 6B)
6	September 14-17, 2020	AIS	Verification: Kern, Tulare Counties (Delivery Areas 5A, 5B)
7	June 21-25, 2021	AIS/CNPS	Verification: Fresno, Tulare Counties (Delivery Areas 3, 4)

Field crews from AIS collected over 2450 reconnaissance/verification observations as shown in **Figure 2**.

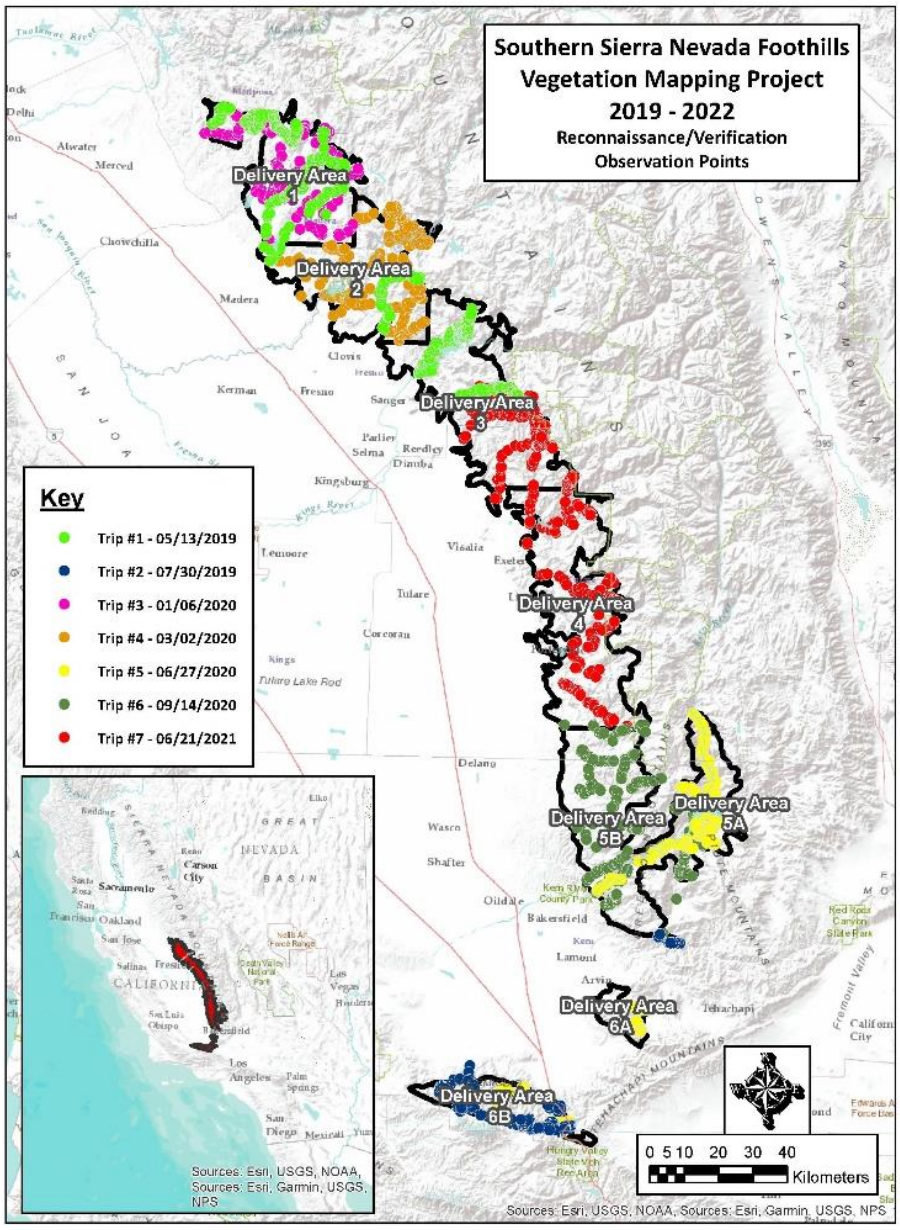


Figure 2: Location of Reconnaissance/Verification Observation Points

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 regions 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, crews traversed the areas in 4WD vehicles 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 photointerpreters 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. The location of these remote stands was typically determined using a compass and laser rangefinder. Field crew members recorded each location visited on a GPS unit and logged pertinent information into the Collector app on the tablet.

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 photointerpreted. 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 and ground conditions.

Ancillary data sources (see Section 2.2.3) and field reconnaissance data are used to complement and assist the mapper in their photointerpretation and attribute code assignment process. For example, classification plot point data contains the location of the plot as well as miscellaneous data related to the species composition and cover of the stand, abiotic and ecological information, and 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 photointerpreters incorporate into their understanding of the 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 and found in a variety of settings.

The descriptions also discuss the relative percent cover of various plant species in the alliance. Frequently, complicated relationships exist between the relative covers of plants, such as in alliances named for indicator species having lower percent cover than other species present. 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 photointerpreters 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 that for the most part corresponded to USGS 7.5-minute topographic quadrangles or portions thereof. This 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 his or her ArcMap session. Using an on-screen heads-up digitizing method, the photointerpreters had at their disposal a suite of standard and custom ArcMap tools to facilitate the creation of polygons. The photointerpreters 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, photointerpreters 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.

Photointerpreters assigned each polygon the appropriate attribute code string: Vegetation Type (VegCode/PI), five different Percent Cover types, Conifer Dieback, Exotics, Roadedness Disturbance, Development Disturbance, Anthropogenically Altered Disturbance, Land Use, Tree Size, Tree Height, 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. As mapping progressed, completed modules within a subarea unit were joined together. These database units were subject to further processing, edge-match checks, and review by a senior staff member before being delivered to VegCAMP for AA allocation, prior to AA 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

As discussed above, reference sources, photointerpretation training, knowledge of vegetation communities, as well as the use of appropriate GIS tools, are all essential in creating a quality vegetation map. However, 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. Guidelines and rules regarding exceptions, special situations, and minimum feature size are discussed and disseminated to all staff members before and during the mapping effort. This creates a clear and consistent product. Establishing criteria also makes the mapping process more efficient, as individual photointerpreters do not have to pause too long to consider how best to capture the more common 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 (VegCode/PI)

AIS was contracted to map to the Alliance level. However, at the time of mapping there were several vegetation types for which the final vetting had not been completed. By the end of the project these types were determined to be associations rather than alliances and assigned to their corresponding place in the vegetation hierarchy. The result was

that 9 of the types became Associations. So rather than lump up to the Alliance level it was decided to keep them as Associations and not lose that detail.

The final map contains 111 types that were mapped, composed of 75 Alliances and Alliance-level types such as Provisional Alliances, Semi-natural Alliances, and Mapping Units; 9 Associations, and 15 Miscellaneous Classes relating to features such as agriculture, water, and urban disturbance; and 12 upper-level hierarchical types, such as Class, Subclass, 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 summary tables of polygon counts and acreage by VegCode 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 2 acres. 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-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 an attempt 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.

CDFW's long-range goal is to map vegetation for the entire state of California. This is accomplished as funding or need allows, one area or project at a time. The Southern Sierra Nevada Foothills vegetation geodatabase created in this project is to be incorporated into the Statewide vegetation mapping effort. The general Statewide mapping criteria (VegCAMP 2020) specifies an MMU of 1 acre for non-desert environs, however to be consistent with the previously mapped Northern Sierra Nevada Foothills vegetation database, the MMU for upland vegetation is 2 acres.

A summary of the minimum mapping units for this mapping effort is presented in **Table 3**.

Table 3: Minimum Mapping Unit Size

Mapped Features	Minimum Mapping Unit
Riparian vegetation; wetlands	1 acre
Water bodies, perennial streams and lakes/ponds, dammed ephemeral ponds	1 acre
Land Use/built-up, agriculture, water impoundment features, rock outcrops	1 acre
Upland vegetation	2 acres

The establishment of an MMU entails the need for making rules for aggregating stands 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 2.6.3.9). 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. The natural vegetation rather than the land use miscellaneous class typically took precedence when assigning a VegCode value. For example, a polygon would be coded as the *Pinus ponderosa* Alliance – a vegetation type – but in the Land Use layer, the same polygon would be coded as having an urban component.

An attempt was made to correlate code values between the VegCode assignment for Miscellaneous Classes and the Land Use attribute field code values where “dual

coding" was not involved. A polygon that had a Miscellaneous Class code value Built-up & Urban Disturbance, Agriculture, or Water in VegCode field, was automatically populated with a corresponding land use code value in the Land Use layer.

In this project, the concept of an "urban window" was also applied. Urban window, one of the Miscellaneous Classes in the vegetation map unit classification, is defined as a fully developed contiguous area of built-up and disturbed lands greater than one square mile in size. Natural vegetation stands may exist within an urban window, but they generally are not viable candidates for mitigation, preservation, and/or conservation measures, due to the surrounding urbanization. Therefore, natural vegetation was not mapped within an urban window unless it formed an area at least 10 acres in size and was not split by roads or other manmade features.

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 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

Photointerpreters 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 5 acres, and 3 acres for special types. 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 was 10 acres, and 5 acres for special types.

The photointerpreters 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.

Photointerpreters 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 photointerpreters 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 photointerpreters 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 Conifer Dieback

Conifer Dieback is a True/False modifier attribute to indicate the mere presence of tree conifer death within a polygon. The amount of death is not assessed. Using the base imagery, the photo interpreter simply assessed the polygon for any standing dead conifer trees (even only one tree in a polygon). The modifier is an indication of “natural death” and not death caused as a result of fire. Hardwood and shrub death were not assessed.

2.6.3.4 Exotics

Photointerpreters 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 4**, 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.

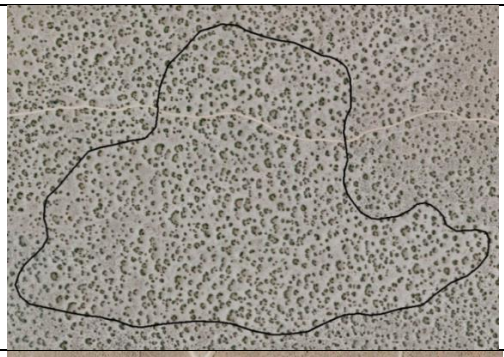
Table 4: Map Classes for Exotics

Code	Range	Discussion
0	None observed	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	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	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.
3	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 *Bromus diandrus.*
9	Not Applicable/Not Assigned	Exotics are not applicable when the VegCode is 9300, 9310, 9404, 9600, 9800, 9801, 9802, 9803, 9804

2.6.3.5 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 5**. The table is adapted from VegCAMP (2013). Roads following polygon boundaries were 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 5: Map Classes for Roadedness Disturbance

Code	Range	Example
0	None observed	
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, 9310, 9800, 9801, 9802, 9803, 9804

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.

2.6.3.6 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 6**, adapted from VegCAMP (2013), presents the map classes for Development Disturbance.

Table 6: Map Classes for Development Disturbance

Code	Range	Discussion
0	None observed	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, 9801, 9802, 9803, 9804

2.6.3.7 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 7**, which was adapted from VegCAMP (2013).

Table 7: Map Classes for Anthropogenically Altered Disturbance

Code	Range	Discussion
0	None observed	No ghost lines of tilling, differential effects of enclosure/exclosure fencing, effects of grazing/browsing, etc. are visible.
1	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	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	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 9801.

2.6.3.8 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 = Photo Interpretation
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

2.6.3.9 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) with lower levels for specific categories, as shown below:

0000 = Not assigned/Not assessed
1000 = Urban
    1400 = Utility (Canal and aqueduct facilities)
2000 = Agriculture (includes nurseries)
9502 = Plantation
9800 = Undifferentiated Water (contains water at time of imagery)

In this work effort, the definition of the 1400 land use code correlates to the VegCode code of “Major Canals and Aqueducts” (9804).

2.6.3.9 Size (Modal CWHR Size Class)

CWHR Size, corresponding to ranges of diameter at base height (dbh) and life form, were 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:

T = Tree

S = Shrub

H = Herb

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%
9 = Not Applicable/Not Assessed

2.6.3.10 Height (Modal Tree Height) (meters)

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.

0 = Not Applicable/Not Assessed
1 = <.5m
2 = >5-1m
3 = >1-2m
4 = >2-5m
5 = >5-10m
6 = >10-15m
7 = >15-20m
8 = >20-35m

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, photointerpreters 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 adjoining completed modules were edge-matched, any mapping discrepancies found at the edges between

modules were corrected and, if necessary, changes were applied throughout the modules.

When all the modules were joined together, 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 checked, as were any edge-match problems. Another round of quality control was conducted after AA results had been applied to each of the subarea units.

2.7 Accuracy Assessment

To validate the vegetation maps, an accuracy assessment (AA) was performed for each Delivery Area. After AA of the last Delivery Area was completed, the results were combined for reporting of the project as a whole.

Polygons from the vegetation geodatabases were allocated for AA using a stratified random sampling, in which allocated polygons were distributed across the mapped units so that both rare and common types were represented. For the contracted subareas, CDFW staff provided in-kind time to allocate the accuracy assessment polygons. The sample allocation of polygons to select for visitation took the following parameters into consideration: land ownership, proximity to roads and trails (e.g., within 500 meters), other accessibility issues (e.g., slope steepness), and a targeted number of allocated polygons based on the number of vegetation types. The Southern Sierra Nevada Foothills study area was broken up into four subareas for AA including Delivery Areas 1 and 2, Delivery Areas 3 and 4, Delivery Areas 5, and Delivery Area 6.

Using the field key and descriptions developed during classification analysis, field staff visited allocated polygons to determine the vegetation type, without knowledge of the polygon attribution. For a polygon to be validly assessed for accuracy, at least 20 percent of its area has to be viewed, however, usually greater than 50 percent of the area was viewed in the field. For each AA survey, the location of the survey was marked using a GPS device (i.e., iPad, Garmin), and ground photos were taken at the AA GPS location. The field staff provided a primary vegetation type call and a list of dominant plant species, along with percent cover estimates by species and by vegetation strata. If a polygon contained more than one mappable vegetation type, notes were provided for how the polygon should be divided, and a separate survey was taken for each type meeting the minimum map unit size. See Appendix D for the AA field form.

AA field data was entered into a standardized 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 as used for the Survey of California Vegetation (VegCAMP 2020). CDFW staff reviewed each AA 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 identify the vegetation type based on the field key or incorrectly identified the

type, CDFW staff assigned the correct type based on the species covers recorded in the AA data, any additional notes taken by the field crews, and sometimes the field photos.

AA scores were calculated by vegetation type and results were summarized in the form of a contingency table, so that specific and systematic errors could be addressed by the photointerpreters. 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 photointerpreters (Story and Congalton 1986, Lea and Curtis 2010). Both user's and producer's accuracy were calculated.

A fuzzy logic method was used to score each AA survey, rather than simply denoting whether a sample was correct or incorrect (Congalton and Green 2009, Gopal and Woodcock 1994, Hagen 2003). Each field-verified polygon was scored according to a set of decision rules **(Table 8)**, 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 a percent accuracy. Additionally, a total overall accuracy was calculated by counting 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.

Table 8: 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 *Yucca brevifolia* Alliance for a stand with 1% evenly distributed *Yucca brevifolia* over *Larrea tridentata – Ambrosia dumosa* would get this score if the PI call was *Larrea tridentata – Ambrosia dumosa* Alliance with <1% *Yucca brevifolia*).	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

Once a Delivery Area had been scored, the accuracy assessment results were reviewed by senior photointerpreters. In some cases, the photo interpreter flagged a specific AA finding for follow-up discussion and review with the AA ecologist staff, resulting in either accepting, modifying the AA call, or eliminating the AA point out of the analysis. Once AA review was completed, any types not achieving 80% accuracy were further evaluated in consultation between the ecologists and mapping staff. The photointerpreters then revised the polygons based on the AA results. Therefore, the final map product is better than the stated accuracy.

CHAPTER 3: Results

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

3.1 Mapping

As noted above in Section 2.6.3.1, AIS was contracted to map to the Alliance level. However, at the time of mapping there were several vegetation types for which the final vetting had not been completed. By the end of the project these types were determined to be associations rather than alliances and assigned to their corresponding place in the vegetation hierarchy. The result was that 9 of the types became Associations. So rather than lump up to the Alliance level it was decided to keep them as Associations and not lose that detail.

The final map contains 111 types that were mapped, composed of 75 Alliances and Alliance-level types such as Provisional Alliances, Semi-natural Alliances, and Mapping Units; 9 Associations, and 15 Miscellaneous Classes relating to features such as agriculture, water, and urban disturbance; and 12 upper-level hierarchical types, such as Class, Subclass, 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.

A total of 1,821,092 acres were mapped, with a total of 92,942 polygons. For area (including acreage), and polygon counts by vegetation type for the Southern Sierra Nevada Foothills study area, refer to Appendix C.

3.2 Accuracy Assessment

The AA data collection for the Delivery Areas was conducted at different times by CNPS staff, based on when AIS produced the draft vegetation maps. Due to the timing and location of the Southern Sierra Nevada Foothills Delivery Area mapping, it was determined that the Delivery Areas 1 & 2 would be combined into one area for AA sample allocation, and the AA data collection. AA scoring would be conducted separately by CDFW staff. Then Delivery Areas 5 & 6 were mapped separately for AA data collection and scoring. Delivery Areas 3 & 4, which were the last areas to be mapped, were combined into one area for AA sample allocation, data collection and AA scoring. The locations, timing, and number of AA field surveys are summarized below in **Table 9**. The AAs were stand-based, in which both the vegetation type and the extent of the polygon were evaluated when possible. When a mapped polygon could be divided due to the presence of more than one vegetation type within the given MMU standards, an assessment was done for each type (i.e., a polygon sometimes had more than one AA survey). Also, the survey point locations are displayed in **Figures 3, 4,** and **5** below.

Table 9: Locations and Dates for AA Field Surveys

Location	Dates for AA Field Surveying	No. of AA Surveys Collected	No. of Surveys Scored	No. of Polygons Scored
Delivery Areas 1 & 2	June – July 2020	222	117	110
Delivery Areas 3 & 4	October – November 2021	147	133	128
Delivery Area 5	November 2020	176	167	163
Delivery Area 6	August – September 2020	114	114	105

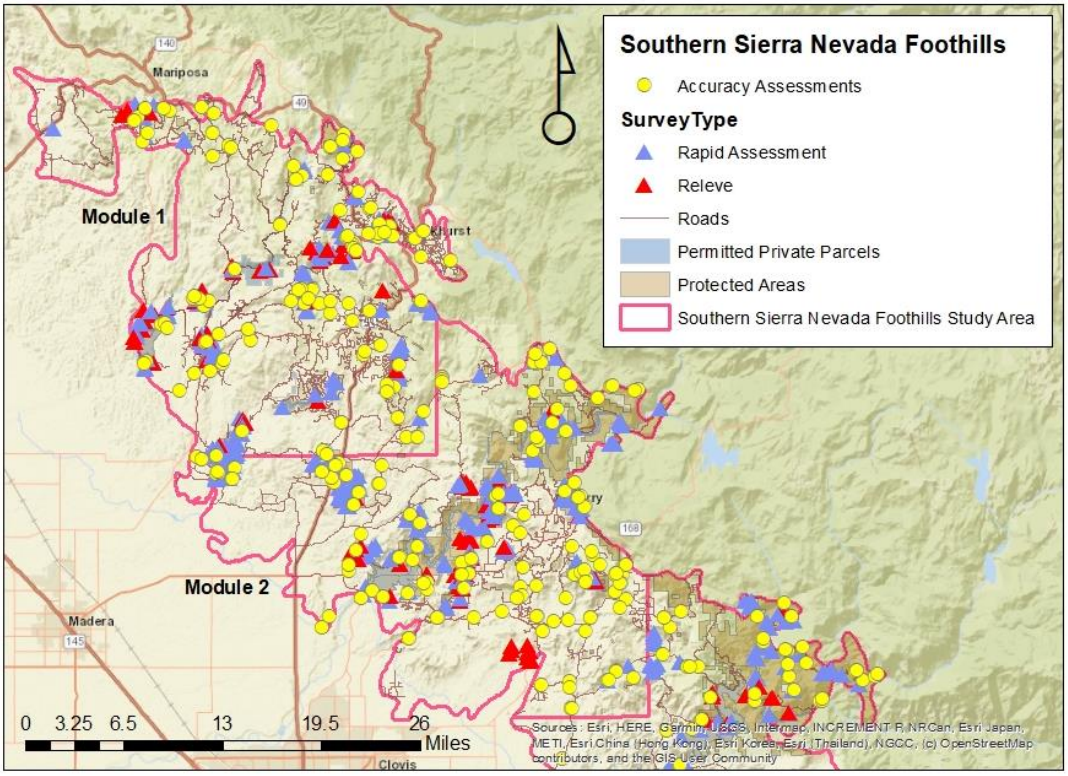


Figure 3: Map of the AA Survey Locations for Delivery Areas 1 and 2

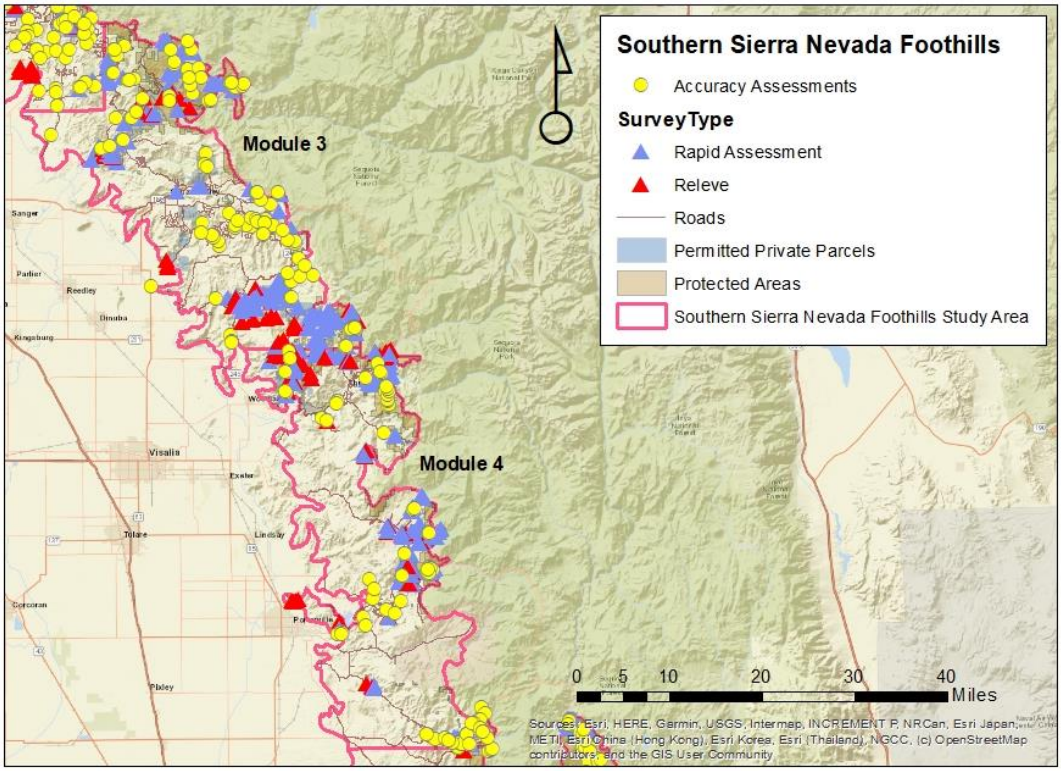


Figure 4: Map of the AA Survey Locations for Delivery Areas 3 and 4

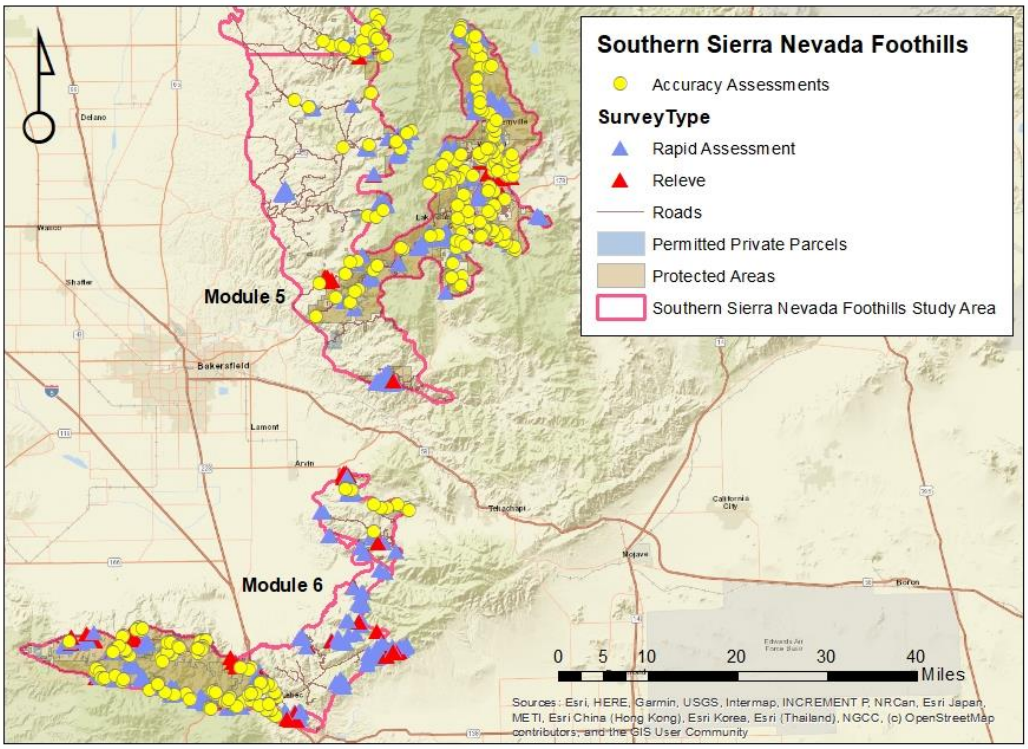


Figure 5: Map of the AA Survey Locations for Delivery Areas 5 and 6

The AA field data were analyzed by CDFW-VegCAMP staff to verify accuracy of the vegetation maps. The resulting calculated percent accuracy for each area was greater than 80% overall for fuzzy scores 3 and above. The overall Fuzzy Accuracy Assessment ratings for the final vegetation map at the Alliance and Group levels were 89.5 percent. Tables with AA scores for the Southern Sierra Nevada Foothills study area is provided in **Table 10** below.

Also, contingency tables displaying assessed types by users (Field assessed types) and producers (PI mapped types) for this accuracy assessment are included in Appendix G. 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 photointerpreters (producers). Numbers on the diagonal are correct calls by the photointerpreters. These contingency tables display the numbers of assessed polygons by type, and do not include fuzzy scores.

Table 10: Alliance Level Accuracy Assessment Scores for the Southern Sierra Nevada Foothills Region

*Values with 5 or more meet the minimum sample size of 5.

Veg Code	Map Unit Name	Users Count	User's Accuracy (%)	Producers Count	Producer's Accuracy (%)
2214	Abies concolor Alliance	2	90.0	1	100.0
5431	Achnatherum speciosum Alliance	1	100.0	1	100.0
4111	Adenostoma fasciculatum Alliance	**14**	**100.0**	**14**	**100.0**
1310	Aesculus californica Alliance	**15**	**100.0**	**18**	**96.7**
3210	Alnus rhombifolia Alliance	**5**	**80.0**	**9**	**82.2**
4118	Arctostaphylos glauca Alliance	**5**	**80.0**	3	93.3
4412	Arctostaphylos pungens - Arctostaphylos pringlei Alliance	1	20.0	**6**	**70.0**
4112	Arctostaphylos viscida Alliance	**12**	**100.0**	**15**	**92.0**
5311	Artemisia tridentata Alliance	**10**	**98.0**	**13**	**83.1**
5111	Atriplex canescens Alliance	2	60.0	0	
5710	Atriplex polycarpa Alliance	4	100.0	**5**	**100.0**
6210	Baccharis salicifolia Alliance	**9**	**82.2**	**9**	**88.9**
7100	California Annual and Perennial Grassland Macrogroup	**32**	**82.5**	**25**	**98.4**

Veg Code	Map Unit Name	Users Count	User's Accuracy (%)	Producers Count	Producer's Accuracy (%)
7600	Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group	1	60.0	0	
7200	Californian warm temperate marsh/seep Group	4	95.0	4	70.0
4113	Ceanothus cuneatus Alliance	**26**	**84.6**	**23**	**93.9**
6520	Ceanothus greggii – Fremontodendron californicum Alliance	**7**	**91.4**	**5**	**100.0**
4413	Ceanothus leucodermis Alliance	3	73.3	2	80.0
6214	Cephalanthus occidentalis Association	3	100.0	4	90.0
4211	Cercocarpus montanus Alliance	**9**	**93.3**	**14**	**82.9**
9401	Cliffs/Rock Outcrop Mapping Unit	2	60.0	0	
8110	Distichlis spicata Alliance	2	30.0	0	
5417	Ephedra viridis Alliance	**5**	**76.0**	**6**	**76.7**
4710	Ericameria linearifolia – Cleome isomeris Alliance	2	100.0	**5**	**80.0**
5212	Ericameria nauseosa Alliance	**12**	**90.0**	**15**	**84.0**
5428	Eriogonum fasciculatum – Viguiera parishii Alliance	3	93.3	4	90.0
4810	Eriogonum fasciculatum Alliance	**21**	**84.8**	**13**	**93.8**
4820	Eriogonum wrightii – Eriogonum heermannii – Buddleja utahensis Alliance	**17**	**95.3**	**17**	**95.3**
9501	Eucalyptus spp. - Ailanthus altissima - Robinia pseudoacacia Semi-natural Alliance	3	73.3	2	100
9500	Exotic Trees and Planted Trees Mapping Unit	3	86.7	4	75.0
4501	Frangula californica ssp. tomentella Association	1	100.0	2	80.0
3211	Fraxinus latifolia Alliance	**25**	**92.0**	**22**	**88.2**
1214	Hesperocyparis forbesii - Hesperocyparis nevadensis Alliance	1	100.0	2	70.0
3113	Juglans hindsii and Hybrids Semi-natural Alliance	0		1	60.0

Veg Code	Map Unit Name	Users Count	User's Accuracy (%)	Producers Count	Producer's Accuracy (%)
7216	Juncus arcticus (var. balticus, mexicanus) Alliance	1	100.0	**5**	**60.0**
1212	Juniperus californica Alliance	**14**	**97.1**	**14**	**98.6**
7115	Vulpia microstachys – Selaginella hansenii Association	4	100.0	6	86.7
5610	Lepidospartum squamatum Alliance	**6**	**80.0**	**8**	**77.5**
4720	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	**12**	**91.7**	**19**	**71.6**
7101	Mediterranean California naturalized annual and perennial grassland Group	1	60.0	0	
5600	Mojavean semi-desert wash scrub Group	1	100.0	0	
7500	Naturalized warm-temperate riparian and wetland Group	3	86.7	0	
2215	Pinus jeffreyi Alliance	**7**	**94.3**	**10**	**88.0**
2310	Pinus monophylla - (Juniperus osteosperma) Alliance	**15**	**90.7**	**13**	**86.2**
2212	Pinus ponderosa - Calocedrus decurrens – Pseudotsuga menziesii Alliance	4	95.0	4	85.0
1210	Pinus sabiniana Alliance	**15**	**90.7**	**21**	**87.6**
3310	Platanus racemosa – Quercus agrifolia Alliance	**26**	**96.2**	**27**	**93.3**
3110	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	**26**	**89.2**	**22**	**96.4**
2216	Pseudotsuga macrocarpa Alliance	0		1	80.0
4210	Quercus berberidifolia Alliance	2	70.0	0	
1410	Quercus chrysolepis Alliance	**12**	**90.0**	**16**	**81.3**
1311	Quercus douglasii Alliance	**42**	**91.0**	**32**	**98.1**
6111	Quercus garryana (shrub) Alliance	**11**	**81.8**	**10**	**96.0**
6510	Quercus john-tuckeri Alliance	2	90.0	4	65.0
1312	Quercus kelloggii Alliance	**13**	**92.3**	**16**	**82.5**
3314	Quercus lobata Riparian Alliance	**32**	**96.3**	**29**	**97.9**
1313	Quercus lobata Alliance	1	20.0	0	

Veg Code	Map Unit Name	Users Count	User's Accuracy (%)	Producers Count	Producer's Accuracy (%)
4410	Quercus wislizeni (Short Stature) Mapping Unit	**18**	**78.9**	**13**	**92.3**
1111	Quercus wislizeni – Quercus parvula (tree) Alliance	**52**	**88.5**	**32**	**97.5**
6218	Rhus trilobata Sierran Association	1	100.0	1	100.0
6420	Ribes quercetorum Association	3	100.0	3	100.0
9402	River & Lacustrine Flats & Streambeds Mapping Unit	2	100.0	3	93.3
6213	Rubus armeniacus - Sesbania punicea - Ficus carica Semi-natural Alliance	1	0.0	0	
6211	Salix exigua Alliance	**9**	**93.3**	**8**	**95.0**
3114	Salix gooddingii - Salix laevigata Alliance	**20**	**87.0**	**23**	**88.7**
6217	Salix lasiolepis Alliance	0		1	80.0
8200	Southwestern North American alkali marsh/seep vegetation Group	1	40.0	0	
9600	Standing Dead Trees High Cover Mapping Unit	1	100.0	2	70.0
6301	Toxicodendron diversilobum Alliance	**5**	**100.0**	**6**	**96.7**
7310	Typha (angustifolia, domingensis, latifolia) Alliance	0		4	30.0
1110	Umbellularia californica Alliance	**7**	**97.1**	**11**	**83.6**
7102	Vancouverian and Rocky Mountain naturalized perennial grassland Group	1	60.0	**5**	**76.0**

Veg Code	Map Unit Name	Users Count	User's Accuracy (%)	Producers Count	Producer's Accuracy (%)
	Overall Polygon Count	633		633	
	Polygons with 60-100% Accuracy (Score 3 or above)	**594**			
	Polygons with 80-100% Accuracy (Score 4 or above)	**540**			
	Fuzzy Overall Percent Accuracy		**89.50%**		

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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 *et al*. 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 *et al*. 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 *et al*. 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, photointerpreter
ROW	Right-of-way
USGS	US Geological Survey
VegCAMP	Vegetation Classification and Mapping Program

CDFW – Southern Sierra Nevada Foothills Vegetation Mapping Classification Alliance Level Hierarchy 2009 Version 3/31/2022

Appendix A-1: Mapping Classification Alliance Hierarchy 3/31/2022

(Includes vegetation types mapped in the Northern Sierra Nevada Foothills (NSNF))
Class
Subclass
Formation
Division
Macrogroup
Group
Alliance (VegCode indicates mapped alliance)
Association (VegCode indicated mapped association)

Mesomorphic Tree Vegetation (Forest and Woodland) Class
Temperate Forest SubClass
Cool Temperate Forest Formation
North American Intermountain Basins Scrub Woodland Division
Intermountain Basins Pinyon–Juniper Woodland Macrogroup
Western Great Basin montane conifer woodland Group
Pinus monophylla – (Juniperus osteosperma) Alliance (2310)

Western North America Cool Temperate Forest Division
Californian–Vancouverian Montane and Foothill Forest Macrogroup
Vancouverian evergreen broadleaf and mixed forest Group
Arbutus menziesii Alliance

Californian montane conifer forest Group (2200) [mapped in NSNF] (includes managed conifer stands)
Abies concolor Alliance (2214)
Calocedrus decurrens Alliance [mapped in NSNF as 2213]
Pinus jeffreyi Alliance (2215)
Pinus ponderosa – Calocedrus decurrens – Pseudotsuga menziesii Alliance (2212) [mapped in NSNF as PiPo-CaDe 2212 and PsMe 2110]
Pinus ponderosa Alliance
Pseudotsuga macrocarpa Alliance (2216)

Upland Vancouverian mixed woodland and forest Group
Acer macrophyllum – Alnus rubra Alliance [mapped in NSNF with AcMa as 2111]

Warm Temperate Forest Formation
Madrean Forest and Woodland Division
California Forest and Woodland Macrogroup
Californian broadleaf forest and woodland Group
Quercus chrysolepis Alliance (1410) [mapped in NSNF]
Quercus douglasii Alliance (1311) [mapped in NSNF]
Quercus kelloggii Alliance (1312) [mapped in NSNF]
Quercus lobata Alliance (1313) [mapped in NSNF]

Quercus wislizeni – Quercus parvula (tree) Alliance (1111) [mapped in NSNF as QuWi tree]

Umbellularia californica Alliance (1110) [mapped in NSNF]
Aesculus californica Alliance (1310) [mapped in NSNF]

Californian evergreen coniferous forest and woodland Group
Hesperocyparis forbesii – Hesperocyparis nevadensis Alliance (1214)
Hesperocyparis (sargentii, macnabiana) Alliance [mapped in NSNF as Callitropsis (Cupressus) macnabiana 1213]
Juniperus californica Alliance (1212) [mapped in NSNF]
Pinus attenuata Alliance [mapped in NSNF as 1211]
Pinus sabiniana Alliance (1210) [mapped in NSNF]

Temperate Flooded and Swamp Forest Formation
Western North America Flooded and Swamp Forest Division
Western Cordilleran montane–boreal riparian scrub Macrogroup
Vancouverian riparian deciduous forest Group
Alnus rhombifolia Alliance (3210) [mapped in NSNF]
Fraxinus latifolia Alliance (3211) [mapped in NSNF]

Vancouverian coastal riparian scrub Group
Frangula californica – Rhododendron occidentale – Salix breweri Alliance [mapped in NSNF as Frangula californica 4501]

Western cool temperate scrub swamp Macrogroup
Western dogwood thicket Group
Cornus sericea – Rosa woodsia – Ribes spp. Alliance

Western North America Warm Temperate Flooded and Swamp Forest Division
Southwestern North American Riparian, Flooded and Swamp Forest Macrogroup
Southwestern North American introduced riparian scrub Group
Tamarix spp. Semi-Natural Alliance (6212) [mapped in NSNF]

Southwestern North American riparian evergreen and deciduous woodland Group (3100)
Juglans hindsii and Hybrids Semi-Natural Alliance (3113) [mapped in NSNF]
Platanus racemosa – Quercus agrifolia Alliance (3310) [mapped in NSNF]
Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance (3110) [mapped in NSNF]
Quercus lobata Riparian Alliance (3314) [mapped in NSNF as QuLo 1313]
Salix gooddingii – Salix laevigata Alliance (3114) [mapped in NSNF separately as SaGo 3112 and SalLaev 3111]

Southwestern North American riparian/wash scrub Group
Baccharis salicifolia Alliance (6210) [mapped in NSNF]
Cephalanthus occidentalis – Rosa californica Alliance (6250)
Cephalanthus occidentalis Association (6214) [mapped in NSNF as an alliance]
Rosa californica Association (6401) [mapped in NSNF as an alliance]
Calycanthus occidentalis (Provisional) Association (6216)
Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance (6230)
Rhus trilobata Association (6231)

Heterotheca (oregona, sessiliflora) Alliance (6221)
Salix exigua Alliance (6211) [mapped in NSNF]
Salix lasiolepis Alliance (6217) [mapped in NSNF]
Vitis arizonica – Vitis girdiana Alliance (6220)

Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland) Class
Mediterranean Scrub and Grassland SubClass
Mediterranean Grassland and Forb Meadow Formation
California Grassland and Meadow Division
California Annual and Perennial Grassland Macrogroup (7100)
California annual herb/grass Group (7110)
Amsinckia (menziesii, tessellata) – Phacelia spp. Alliance
Artemisia dracunculus Alliance (7112)
Eschscholzia (californica) – Lupinus (nanus) Alliance
Holocarpha (heermannii, virgata) Alliance (7114)
Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance (7104)
Vulpia microstachys – Selaginella hansenii Association (7115)
Lotus unifoliolatus Provisional Alliance (7116)
Monolopia (lanceolata) – Coreopsis (calliopsidea) Alliance
Plagiobothrys nothofulvus Alliance

California perennial grassland Group
Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance (7121)
Nassella spp. – Melica spp. Alliance
Leymus condensatus Alliance (7122)

Mediterranean California naturalized annual and perennial grassland Group (7101) [mapped in NSNF]
Avena spp. – Bromus spp. Semi-Natural Alliance (7191)
Brassica nigra – Centaurea (solstitialis, melitensis) Semi-Natural Alliance
Lolium perenne Semi-Natural Alliance

Mediterranean Scrub Formation
California Scrub Division
California Chaparral Macrogroup
Californian mesic chaparral Group [mapped in NSNF as 4200]
Cercocarpus montanus Alliance (4211) [mapped in NSNF]
Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance [mapped in NSNF as 4212]
Quercus berberidifolia Alliance (4210) [mapped in NSNF]

Californian pre-montane chaparral Group
Arctostaphylos glandulosa Alliance
Ceanothus leucodermis Alliance (4413)
Quercus wislizeni (Short Stature) Mapping Unit (includes Quercus wislizeni – Quercus chrysolepis (shrub) Alliance) (4410) [mapped in NSNF]

Californian serpentine chaparral Group
Quercus durata Alliance [mapped in NSNF as 4310]

Californian xeric chaparral Group

Adenostoma fasciculatum Alliance (4111) [mapped in NSNF]
Arctostaphylos (canescens, manzanita, stanfordiana) Alliance [mapped in NSNF as 4115]
Arctostaphylos glauca Alliance (4118)
Arctostaphylos viscida Alliance (4112) [mapped in NSNF]
Ceanothus cuneatus Alliance (4113) [mapped in NSNF]

California Coastal Scrub Macrogroup
Central and south coastal California seral scrub Group

Ericameria linearifolia – Cleome isomeris Alliance (4710)
Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance (4720)
Malacothamnus fasciculatus – Malacothamnus spp. Alliance

Central and south coastal Californian coastal sage scrub Group

Diplacus aurantiacus Alliance
Eriogonum fasciculatum Alliance (4810)

Naturalized non-native Mediterranean scrub Group

Cytisus scoparius – Genista monspessulana – Cotoneaster spp. Semi-Natural Alliance

Temperate and Boreal Shrubland and Grassland SubClass
Temperate and Boreal Freshwater Marsh Formation
Western North American Freshwater Marsh Division
Western North America Vernal Pool Macrogroup
Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group (7600) [mapped in NSNF]
Vernal Pool & Californian Annual and Perennial Grassland Matrix Mapping Unit (7400) [mapped in NSNF]

Centromadia (pungens) Alliance
Lasthenia fremontii – Downingia (bicornuta) Alliance
Lasthenia glaberrima Alliance
Layia fremontii – Achyrachaena mollis Alliance
Montia fontana – Sidalcea calycosa Alliance
Trifolium variegatum Alliance

Western North America Wet Meadow and Low Shrub Carr Macrogroup
Californian warm temperate marsh/seep Group (7200) [mapped in NSNF]

Bidens cernua – Euthamia occidentalis – Ludwigia palustris Alliance
Carex barbarae Alliance
Carex nudata Alliance
Carex utriculata – Calamagrostis canadensis Alliance
Equisetum (arvense, variegatum, hyemale) Alliance
Juncus (oxymeris, xiphioides) Alliance
Juncus arcticus (var. balticus, mexicanus) Alliance (7216)
Mimulus guttatus – Cirsium app. – Stachys spp. Alliance
Muhlenbergia rigens Alliance
Polygonum lapathifolium – Xanthium strumarium Alliance

Naturalized warm-temperate riparian and wetland Group (7500)
Cynodon dactylon – Crypsis spp. – Paspalum spp. Semi-Natural Alliance

Western North American Freshwater Marsh Macrogroup
Arid West freshwater emergent marsh Group (7300) [mapped in NSNF]
Schoenoplectus (acutus, californicus) Alliance (7320)
Typha (angustifolia, domingensis, latifolia) Alliance (7310)

Vancouverian coastal/tidal marsh and meadow Group (7800)
Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance (7830)
Juncus effusus Association (7820)

Temperate and Boreal Salt Marsh Formation
Temperate and Boreal Pacific Coastal Salt Marsh Division
North American Pacific Coastal Salt Marsh Macrogroup
Temperate Pacific tidal salt and brackish meadow Group
Distichlis spicata Alliance (8110)

Western North American Interior Alkali–Saline Wetland Division
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland Macrogroup
Southwestern North American alkali marsh/seep vegetation Group (8200)
Anemopsis californica – Helianthus nuttallii – Solidago spectabilis Alliance (8210)
Leymus cinereus – Leymus triticoides Alliance (8211)
Schoenoplectus americanus Alliance (8212)
Sporobolus airoides – Muhlenbergia asperifolia – Spartina gracilis Alliance

Southwestern North American salt basin and high marsh Group
Suaeda moquinii Alliance

Temperate and Boreal Scrub and Herb Coastal Vegetation Formation
Pacific Coast Scrub and Herb Littoral Vegetation Division
Vancouverian Coastal Dune and Bluff Macrogroup
California Coastal evergreen bluff and dune scrub Group
Baccharis pilularis Alliance [mapped in NSNF as 4420]

Temperate Grassland, Meadow, and Shrubland Formation
Vancouverian and Rocky Mountain Grassland and Shrubland Division
Vancouverian Lowland Grassland and Shrubland Macrogroup
Naturalized non-native deciduous scrub Group
Rubus armeniacus – Sesbania punicea – Ficus carica Semi-Natural Alliance (6213) [mapped in NSNF]

Vancouverian coastal deciduous scrub Group
Toxicodendron diversilobum Alliance (6301) [mapped in NSNF]

Western Cordilleran Montane Shrubland and Grassland Macrogroup
Southern Vancouverian montane deciduous scrub Group
Ceanothus integerrimus Alliance (6110) [mapped in NSNF]
Quercus garryana (shrub) Alliance (6111) [mapped in NSNF]

Western Cordilleran montane deciduous scrub Group
Prunus virginiana Alliance
Ribes quercetorum – Rhus trilobata – Frangula californica Alliance (6440)
Ribes quercetorum Association (6420)
Rhus trilobata Sierran Association (6218)
Frangula californica ssp. tomentella Association (4501)
Sambucus nigra Association (6219)
Western Cordilleran montane moist graminoid meadow Group
Poa secunda – Muhlenbergia richardsonis – Carex douglasii Alliance

Western North American Temperate Grassland and Meadow Macrogroup
Vancouverian and Rocky Mountain naturalized annual grassland Group
Bromus tectorum – Taeniatherum caput-medusae Semi-Natural Alliance (7181)

Vancouverian and Rocky Mountain naturalized perennial grassland Group (irrigated pasture) (7102) [mapped in NSNF]
Poa pratensis – Agrostis gigantea – Agrostis stolonifera Semi-Natural Alliance
Holcus lanatus – Anthoxanthum odoratum Semi-Natural Alliance
Phalaris aquatica – Phalaris arundinacea Semi-Natural Alliance

Western dry upland perennial grassland Group
Aristida purpurea – Elymus elymoides – Poa secunda Alliance
Bromus carinatus – Elymus glaucus Alliance

Western North America Interior Sclerophyllous Shrubland Division
Warm Interior Chaparral Macrogroup
Western Mojave and Western Sonoran Desert borderland chaparral Group
Quercus john-tuckeri Alliance (6510)

Mogollon Rim chaparral Group
Ceanothus greggii – Fremontodendron californicum Alliance (6520)
Arctostaphylos pungens – Arctostaphylos pringlei Alliance (4412)

Xeromorphic Scrub and Herb Vegetation (Semi-Desert) Class
Cool Semi-Desert Scrub and Grassland SubClass
Cool Semi-Desert Scrub and Grassland Formation
Western North American Cool Semi-Desert Scrub and Grassland Division
Cool Semi-desert Wash and Disturbance Scrub Macrogroup
Intermontane seral shrubland Group
Ericameria nauseosa Alliance (5212)
Ericameria teretifolia Alliance
Inter-Mountain Dry Shrubland and Grassland Macrogroup
Intermontane deep or well-drained soil scrub Group
Ephedra viridis Alliance (5417)
Ephedra nevadensis – Lycium andersonii – Grayia spinosa Alliance

Southern Great Basin semi-desert grassland Group
Achnatherum speciosum Alliance (5431)

Intermountain shallow/calcareous soil scrub Group
Cercocarpus ledifolius Alliance

Western North America Tall Sage Shrubland and Steppe Macrogroup
Inter-Mountain West mesic tall sagebrush shrubland and steppe Group
Artemisia tridentata Alliance (5311)
Purshia tridentata – Artemisia tridentata Alliance

Cool Semi-Desert Alkali-Saline Flats Macrogroup
Shadscale-saltbush cool semi-desert scrub Group
Atriplex canescens Alliance (5111)

Warm Semi-Desert Scrub and Grassland SubClass
Warm Semi-Desert Scrub and Grassland Formation
Sonoran and Chihuahuan Semi-Desert Scrub and Grassland Division
Madrean Warm Semi-Desert Wash Woodland/Scrub Macrogroup
Mojavean semi-desert wash scrub Group (5600)
Encelia (actonii, virginensis) – Viguiera reticulata Alliance (5211)
Lepidospartum squamatum Alliance (5610)
Prunus fasciculata – Salazaria mexicana Alliance (5415)
Ambrosia salsola – Bebbia juncea Alliance
Ephedra californica – Ephedra trifurca Alliance (5620)

Mojavean–Sonoran Desert Scrub Macrogroup
Lower Bajada and Fan Mojavean–Sonoran desert scrub Group
Atriplex polycarpa Shrubland Alliance (5710)

Mojavean upper desert scrub Group
Yucca brevifolia Alliance (5423)
Eriogonum wrightii – Eriogonum heermannii – Buddleja utahensis Alliance (4820)
Eriogonum fasciculatum – Viguiera parishii Alliance (5428)

Hydromorphic Vegetation (Aquatic Vegetation) Class
Freshwater Aquatic Vegetation SubClass
Freshwater Aquatic Vegetation Formation
North American Freshwater Aquatic Vegetation Division
Western North American Freshwater Aquatic Vegetation Macrogroup
Naturalized temperate Pacific freshwater vegetation Group
Ludwigia (hexapetala, peploides) – Eichhornia crassipes Semi-Natural Alliance
Lemna (minor) and Relatives Provisional Alliance

Western North American Temperate Freshwater Aquatic Vegetation Group
Azolla (filiculoides, microphylla) Alliance
Ranunculus aquatilis – Callitriche palustris – Callitriche heterophylla Alliance

Miscellaneous Classes (code indicates mapped mapping unit)
Agriculture (9200) (without fallow annual grasses dominating) [mapped in NSNF]
Built-Up & Urban Disturbance (9300) [mapped in NSNF]
    Urban Window [mapped in NSNF as 9310]
Areas of Little or No Vegetation (9400) [mapped in NSNF]
    Cliff/Rock Outcrop (9401) (Includes Cliff, Scree, and Other Rock Vegetation Group) [mapped in NSNF]
    River and Lacustrine Flats & Streambeds (9402) [mapped in NSNF]
    Undefined Areas with Little or No Vegetation (Anthropogenic clearing) (9403) [mapped in NSNF]
    Sparsely Vegetated Recently Burned Areas (9404) [mapped in NSNF]
Exotic Trees and Planted Trees (9500) [mapped in NSNF]
    Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-Natural Alliance (9501) [mapped in NSNF]
Standing Dead Trees High Cover (9600)
Water (9800) [mapped in NSNF]
    Perennial Stream Channel (9801) [mapped in NSNF]
    Reservoirs (9802) [mapped in NSNF]
    Small Earthen Dam Ponds & Natural Lakes (9803) [mapped in NSNF]
    Major Canals and Aqueducts (9804) [mapped in NSNF]

Other Attributes

Percent Cover - Woody (Conifer, Hardwood, Total Tree, Shrub)
Absolute Cover 1% increment
nnn = Absolute Cover
000 = None or None Observable
999 = Not Applicable, Not Assessed

Conifer Dieback (Dead) Modifier
0 = Not Assessed or Not Observed
1 = Dead Conifer Present in Stand

Percent Cover – Herbaceous
1 = 0-2%
2 = >2-10%
3 = >10-40%
4 = >40%
9 = Not Applicable, Not Assessed

Roadedness Disturbance
0 = No observed roads or trails.
1 = Minimal Roadedness: Less than one-third of the polygon is crossed by roads or trails. Polygons adjacent to paved roads are also placed into this category.
2 = Moderate Roadedness: Between one-third and two-thirds of the polygon is crossed by roads or trails.
3 = High Roadedness: Over two-thirds of the polygon is crossed by roads or trails.
9 = Not Applicable/Not Assigned

Development Disturbance
0 = None observed
1 = Low – 0-2% of polygon affected
2 = Moderate – >2-5% of polygon affected
3 = High – >5% of polygon affected
4 = Urban (used to automatically code Land Use=1000)
5 = Agriculture (used to automatically code Land Use = 2000)
9 = Not Applicable/Not Assigned

Anthropogenically Altered Disturbance (Clearing)
0 = No observed clearing
1 = Minimal Anthropogenic Clearing: Less than one-third of the polygon has been cleared of at least the understory vegetation.
2 = Moderate Anthropogenic Clearing: Between one-third and two-thirds of the polygon has been cleared of at least the understory vegetation.
3 = High Anthropogenic Clearing: Over two-thirds of the polygon has been cleared of at least the understory vegetation.
9 = Not Applicable/Not Assigned

Exotics (Invasives)
0 = Little or No Observable Invasive Plant Cover: Less than 5%
1 = Low Invasive Plant Cover: Less than 33% of the polygon but over 5% is covered with invasive plants.
2 = Moderate Invasive Plant Cover: Between 33% and 66% of the polygon is covered with invasive plants.
3 = High Invasive Plant Cover: Over 66% of the polygon's area is covered with invasive plants.
9 = Not Applicable/Not Assigned

Land Use
0000 = Not Assessed
1000 = Urban
1400 = Utility
2000 = Agriculture
9502 = Plantation
9800 = Undifferentiated Water

Modal Overstory Height Class (Trees) (note that categories >35-50m and >50m were not encountered)
0 = Not Applicable/Not Assessed
1 = <.5m
2 = >.5-1m
3 = >1-2m
4 = >2-5m
5 = >5-10m
6 = >10-15m
7 = >15-20m
8 = >20-35m
9 = >35-50m

California Wildlife Habitat Relations (CWHR) Modal Size Class
T = Tree
S = Shrub
H = Herb

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%
9 = Not Applicable/Not Assessed

Method ID
01 = Rapid Assessment (current project)
02 = Releve (current project)
03 = Field Verification (current project)
04 = Photo Interpretation
05 = Adjacent stand information or photo
06 = AIS Reconnaissance (current project)
07 = Other information
08 = Older plot data/Other agency recent plot data
09 = Older AIS recon data/Other agency recon data
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.

CDFW – Southern Sierra Nevada Foothills Vegetation Mapping Classification 3/31/2022

APPENDIX A-2: Mapping Classification Numeric Short List

VegCode/PI and Map Unit Name (not hierarchical, mapped classes only)

Gray highlight = 1-acre MMU Special (Water/Riparian/Wetland/Mesic Herb/Rock Outcrop/Urban)

Trees

1110 = Umbellularia californica Alliance
1111 = Quercus wislizeni – Quercus parvula (tree) Alliance
1210 = Pinus sabiniana Alliance
1212 = Juniperus californica Alliance
1214 = Hesperocyparis forbesii – Hesperocyparis nevadensis Alliance
1310 = Aesculus californica Alliance
1311 = Quercus douglasii Alliance
1312 = Quercus kelloggii Alliance
1313 = Quercus lobata Alliance
1410 = Quercus chrysolepis Alliance
2200 = *Californian montane conifer forest Group (includes managed conifer stands)*
2212 = Pinus ponderosa – Calocedrus decurrens – Pseudotsuga menziesii Alliance
2214 = Abies concolor Alliance
2215 = Pinus jeffreyi Alliance
2216 = Pseudotsuga macrocarpa Alliance
2310 = Pinus monophylla – (Juniperus osteosperma) Alliance
3100 = *Southwestern North American riparian evergreen and deciduous woodland Group*
3110 = Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance
3113 = Juglans hindsii and Hybrids Semi-Natural Alliance
3114 = Salix gooddingii – Salix laevigata Alliance
3210 = Alnus rhombifolia Alliance
3211 = Fraxinus latifolia Alliance
3310 = Platanus racemosa – Quercus agrifolia Alliance
3314 = Quercus lobata Riparian Alliance
5423 = Yucca brevifolia Alliance

Shrubs

4111 = Adenostoma fasciculatum Alliance
4112 = Arctostaphylos viscida Alliance
4113 = Ceanothus cuneatus Alliance
4118 = Arctostaphylos glauca Alliance
4210 = Quercus berberidifolia Alliance
4211 = Cercocarpus montanus Alliance
4410 = Quercus wislizeni (Short Stature) Mapping Unit
4412 = Arctostaphylos pungens – Arctostaphylos pringlei Alliance
4413 = Ceanothus leucodermis Alliance
4501 = Frangula californica ssp. tomentella Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance
4710 = Ericameria linearifolia – Cleome isomeris Alliance

4720 = Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance
4810 = Eriogonum fasciculatum Alliance
4820 = Eriogonum wrightii – Eriogonum heermannii – Buddleja utahensis Alliance
5111 = Atriplex canescens Alliance
5211 = Encelia (actonii, virginensis) – Viguiera reticulata Alliance
5212 = Ericameria nauseosa Alliance
5311 = Artemisia tridentata Alliance
5415 = Prunus fasciculata – Salazaria mexicana Alliance
5417 = Ephedra viridis Alliance
5428 = Eriogonum fasciculatum – Viguiera parishii Alliance
5600 = Mojavean semi-desert wash scrub Group
5610 = Lepidospartum squamatum Alliance
5620 = Ephedra californica – Ephedra trifurca Alliance
5710 = Atriplex polycarpa Alliance
6110 = Ceanothus integerrimus Alliance
6111 = Quercus garryana (shrub) Alliance
6210 = Baccharis salicifolia Alliance
6211 = Salix exigua Alliance
6212 = Tamarix spp. Semi-Natural Alliance
6213 = Rubus armeniacus – Sesbania punicea – Ficus carica Semi-Natural Alliance
6214 = Cephalanthus occidentalis Association of the Cephalanthus occidentalis – Rosa californica Alliance
6216 = Calycanthus occidentalis Provisional Association of the Cephalanthus occidentalis – Rosa californica Alliance
6217 = Salix lasiolepis Alliance
6218 = Rhus trilobata Sierran Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance
6219 = Sambucus nigra Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance
6220 = Vitis arizonica – Vitis girdiana Alliance
6230 = Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance
6231 = Rhus trilobata Association of the Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance
6250 = Cephalanthus occidentalis – Rosa californica Alliance
6301 = Toxicodendron diversilobum Alliance
6401 = Rosa californica Association of the Cephalanthus occidentalis – Rosa californica Alliance
6420 = Ribes quercetorum Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance
6440 = Ribes quercetorum – Rhus trilobata – Frangula californica Alliance
6510 = Quercus john-tuckeri Alliance
6520 = Ceanothus greggii – Fremontodendron californicum Alliance

Herb
5431 = Achnatherum speciosum Alliance
6221 = Heterotheca (oregona, sessiliflora) Alliance
7100 = *California Annual and Perennial Grassland Macrogroup*
7101 = *Mediterranean California naturalized annual and perennial grassland Group*
7102 = Vancouverian and Rocky Mountain naturalized perennial grassland Group (irrigated pasture)

7104 = Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance
7110 = *California annual herb/grass Group*
7112 = Artemisia dracunculus Alliance
7114 = Holocarpha (heermannii, virgata) Alliance
7115 = Vulpia microstachys – Selaginella hansenii Association of the Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance
7116 = Lotus unifoliolatus Alliance
7121 = Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance
7122 = Leymus condensatus Alliance
7181 = Bromus tectorum – Taeniatherum caput-medusae Herbaceous Semi-Natural Alliance
7191 = Avena spp. – Bromus spp. Herbaceous Semi-Natural Alliance
7200 = *Californian warm temperate marsh/seep Group*
7216 = Juncus arcticus (var. balticus, mexicanus) Alliance
7300 = *Arid West freshwater emergent marsh Group*
7310 = Typha (angustifolia, domingensis, latifolia) Alliance
7320 = Schoenoplectus (acutus, californicus) Alliance
7400 = Vernal Pool & Californian Annual and Perennial Grassland Matrix Mapping Unit
7500 = *Naturalized warm-temperate riparian and wetland Group*
7600 = *Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group*
7800 = *Vancouverian coastal/tidal marsh and meadow Group*
7820 = Juncus effusus Association of the Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance
7830 = Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance
8110 = Distichlis spicata Alliance
8200 = *Southwestern North American alkali marsh/seep vegetation Group*
8210 = Anemopsis californica – Helianthus nuttallii – Solidago spectabilis Alliance
8211 = Leymus cinereus – Leymus triticoides Alliance
8212 = Schoenoplectus americanus Alliance

Miscellaneous Classes (Mapping Units)
9200 = Agriculture (without fallow annual grasses dominating)
9300 = Built-Up & Urban Disturbance (includes development, mines and borrow pits)
9400 = Areas of Little or No Vegetation
9401 = Cliffs/Rock Outcrop
9402 = River and Lacustrine Flats & Streambeds
9403 = Undefined Areas with Little or No Vegetation (Anthropogenic clearing)
9404 = Sparsely Vegetated Recently Burned Areas
9500 = Exotic Trees and Planted Trees
9501 = Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-Natural Alliance
9600 = Standing Dead Trees High Cover
9800 = Water
9801 = Perennial Stream Channel
9802 = Reservoirs
9803 = Small Earthen Dam Ponds & Natural Lakes
9804 = Major Canals and Aqueducts

Other Attributes

Percent Cover - Woody (Conifer, Hardwood, Total Tree, Shrub)
Absolute Cover 1% increment
nnn = Absolute Cover
000 = None or None Observable
999 = Not Applicable, Not Assessed

Conifer Dieback (Dead) Modifier
0 = Not Assessed or Not Observed
1 = Dead Conifer Present in Stand

Percent Cover – Herbaceous
1 = 0-2%
2 = >2-10%
3 = >10-40%
4 = >40%
9 = Not Applicable, Not Assessed

Roadedness Disturbance
0 = No observed roads or trails.
1 = Minimal Roadedness: Less than one-third of the polygon is crossed by roads or trails. Polygons adjacent to paved roads are also placed into this category.
2 = Moderate Roadedness: Between one-third and two-thirds of the polygon is crossed by roads or trails.
3 = High Roadedness: Over two-thirds of the polygon is crossed by roads or trails.
9 = Not Applicable/Not Assigned

Development Disturbance
0 = None observed
1 = Low – 0-2% of polygon affected
2 = Moderate – >2-5% of polygon affected
3 = High – >5% of polygon affected
4 = Urban (used to automatically code Land Use=1000)
5 = Agriculture (used to automatically code Land Use = 2000)
9 = Not Applicable/Not Assigned

Anthropogenically Altered Disturbance (Clearing)
0 = No observed clearing
1 = Minimal Anthropogenic Clearing: Less than one-third of the polygon has been cleared of at least the understory vegetation.
2 = Moderate Anthropogenic Clearing: Between one-third and two-thirds of the polygon has been cleared of at least the understory vegetation.
3 = High Anthropogenic Clearing: Over two-thirds of the polygon has been cleared of at least the understory vegetation.
9 = Not Applicable/Not Assigned

Exotics (Invasives)
0 = Little or No Observable Invasive Plant Cover: Less than 5%
1 = Low Invasive Plant Cover: Less than 33% of the polygon but over 5% is covered with invasive plants.
2 = Moderate Invasive Plant Cover: Between 33% and 66% of the polygon is covered with invasive plants.
3 = High Invasive Plant Cover: Over 66% of the polygon's area is covered with invasive plants.
9 = Not Applicable/Not Assigned

Land Use
0000 = Not Assessed
1000 = Urban
1400 = Utility
2000 = Agriculture
9502 = Plantation
9800 = Undifferentiated Water

Modal Overstory Height Class (Trees) (note that categories >35-50m and >50m were not encountered)
0 = Not Applicable/Not Assessed
1 = <.5m
2 = >.5-1m
3 = >1-2m
4 = >2-5m
5 = >5-10m
6 = >10-15m
7 = >15-20m
8 = >20-35m
9 = >35-50m

California Wildlife Habitat Relations (CWHR) Modal Size Class
T = Tree
S = Shrub
H = Herb

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%
9 = Not Applicable/Not Assessed

Method ID
01 = Rapid Assessment (current project)
02 = Releve (current project)
03 = Field Verification (current project)
04 = Photo Interpretation
05 = Adjacent stand information or photo
06 = Reconnaissance (current project)
07 = Other information
08 = Older plot data/Other agency recent plot data
09 = Older recon data/Other agency recon data
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.

CDFW – Southern Sierra Nevada Foothills Vegetation Mapping Classification 03/31/2022

APPENDIX A-3: Mapping Classification Alliance Alpha Short List

Map Unit Name and VegCode/PI (mapped classes only)

Gray highlight = 1 acre MMU Special (Water/Riparian/Wetland/Mesic Herb/Rock Outcrop/Urban)

Trees

Abies concolor Alliance (2214)
Aesculus californica Alliance (1310)
Alnus rhombifolia Alliance (3210)
Californian montane conifer forest Group (includes managed conifer stands) (2200)
Fraxinus latifolia Alliance (3211)
Hesperocyparis forbesii – Hesperocyparis nevadensis Alliance (1214)
Juglans hindsii and Hybrids Semi-Natural Alliance (3113)
Juniperus californica Alliance (1212)
Pinus jeffreyi Alliance (2215)
Pinus monophylla – (Juniperus osteosperma) Alliance (2310)
Pinus ponderosa – Calocedrus decurrens – Pseudotsuga menziesii Alliance (2212)
Pinus sabiniana Alliance (1210)
Platanus racemosa – Quercus agrifolia Alliance (3310)
Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance (3110)
Pseudotsuga macrocarpa Alliance (2216)
Quercus chrysolepis Alliance (1410)
Quercus douglasii Alliance (1311)
Quercus kelloggii Alliance (1312)
Quercus lobata Alliance (1313)
Quercus lobata Riparian Alliance (3314)
Quercus wislizeni – Quercus parvula (tree) Alliance (1111)
Salix gooddingii – Salix laevigata Alliance (3114)
Southwestern North American riparian evergreen and deciduous woodland Group (3100)
Umbellularia californica Alliance (1110)
Yucca brevifolia Alliance (5423)

Shrubs

Adenostoma fasciculatum Alliance (4111)
Arctostaphylos glauca Alliance (4118)
Arctostaphylos pungens – Arctostaphylos pringlei Alliance (4412)
Arctostaphylos viscida Alliance (4112)
Artemisia tridentata Alliance (5311)
Atriplex canescens (5111)
Atriplex polycarpa Alliance (5710)
Baccharis salicifolia Alliance (6210)
Calycanthus occidentalis Provisional Association of the Cephalanthus occidentalis – Rosa californica Alliance (6216)
Ceanothus cuneatus Alliance (4113)
Ceanothus greggii – Fremontodendron californicum Alliance (6520)

Ceanothus integerrimus Alliance (6110)
Ceanothus leucodermis Alliance (4413)
Cephalanthus occidentalis Association of the Cephalanthus occidentalis – Rosa californica Alliance (6214)
Cephalanthus occidentalis – Rosa californica Alliance (6250)
Cercocarpus montanus Alliance (4211)
Encelia (actonii, virginensis) – Viguiera reticulata Alliance (5211)
Ephedra californica – Ephedra trifurca Alliance (5620)
Ephedra viridis Alliance (5417)
Ericameria linearifolia – Cleome isomeris Alliance (4710)
Ericameria nauseosa Alliance (5212)
Eriogonum fasciculatum Alliance (4810)
Eriogonum fasciculatum – Viguiera parishii (5428)
Eriogonum wrightii – Eriogonum heermannii – Buddleja utahensis Alliance (4820)
Frangula californica ssp. tomentella Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance (4501)
Lepidospartum squamatum Alliance (5610)
Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance (4720)
Mojavean semi-desert wash scrub Group (5600)
Prunus fasciculata – Salazaria mexicana Alliance (5415)
Quercus berberidifolia Alliance (4210)
Quercus garryana (shrub) Alliance (6111)
Quercus john-tuckeri Alliance (6510)
Quercus wislizeni (Short Stature) Mapping Unit (4410)
Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance (6230)
Rhus trilobata Association of the Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance (6231)
Rhus trilobata Sierran Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance (6218)
Ribes quercetorum Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance (6420)
Ribes quercetorum – Rhus trilobata – Frangula californica Alliance (6440)
Rosa californica Association of the Cephalanthus occidentalis – Rosa californica Alliance (6401)
Rubus armeniacus – Sesbania punicea – Ficus carica Semi-Natural Alliance (6213)
Salix exigua Alliance (6211)
Salix lasiolepis Alliance (6217)
Sambucus nigra Association of the Ribes quercetorum – Rhus trilobata – Frangula californica Alliance (6219)
Tamarix spp. Shrubland Semi-Natural Alliance (6212)
Toxicodendron diversilobum Alliance (6301)
Vitis arizonica – Vitis girdiana Alliance (6220)

Herb
Achnatherum speciosum Alliance (5431)
Anemopsis californica – Helianthus nuttallii – Solidago spectabilis Alliance (8210)
Arid West freshwater emergent marsh Group (7300)
Artemisia dracunculus Alliance (7112)
Avena spp. – Bromus spp. Herbaceous Semi-Natural Alliance (7191)

Bromus tectorum – Taeniatherum caput-medusae Herbaceous Semi-Natural Alliance (7181)
California Annual and Perennial Grassland Macrogroup (7100)
California annual herb/grass Group (7110)
Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group (7600)
Californian warm temperate marsh/seep Group (7200)
Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance (7121)
Distichlis spicata Alliance (8110)
Heterotheca (oregona, sessiliflora) Alliance (6221)
Holocarpha (heermannii, virgata) Alliance (7114)
Juncus arcticus (var. balticus, mexicanus) Alliance (7216)
Juncus effusus Association of the Juncus (effusus, patens) - Carex (pansa, praegracilis) Alliance (7820)
Juncus (effusus, patens) – Carex (pansa, praegracilis) Alliance (7830)
Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance (7104)
Leymus cinereus – Leymus triticoides Alliance (8211)
Leymus condensatus Alliance (7122)
Lotus unifoliolatus Alliance (7116)
Mediterranean California naturalized annual and perennial grassland Group (7101)
Naturalized warm-temperate riparian and wetland Group (7500)
Schoenoplectus (acutus, californicus) Alliance (7320)
Schoenoplectus americanus Alliance (8212)
Southwestern North American alkali marsh/seep vegetation Group (8200)
Typha (angustifolia, domingensis, latifolia) Alliance (7310)
Vancouverian and Rocky Mountain naturalized perennial grassland Group (irrigated pasture) (7102)
Vancouverian coastal/tidal marsh and meadow Group (7800)
Vernal Pool & Californian Annual and Perennial Grassland Matrix Mapping Unit (7400)
Vulpia microstachys – Selaginella hansenii Association of the Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance (7115)

Miscellaneous Classes (Mapping Units)
Agriculture (9200) (without fallow annual grasses dominating)
Built-Up & Urban Disturbance (9300) (includes development, mines and borrow pits)
Areas of Little or No Vegetation (9400)
- Cliffs/Rock Outcrop (9401)
- River and Lacustrine Flats & Streambeds (9402)
- Undefined Areas with Little or No Vegetation (Anthropogenic clearing) (9403)
- Sparsely Vegetated Recently Burned Areas [9404]

Exotic Trees and Planted Trees (9500)
- Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-Natural Alliance (9501)

Standing Dead Trees High Cover [9600]
Water (9800)
- Perennial Stream Channel (9801)
- Reservoirs (9802)
- Small Earthen Dam Ponds & Natural Lakes (9803)
- Major Canals and Aqueducts (9804)

Other Attributes

Percent Cover - Woody (Conifer, Hardwood, Total Tree, Shrub)
Absolute Cover 1% increment
nnn = Absolute Cover
000 = None or None Observable
999 = Not Applicable, Not Assessed

Conifer Dieback (Dead) Modifier
0 = Not Assessed or Not Observed
1 = Dead Conifer Present in Stand

Percent Cover – Herbaceous
1 = 0-2%
2 = >2-10%
3 = >10-40%
4 = >40%
9 = Not Applicable, Not Assessed

Roadedness Disturbance
0 = No observed roads or trails.
1 = Minimal Roadedness: Less than one-third of the polygon is crossed by roads or trails. Polygons adjacent to paved roads are also placed into this category.
2 = Moderate Roadedness: Between one-third and two-thirds of the polygon is crossed by roads or trails.
3 = High Roadedness: Over two-thirds of the polygon is crossed by roads or trails.
9 = Not Applicable/Not Assigned

Development Disturbance
0 = None observed
1 = Low – 0-2% of polygon affected
2 = Moderate – >2-5% of polygon affected
3 = High – >5% of polygon affected
4 = Urban (used to automatically code Land Use=1000)
5 = Agriculture (used to automatically code Land Use = 2000)
9 = Not Applicable/Not Assigned

Anthropogenically Altered Disturbance (Clearing)
0 = No observed clearing
1 = Minimal Anthropogenic Clearing: Less than one-third of the polygon has been cleared of at least the understory vegetation.
2 = Moderate Anthropogenic Clearing: Between one-third and two-thirds of the polygon has been cleared of at least the understory vegetation.
3 = High Anthropogenic Clearing: Over two-thirds of the polygon has been cleared of at least the understory vegetation.
9 = Not Applicable/Not Assigned

Exotics (Invasives)
0 = Little or No Observable Invasive Plant Cover: Less than 5%
1 = Low Invasive Plant Cover: Less than 33% of the polygon but over 5% is covered with invasive plants.
2 = Moderate Invasive Plant Cover: Between 33% and 66% of the polygon is covered with invasive plants.
3 = High Invasive Plant Cover: Over 66% of the polygon's area is covered with invasive plants.
9 = Not Applicable/Not Assigned

Land Use
0000 = Not Assessed
1000 = Urban
1400 = Utility
2000 = Agriculture
9502 = Plantation
9800 = Undifferentiated Water

Modal Overstory Height Class (Trees) (note that categories >35-50m and >50m were not encountered)
0 = Not Applicable/Not Assessed
1 = <.5m
2 = >.5-1m
3 = >1-2m
4 = >2-5m
5 = >5-10m
6 = >10-15m
7 = >15-20m
8 = >20-35m
9 = >35-50m

California Wildlife Habitat Relations (CWHR) Modal Size Class
T = Tree
S = Shrub
H = Herb

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%
9 = Not Applicable/Not Assessed

Method ID
01 = Rapid Assessment (current project)
02 = Releve (current project)
03 = Field Verification (current project)
04 = Photo Interpretation
05 = Adjacent stand information or photo
06 = AIS Reconnaissance (current project)
07 = Other information
08 = Older plot data/Other agency recent plot data
09 = Older recon data/Other agency recon data
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.

APPENDIX C

SUMMARIES OF ACREAGE AND POLYGON COUNT BY MAP UNIT

Three tables are presented on the following pages. The first table lists each of the map units occurring in the final database of the Southern Sierra Nevada Foothills 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

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
1110	Umbellularia californica Alliance	625	2,401.3	5,933.7	0.3%	9.5
1111	Quercus wislizeni - Quercus parvula (tree) Alliance	19831	163,641.4	404,366.8	22.2%	20.4
1210	Pinus sabiniana Alliance	494	1,578.4	3,900.2	0.2%	7.9
1212	Juniperus californica Alliance	590	2,950.9	7,291.9	0.4%	12.4
1214	Hesperocyparis forbesii - Hesperocyparis nevadensis Alliance	20	128.4	317.3	0.0%	15.9
1310	Aesculus californica Alliance	959	2,446.3	6,045.0	0.3%	6.3
1311	Quercus douglasii Alliance	26201	240,931.8	595,355.5	32.6%	22.7
1312	Quercus kelloggii Alliance	885	6,843.3	16,910.2	0.9%	19.1
1313	Quercus lobata Alliance	65	524.5	1,296.2	0.1%	19.9
1410	Quercus chrysolepis Alliance	2430	17,468.5	43,165.6	2.4%	17.8
2200	Californian montane conifer forest Group (includes managed conifer stands)	3	57.2	141.3	0.0%	47.1
2212	Pinus ponderosa - Calocedrus decurrens - Pseudotsuga menziesii Alliance	43	170.9	422.4	0.0%	9.8
2214	Abies concolor Alliance	2	3.5	8.8	0.0%	4.4
2215	Pinus jeffreyi Alliance	59	1,926.9	4,761.6	0.3%	80.7
2216	Pseudotsuga macrocarpa Alliance	31	912.9	2,255.7	0.1%	72.8
2310	Pinus monophylla - (Juniperus osteosperma) Alliance	490	7,806.0	19,289.2	1.1%	39.4
3100	Southwestern North American riparian evergreen and deciduous woodland Group	1	0.8	2.1	0.0%	2.1
3110	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	313	539.2	1,332.3	0.1%	4.3
3113	Juglans hindsii and Hybrids Semi-Natural Alliance	2	0.6	1.5	0.0%	0.8
3114	Salix gooddingii - Salix laevigata Alliance	641	1,291.9	3,192.3	0.2%	5.0
3210	Alnus rhombifolia Alliance	53	71.2	175.8	0.0%	3.3
3211	Fraxinus latifolia Alliance	349	800.8	1,978.9	0.1%	5.7
3310	Platanus racemosa - Quercus agrifolia Alliance	1735	5,716.7	14,126.4	0.8%	8.1
3314	Quercus lobata Riparian Alliance	1252	4,495.0	11,107.4	0.6%	8.9
4111	Adenostoma fasciculatum Alliance	516	2,499.9	6,177.4	0.3%	12.0
4112	Arctostaphylos viscida Alliance	484	1,241.8	3,068.7	0.2%	6.3
4113	Ceanothus cuneatus Alliance	1772	5,253.8	12,982.5	0.7%	7.3

Table C-1: Map Unit Acreage, Listed Numerically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
4118	Arctostaphylos glauca Alliance	76	337.6	834.1	0.0%	11.0
4210	Quercus berberidifolia Alliance	54	261.1	645.2	0.0%	11.9
4211	Cercocarpus montanus Alliance	1996	11,244.4	27,785.5	1.5%	13.9
4410	Quercus wislizeni (Short Stature) Mapping Unit	662	5,689.6	14,059.3	0.8%	21.2
4412	Arctostaphylos pungens - Arctostaphylos pringlei Alliance	142	432.3	1,068.2	0.1%	7.5
4413	Ceanothus leucodermis Alliance	57	106.8	264.0	0.0%	4.6
4501	Frangula californica ssp. tomentella Association	123	276.3	682.7	0.0%	5.6
4710	Ericameria linearifolia - Cleome isomeris Alliance	179	1,153.4	2,850.2	0.2%	15.9
4720	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	912	3,349.0	8,275.7	0.5%	9.1
4810	Eriogonum fasciculatum Alliance	1800	8,862.7	21,900.1	1.2%	12.2
4820	Eriogonum wrightii - Eriogonum heermannii - Buddleja utahensis Alliance	123	476.6	1,177.8	0.1%	9.6
5111	Atriplex canescens Alliance	5	14.8	36.6	0.0%	7.3
5211	Encelia (actonii, virginensis) - Viguiera reticulata Alliance	71	396.1	978.7	0.1%	13.8
5212	Ericameria nauseosa Alliance	190	787.4	1,945.8	0.1%	10.2
5311	Artemisia tridentata Alliance	433	1,327.4	3,280.1	0.2%	7.6
5415	Prunus fasciculata - Salazaria mexicana Alliance	1	0.3	0.8	0.0%	0.8
5417	Ephedra viridis Alliance	122	468.9	1,158.8	0.1%	9.5
5423	Yucca brevifolia Alliance	1	0.7	1.8	0.0%	1.8
5428	Eriogonum fasciculatum - Viguiera parishii Alliance	51	349.1	862.7	0.0%	16.9
5431	Achnatherum speciosum Alliance	4	12.6	31.2	0.0%	7.8
5610	Lepidospartum squamatum Alliance	43	147.8	365.3	0.0%	8.5
5620	Ephedra californica - Ephedra trifurca Alliance	16	51.1	126.3	0.0%	7.9
5710	Atriplex polycarpa Alliance	43	222.5	549.9	0.0%	12.8
6110	Ceanothus integerrimus Alliance	1	3.3	8.3	0.0%	8.3
6111	Quercus garryana (shrub) Alliance	363	1,388.1	3,430.1	0.2%	9.4
6210	Baccharis salicifolia Alliance	67	64.6	159.7	0.0%	2.4
6211	Salix exigua Alliance	62	65.2	161.0	0.0%	2.6
6212	Tamarix spp. Semi-Natural Alliance	2	1.8	4.5	0.0%	2.3

Table C-1: Map Unit Acreage, Listed Numerically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
6213	Rubus armeniacus - Sesbania punicea - Ficus carica Semi-Natural Alliance	4	3.2	7.9	0.0%	2.0
6214	Cephalanthus occidentalis Association	43	51.9	128.3	0.0%	3.0
6216	Calycanthus occidentalis Provisional Association	1	0.8	2.0	0.0%	2.0
6217	Salix lasiolepis Alliance	29	24.4	60.4	0.0%	2.1
6218	Rhus trilobata Sierran Association	9	9.4	23.2	0.0%	2.6
6219	Sambucus nigra Association	7	13.6	33.6	0.0%	4.8
6220	Vitis arizonica - Vitis girdiana Alliance	3	2.2	5.4	0.0%	1.8
6221	Heterotheca (oregona, sessiliflora) Alliance	1	0.7	1.8	0.0%	1.8
6231	Rhus trilobata Association	3	2.7	6.6	0.0%	2.2
6301	Toxicodendron diversilobum Alliance	235	415.9	1,027.8	0.1%	4.4
6401	Rosa californica Alliance	8	11.0	27.3	0.0%	3.4
6420	Ribes quercetorum Association	120	136.3	336.7	0.0%	2.8
6510	Quercus john-tuckeri Alliance	568	5,562.2	13,744.4	0.8%	24.2
6520	Ceanothus greggii - Fremontodendron californicum Alliance	99	705.0	1,742.2	0.1%	17.6
7100	California Annual and Perennial Grassland Macrogroup	13802	182,589.4	451,188.3	24.7%	32.7
7101	Mediterranean California naturalized annual and perennial grassland Group	1	19.1	47.3	0.0%	47.3
7102	Vancouverian and Rocky Mountain naturalized perennial grassland Group (irrigated pasture)	48	291.6	720.5	0.0%	15.0
7110	California annual herb/grass Group	19	1,175.3	2,904.3	0.2%	152.9
7112	Artemisia dracunculus Alliance	3	4.5	11.1	0.0%	3.7
7114	Holocarpha (heermannii, virgata) Alliance	10	98.4	243.3	0.0%	24.3
7115	Vulpia microstachys - Selaginella hansenii Association	261	262.5	648.7	0.0%	2.5
7116	Lotus unifoliolatus Alliance	1	0.5	1.3	0.0%	1.3
7121	Corethrogyne filaginifolia - Eriogonum (elongatum, nudum) Alliance	3	8.5	21.0	0.0%	7.0
7122	Leymus condensatus Alliance	13	8.6	21.2	0.0%	1.6
7181	Bromus tectorum - Taeniatherum caput-medusae Semi-Natural Alliance	1	5.7	14.1	0.0%	14.1
7191	Avena spp. - Bromus spp. Semi-Natural Alliance	6	11.7	28.8	0.0%	4.8
7200	Californian warm temperate marsh/seep Group	34	111.5	275.5	0.0%	8.1

Table C-1: Map Unit Acreage, Listed Numerically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
7216	Juncus arcticus (var. balticus, mexicanus) Alliance	61	94.1	232.4	0.0%	3.8
7300	Arid West freshwater emergent marsh Group	1	0.2	0.6	0.0%	0.6
7310	Typha (angustifolia, domingensis, latifolia) Alliance	17	13.3	32.9	0.0%	1.9
7320	Schoenoplectus (acutus, californicus) Alliance	4	2.3	5.6	0.0%	1.4
7400	Vernal Pool & Californian Annual and Perennial Grassland Matrix Mapping Unit	62	5,424.4	13,404.0	0.7%	216.2
7500	Naturalized warm-temperate riparian and wetland Group	1	0.4	1.0	0.0%	1.0
7600	Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group	39	60.3	149.0	0.0%	3.8
7800	Vancouverian coastal/tidal marsh and meadow Group	1	1.7	4.3	0.0%	4.3
7820	Juncus effusus Association	2	1.5	3.8	0.0%	1.9
8110	Distichlis spicata Alliance	3	7.3	18.0	0.0%	6.0
8200	Southwestern North American alkali marsh/seep vegetation Group	1	3.1	7.7	0.0%	7.7
8210	Anemopsis californica - Helianthus nuttallii - Solidago spectabilis Alliance	1	0.1	0.3	0.0%	0.3
8211	Leymus cinereus - Leymus triticoides Alliance	2	5.0	12.4	0.0%	6.2
8212	Schoenoplectus americanus Alliance	1	2.4	5.9	0.0%	5.9
9200	Agriculture Mapping Unit	215	2,889.4	7,140.0	0.4%	33.2
9300	Built-Up & Urban Disturbance Mapping Unit	8679	17,848.1	44,103.7	2.4%	5.1
9400	Areas of Little or No Vegetation Mapping Unit	3	7.9	19.6	0.0%	6.5
9401	Cliffs/Rock Outcrop Mapping Unit	214	353.6	873.8	0.0%	4.1
9402	River and Lacustrine Flats & Streambeds Mapping Unit	97	98.2	242.8	0.0%	2.5
9403	Undefined Areas with Little or No Vegetation Mapping Unit	38	104.3	257.7	0.0%	6.8
9404	Sparsely Vegetated Recently Burned Areas Mapping Unit	57	785.2	1,940.2	0.1%	34.0
9500	Exotic Trees and Planted Trees Mapping Unit	18	51.6	127.5	0.0%	7.1
9501	Eucalyptus spp. - Ailanthus altissima - Robinia pseudoacacia Semi-Natural Alliance	24	30.8	76.0	0.0%	3.2
9600	Standing Dead Trees High Cover Mapping Unit	26	64.3	158.8	0.0%	6.1
9800	Water Mapping Unit	15	17.6	43.6	0.0%	2.9

Table C-1: Map Unit Acreage, Listed Numerically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
9801	Perennial Stream Channel Mapping Unit	44	460.3	1,137.5	0.1%	25.9
9802	Reservoirs Mapping Unit	9	8,616.6	21,292.2	1.2%	2,365.8
9803	Small Earthen Dam Ponds & Natural Lakes Mapping Unit	772	769.2	1,900.8	0.1%	2.5
9804	Major Canals & Aqueducts Mapping Unit	10	90.2	222.9	0.0%	22.3
	Totals	**93,194**	**738,526.5**	**1,824,938.8**	**100.0%**	**19.6**

Table C-2: Map Unit Acreage, Listed Alphabetically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
2214	Abies concolor Alliance	2	3.5	8.8	0.0%	4.4
5431	Achnatherum speciosum Alliance	4	12.6	31.2	0.0%	7.8
4111	Adenostoma fasciculatum Alliance	516	2,499.9	6,177.4	0.3%	12.0
1310	Aesculus californica Alliance	959	2,446.3	6,045.0	0.3%	6.3
9200	Agriculture Mapping Unit	215	2,889.4	7,140.0	0.4%	33.2
3210	Alnus rhombifolia Alliance	53	71.2	175.8	0.0%	3.3
8210	Anemopsis californica - Helianthus nuttallii - Solidago spectabilis Alliance	1	0.1	0.3	0.0%	0.3
4118	Arctostaphylos glauca Alliance	76	337.6	834.1	0.0%	11.0
4412	Arctostaphylos pungens - Arctostaphylos pringlei Alliance	142	432.3	1,068.2	0.1%	7.5
4112	Arctostaphylos viscida Alliance	484	1,241.8	3,068.7	0.2%	6.3
9400	Areas of Little or No Vegetation Mapping Unit	3	7.9	19.6	0.0%	6.5
7300	Arid West freshwater emergent marsh Group	1	0.2	0.6	0.0%	0.6
7112	Artemisia dracunculus Alliance	3	4.5	11.1	0.0%	3.7
5311	Artemisia tridentata Alliance	433	1,327.4	3,280.1	0.2%	7.6
5111	Atriplex canescens Alliance	5	14.8	36.6	0.0%	7.3
5710	Atriplex polycarpa Alliance	43	222.5	549.9	0.0%	12.8
7191	Avena spp. - Bromus spp. Semi-Natural Alliance	6	11.7	28.8	0.0%	4.8
6210	Baccharis salicifolia Alliance	67	64.6	159.7	0.0%	2.4
7181	Bromus tectorum - Taeniatherum caput-medusae Semi-Natural Alliance	1	5.7	14.1	0.0%	14.1
9300	Built-Up & Urban Disturbance Mapping Unit	8679	17,848.1	44,103.7	2.4%	5.1
7100	California Annual and Perennial Grassland Macrogroup	13802	182,589.4	451,188.3	24.7%	32.7
7110	California annual herb/grass Group	19	1,175.3	2,904.3	0.2%	152.9
7600	Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group	39	60.3	149.0	0.0%	3.8
2200	Californian montane conifer forest Group (includes managed conifer stands)	3	57.2	141.3	0.0%	47.1
7200	Californian warm temperate marsh/seep Group	34	111.5	275.5	0.0%	8.1

Table C-2: Map Unit Acreage, Listed Alphabetically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
6216	Calycanthus occidentalis Provisional Association	1	0.8	2.0	0.0%	2.0
4113	Ceanothus cuneatus Alliance	1772	5,253.8	12,982.5	0.7%	7.3
6520	Ceanothus greggii - Fremontodendron californicum Alliance	99	705.0	1,742.2	0.1%	17.6
6110	Ceanothus integerrimus Alliance	1	3.3	8.3	0.0%	8.3
4413	Ceanothus leucodermis Alliance	57	106.8	264.0	0.0%	4.6
6214	Cephalanthus occidentalis Association	43	51.9	128.3	0.0%	3.0
4211	Cercocarpus montanus Alliance	1996	11,244.4	27,785.5	1.5%	13.9
9401	Cliffs/Rock Outcrop Mapping Unit	214	353.6	873.8	0.0%	4.1
7121	Corethrogyne filaginifolia - Eriogonum (elongatum, nudum) Alliance	3	8.5	21.0	0.0%	7.0
8110	Distichlis spicata Alliance	3	7.3	18.0	0.0%	6.0
5211	Encelia (actonii, virginensis) - Viguiera reticulata Alliance	71	396.1	978.7	0.1%	13.8
5417	Ephedra viridis Alliance	122	468.9	1,158.8	0.1%	9.5
5620	Ephedra californica - Ephedra trifurca Alliance	16	51.1	126.3	0.0%	7.9
4710	Ericameria linearifolia - Cleome isomeris Alliance	179	1,153.4	2,850.2	0.2%	15.9
5212	Ericameria nauseosa Alliance	190	787.4	1,945.8	0.1%	10.2
5428	Eriogonum fasciculatum - Viguiera parishii Alliance	51	349.1	862.7	0.0%	16.9
4810	Eriogonum fasciculatum Alliance	1800	8,862.7	21,900.1	1.2%	12.2
4820	Eriogonum wrightii - Eriogonum heermannii - Buddleja utahensis Alliance	123	476.6	1,177.8	0.1%	9.6
9501	Eucalyptus spp. - Ailanthus altissima - Robinia pseudoacacia Semi-Natural Alliance	24	30.8	76.0	0.0%	3.2
9500	Exotic Trees and Planted Trees Mapping Unit	18	51.6	127.5	0.0%	7.1
4501	Frangula californica ssp. tomentella Association	123	276.3	682.7	0.0%	5.6
3211	Fraxinus latifolia Alliance	349	800.8	1,978.9	0.1%	5.7
1214	Hesperocyparis forbesii - Hesperocyparis nevadensis Alliance	20	128.4	317.3	0.0%	15.9
6221	Heterotheca (oregona, sessiliflora) Alliance	1	0.7	1.8	0.0%	1.8
7114	Holocarpha (heermannii, virgata) Alliance	10	98.4	243.3	0.0%	24.3
3113	Juglans hindsii and Hybrids Semi-Natural Alliance	2	0.6	1.5	0.0%	0.8

Table C-2: Map Unit Acreage, Listed Alphabetically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
7216	Juncus arcticus (var. balticus, mexicanus) Alliance	61	94.1	232.4	0.0%	3.8
7820	Juncus effusus Association	2	1.5	3.8	0.0%	1.9
1212	Juniperus californica Alliance	590	2,950.9	7,291.9	0.4%	12.4
5610	Lepidospartum squamatum Alliance	43	147.8	365.3	0.0%	8.5
8211	Leymus cinereus - Leymus triticoides Alliance	2	5.0	12.4	0.0%	6.2
7122	Leymus condensatus Alliance	13	8.6	21.2	0.0%	1.6
4720	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	912	3,349.0	8,275.7	0.5%	9.1
7116	Lotus unifoliolatus Alliance	1	0.5	1.3	0.0%	1.3
9804	Major Canals & Aqueducts Mapping Unit	10	90.2	222.9	0.0%	22.3
7101	Mediterranean California naturalized annual and perennial grassland Group	1	19.1	47.3	0.0%	47.3
7500	Naturalized warm-temperate riparian and wetland Group	1	0.4	1.0	0.0%	1.0
9801	Perennial Stream Channel Mapping Unit	44	460.3	1,137.5	0.1%	25.9
2215	Pinus jeffreyi Alliance	59	1,926.9	4,761.6	0.3%	80.7
2310	Pinus monophylla - (Juniperus osteosperma) Alliance	490	7,806.0	19,289.2	1.1%	39.4
2212	Pinus ponderosa - Calocedrus decurrens - Pseudotsuga menziesii Alliance	43	170.9	422.4	0.0%	9.8
1210	Pinus sabiniana Alliance	494	1,578.4	3,900.2	0.2%	7.9
3310	Platanus racemosa - Quercus agrifolia Alliance	1735	5,716.7	14,126.4	0.8%	8.1
3110	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	313	539.2	1,332.3	0.1%	4.3
5415	Prunus fasciculata - Salazaria mexicana Alliance	1	0.3	0.8	0.0%	0.8
2216	Pseudotsuga macrocarpa Alliance	31	912.9	2,255.7	0.1%	72.8
4210	Quercus berberidifolia Alliance	54	261.1	645.2	0.0%	11.9
1410	Quercus chrysolepis Alliance	2430	17,468.5	43,165.6	2.4%	17.8
1311	Quercus douglasii Alliance	26201	240,931.8	595,355.5	32.6%	22.7
6111	Quercus garryana (shrub) Alliance	363	1,388.1	3,430.1	0.2%	9.4
6510	Quercus john-tuckeri Alliance	568	5,562.2	13,744.4	0.8%	24.2
1312	Quercus kelloggii Alliance	885	6,843.3	16,910.2	0.9%	19.1

Table C-2: Map Unit Acreage, Listed Alphabetically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
3314	Quercus lobata Riparian Alliance	1252	4,495.0	11,107.4	0.6%	8.9
1313	Quercus lobata Alliance	65	524.5	1,296.2	0.1%	19.9
1111	Quercus wislizeni - Quercus parvula (tree) Alliance	19831	163,641.4	404,366.8	22.2%	20.4
4410	Quercus wislizeni (Short Stature) Mapping Unit	662	5,689.6	14,059.3	0.8%	21.2
9802	Reservoirs Mapping Unit	9	8,616.6	21,292.2	1.2%	2,365.8
6231	Rhus trilobata Association	3	2.7	6.6	0.0%	2.2
6218	Rhus trilobata Sierran Association	9	9.4	23.2	0.0%	2.6
6420	Ribes quercetorum Association	120	136.3	336.7	0.0%	2.8
9402	River and Lacustrine Flats & Streambeds Mapping Unit	97	98.2	242.8	0.0%	2.5
6401	Rosa californica Alliance	8	11.0	27.3	0.0%	3.4
6213	Rubus armeniacus - Sesbania punicea - Ficus carica Semi-Natural Alliance	4	3.2	7.9	0.0%	2.0
6211	Salix exigua Alliance	62	65.2	161.0	0.0%	2.6
3114	Salix gooddingii - Salix laevigata Alliance	641	1,291.9	3,192.3	0.2%	5.0
6217	Salix lasiolepis Alliance	29	24.4	60.4	0.0%	2.1
6219	Sambucus nigra Association	7	13.6	33.6	0.0%	4.8
7320	Schoenoplectus (acutus, californicus) Alliance	4	2.3	5.6	0.0%	1.4
8212	Schoenoplectus americanus Alliance	1	2.4	5.9	0.0%	5.9
9803	Small Earthen Dam Ponds & Natural Lakes Mapping Unit	772	769.2	1,900.8	0.1%	2.5
8200	Southwestern North American alkali marsh/seep vegetation Group	1	3.1	7.7	0.0%	7.7
3100	Southwestern North American riparian evergreen and deciduous woodland Group	1	0.8	2.1	0.0%	2.1
9404	Sparsely Vegetated Recently Burned Areas Mapping Unit	57	785.2	1,940.2	0.1%	34.0
9600	Standing Dead Trees High Cover Mapping Unit	26	64.3	158.8	0.0%	6.1
6212	Tamarix spp. Semi-Natural Alliance	2	1.8	4.5	0.0%	2.3
6301	Toxicodendron diversilobum Alliance	235	415.9	1,027.8	0.1%	4.4
7310	Typha (angustifolia, domingensis, latifolia) Alliance	17	13.3	32.9	0.0%	1.9
1110	Umbellularia californica Alliance	625	2,401.3	5,933.7	0.3%	9.5

Table C-2: Map Unit Acreage, Listed Alphabetically

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
9403	Undefined Areas with Little or No Vegetation Mapping Unit	38	104.3	257.7	0.0%	6.8
7102	Vancouverian and Rocky Mountain naturalized perennial grassland Group (irrigated pasture)	48	291.6	720.5	0.0%	15.0
7800	Vancouverian coastal/tidal marsh and meadow Group	1	1.7	4.3	0.0%	4.3
7400	Vernal Pool & Californian Annual and Perennial Grassland Matrix Mapping Unit	62	5,424.4	13,404.0	0.7%	216.2
6220	Vitis arizonica - Vitis girdiana Alliance	3	2.2	5.4	0.0%	1.8
7115	Vulpia microstachys - Selaginella hansenii Association	261	262.5	648.7	0.0%	2.5
9800	Water Mapping Unit	15	17.6	43.6	0.0%	2.9
5423	Yucca brevifolia Alliance	1	0.7	1.8	0.0%	1.8
	Totals	93,194	738,526.5	1,824,938.8	100.0%	19.6

Table C-3: Map Units By Total Area

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
1311	Quercus douglasii Alliance	26201	240,931.8	595,355.5	32.6%	22.7
7100	California Annual and Perennial Grassland Macrogroup	13802	182,589.4	451,188.3	24.7%	32.7
1111	Quercus wislizeni - Quercus parvula (tree) Alliance	19831	163,641.4	404,366.8	22.2%	20.4
9300	Built-Up & Urban Disturbance Mapping Unit	8679	17,848.1	44,103.7	2.4%	5.1
1410	Quercus chrysolepis Alliance	2430	17,468.5	43,165.6	2.4%	17.8
4211	Cercocarpus montanus Alliance	1996	11,244.4	27,785.5	1.5%	13.9
4810	Eriogonum fasciculatum Alliance	1800	8,862.7	21,900.1	1.2%	12.2
9802	Reservoirs Mapping Unit	9	8,616.6	21,292.2	1.2%	2,365.8
2310	Pinus monophylla - (Juniperus osteosperma) Alliance	490	7,806.0	19,289.2	1.1%	39.4
1312	Quercus kelloggii Alliance	885	6,843.3	16,910.2	0.9%	19.1
3310	Platanus racemosa - Quercus agrifolia Alliance	1735	5,716.7	14,126.4	0.8%	8.1
4410	Quercus wislizeni (Short Stature) Mapping Unit	662	5,689.6	14,059.3	0.8%	21.2
6510	Quercus john-tuckeri Alliance	568	5,562.2	13,744.4	0.8%	24.2
7400	Vernal Pool & Californian Annual and Perennial Grassland Matrix Mapping Unit	62	5,424.4	13,404.0	0.7%	216.2
4113	Ceanothus cuneatus Alliance	1772	5,253.8	12,982.5	0.7%	7.3
3314	Quercus lobata Riparian Alliance	1252	4,495.0	11,107.4	0.6%	8.9
4720	Lotus scoparius - Lupinus albifrons - Eriodictyon spp. Alliance	912	3,349.0	8,275.7	0.5%	9.1
1212	Juniperus californica Alliance	590	2,950.9	7,291.9	0.4%	12.4
9200	Agriculture Mapping Unit	215	2,889.4	7,140.0	0.4%	33.2
4111	Adenostoma fasciculatum Alliance	516	2,499.9	6,177.4	0.3%	12.0
1310	Aesculus californica Alliance	959	2,446.3	6,045.0	0.3%	6.3
1110	Umbellularia californica Alliance	625	2,401.3	5,933.7	0.3%	9.5
2215	Pinus jeffreyi Alliance	59	1,926.9	4,761.6	0.3%	80.7
1210	Pinus sabiniana Alliance	494	1,578.4	3,900.2	0.2%	7.9
6111	Quercus garryana (shrub) Alliance	363	1,388.1	3,430.1	0.2%	9.4
5311	Artemisia tridentata Alliance	433	1,327.4	3,280.1	0.2%	7.6

Table C-3: Map Units By Total Area

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
3114	Salix gooddingii - Salix laevigata Alliance	641	1,291.9	3,192.3	0.2%	5.0
4112	Arctostaphylos viscida Alliance	484	1,241.8	3,068.7	0.2%	6.3
7110	California annual herb/grass Group	19	1,175.3	2,904.3	0.2%	152.9
4710	Ericameria linearifolia - Cleome isomeris Alliance	179	1,153.4	2,850.2	0.2%	15.9
2216	Pseudotsuga macrocarpa Alliance	31	912.9	2,255.7	0.1%	72.8
3211	Fraxinus latifolia Alliance	349	800.8	1,978.9	0.1%	5.7
5212	Ericameria nauseosa Alliance	190	787.4	1,945.8	0.1%	10.2
9404	Sparsely Vegetated Recently Burned Areas Mapping Unit	57	785.2	1,940.2	0.1%	34.0
9803	Small Earthen Dam Ponds & Natural Lakes Mapping Unit	772	769.2	1,900.8	0.1%	2.5
6520	Ceanothus greggii - Fremontodendron californicum Alliance	99	705.0	1,742.2	0.1%	17.6
3110	Populus fremontii - Fraxinus velutina - Salix gooddingii Alliance	313	539.2	1,332.3	0.1%	4.3
1313	Quercus lobata Alliance	65	524.5	1,296.2	0.1%	19.9
4820	Eriogonum wrightii - Eriogonum heermannii - Buddleja utahensis Alliance	123	476.6	1,177.8	0.1%	9.6
5417	Ephedra viridis Alliance	122	468.9	1,158.8	0.1%	9.5
9801	Perennial Stream Channel Mapping Unit	44	460.3	1,137.5	0.1%	25.9
4412	Arctostaphylos pungens - Arctostaphylos pringlei Alliance	142	432.3	1,068.2	0.1%	7.5
6301	Toxicodendron diversilobum Alliance	235	415.9	1,027.8	0.1%	4.4
5211	Encelia (actonii, virginensis) - Viguiera reticulata Alliance	71	396.1	978.7	0.1%	13.8
9401	Cliffs/Rock Outcrop Mapping Unit	214	353.6	873.8	0.0%	4.1
5428	Eriogonum fasciculatum - Viguiera parishii Alliance	51	349.1	862.7	0.0%	16.9
4118	Arctostaphylos glauca Alliance	76	337.6	834.1	0.0%	11.0
7102	Vancouverian and Rocky Mountain naturalized perennial grassland Group (irrigated pasture)	48	291.6	720.5	0.0%	15.0
4501	Frangula californica ssp. tomentella Association	123	276.3	682.7	0.0%	5.6
7115	Vulpia microstachys - Selaginella hansenii Association	261	262.5	648.7	0.0%	2.5
4210	Quercus berberidifolia Alliance	54	261.1	645.2	0.0%	11.9
5710	Atriplex polycarpa Alliance	43	222.5	549.9	0.0%	12.8

Table C-3: Map Units By Total Area

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
2212	Pinus ponderosa - Calocedrus decurrens - Pseudotsuga menziesii Alliance	43	170.9	422.4	0.0%	9.8
5610	Lepidospartum squamatum Alliance	43	147.8	365.3	0.0%	8.5
6420	Ribes quercetorum Association	120	136.3	336.7	0.0%	2.8
1214	Hesperocyparis forbesii - Hesperocyparis nevadensis Alliance	20	128.4	317.3	0.0%	15.9
7200	Californian warm temperate marsh/seep Group	34	111.5	275.5	0.0%	8.1
4413	Ceanothus leucodermis Alliance	57	106.8	264.0	0.0%	4.6
9403	Undefined Areas with Little or No Vegetation Mapping Unit	38	104.3	257.7	0.0%	6.8
7114	Holocarpha (heermannii, virgata) Alliance	10	98.4	243.3	0.0%	24.3
9402	River and Lacustrine Flats & Streambeds Mapping Unit	97	98.2	242.8	0.0%	2.5
7216	Juncus arcticus (var. balticus, mexicanus) Alliance	61	94.1	232.4	0.0%	3.8
9804	Major Canals & Aqueducts Mapping Unit	10	90.2	222.9	0.0%	22.3
3210	Alnus rhombifolia Alliance	53	71.2	175.8	0.0%	3.3
6211	Salix exigua Alliance	62	65.2	161.0	0.0%	2.6
6210	Baccharis salicifolia Alliance	67	64.6	159.7	0.0%	2.4
9600	Standing Dead Trees High Cover Mapping Unit	26	64.3	158.8	0.0%	6.1
7600	Californian mixed annual/perennial freshwater vernal pool/swale bottomland Group	39	60.3	149.0	0.0%	3.8
2200	Californian montane conifer forest Group (includes managed conifer stands)	3	57.2	141.3	0.0%	47.1
6214	Cephalanthus occidentalis Association	43	51.9	128.3	0.0%	3.0
9500	Exotic Trees and Planted Trees Mapping Unit	18	51.6	127.5	0.0%	7.1
5620	Ephedra californica - Ephedra trifurca Alliance	16	51.1	126.3	0.0%	7.9
9501	Eucalyptus spp. - Ailanthus altissima - Robinia pseudoacacia Semi-Natural Alliance	24	30.8	76.0	0.0%	3.2
6217	Salix lasiolepis Alliance	29	24.4	60.4	0.0%	2.1
7101	Mediterranean California naturalized annual and perennial grassland Group	1	19.1	47.3	0.0%	47.3

Table C-3: Map Units By Total Area

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
9800	Water Mapping Unit	15	17.6	43.6	0.0%	2.9
5111	Atriplex canescens Alliance	5	14.8	36.6	0.0%	7.3
6219	Sambucus nigra Association	7	13.6	33.6	0.0%	4.8
7310	Typha (angustifolia, domingensis, latifolia) Alliance	17	13.3	32.9	0.0%	1.9
5431	Achnatherum speciosum Alliance	4	12.6	31.2	0.0%	7.8
7191	Avena spp. - Bromus spp. Semi-Natural Alliance	6	11.7	28.8	0.0%	4.8
6401	Rosa californica Alliance	8	11.0	27.3	0.0%	3.4
6218	Rhus trilobata Sierran Association	9	9.4	23.2	0.0%	2.6
7122	Leymus condensatus Alliance	13	8.6	21.2	0.0%	1.6
7121	Corethrogyne filaginifolia - Eriogonum (elongatum, nudum) Alliance	3	8.5	21.0	0.0%	7.0
9400	Areas of Little or No Vegetation Mapping Unit	3	7.9	19.6	0.0%	6.5
8110	Distichlis spicata Alliance	3	7.3	18.0	0.0%	6.0
7181	Bromus tectorum - Taeniatherum caput-medusae Semi-Natural Alliance	1	5.7	14.1	0.0%	14.1
8211	Leymus cinereus - Leymus triticoides Alliance	2	5.0	12.4	0.0%	6.2
7112	Artemisia dracunculus Alliance	3	4.5	11.1	0.0%	3.7
2214	Abies concolor Alliance	2	3.5	8.8	0.0%	4.4
6110	Ceanothus integerrimus Alliance	1	3.3	8.3	0.0%	8.3
6213	Rubus armeniacus - Sesbania punicea - Ficus carica Semi-Natural Alliance	4	3.2	7.9	0.0%	2.0
8200	Southwestern North American alkali marsh/seep vegetation Group	1	3.1	7.7	0.0%	7.7
6231	Rhus trilobata Association	3	2.7	6.6	0.0%	2.2
8212	Schoenoplectus americanus Alliance	1	2.4	5.9	0.0%	5.9
7320	Schoenoplectus (acutus, californicus) Alliance	4	2.3	5.6	0.0%	1.4
6220	Vitis arizonica - Vitis girdiana Alliance	3	2.2	5.4	0.0%	1.8
6212	Tamarix spp. Semi-Natural Alliance	2	1.8	4.5	0.0%	2.3
7800	Vancouverian coastal/tidal marsh and meadow Group	1	1.7	4.3	0.0%	4.3
7820	Juncus effusus Association	2	1.5	3.8	0.0%	1.9

Table C-3: Map Units By Total Area

Veg Code	Map Unit Description	# of Polygons	Total Area (hectares)	Total Area (acres)	% of Total Area	Average Polygon Size (ac.)
3100	Southwestern North American riparian evergreen and deciduous woodland Group	1	0.8	2.1	0.0%	2.1
6216	Calycanthus occidentalis Provisional Association	1	0.8	2.0	0.0%	2.0
6221	Heterotheca (oregona, sessiliflora) Alliance	1	0.7	1.8	0.0%	1.8
5423	Yucca brevifolia Alliance	1	0.7	1.8	0.0%	1.8
3113	Juglans hindsii and Hybrids Semi-Natural Alliance	2	0.6	1.5	0.0%	0.8
7116	Lotus unifoliolatus Alliance	1	0.5	1.3	0.0%	1.3
7500	Naturalized warm-temperate riparian and wetland Group	1	0.4	1.0	0.0%	1.0
5415	Prunus fasciculata - Salazaria mexicana Alliance	1	0.3	0.8	0.0%	0.8
7300	Arid West freshwater emergent marsh Group	1	0.2	0.6	0.0%	0.6
8210	Anemopsis californica - Helianthus nuttallii - Solidago spectabilis Alliance	1	0.1	0.3	0.0%	0.3
	Totals	93,194	738,526.5	1,824,938.8	100.0%	19.6

APPENDIX D - Field Forms for Vegetation Sampling and Accuracy Assessment

RECON FIELD FORM (February 20, 2015)

Recorder: Melinda Estes Other Surveyors: Joslyn Curtis Date: 6/12/15 Return? ☐

Waypoint ID: F 15 06 12 1034

Location Name: HWY 180 corridor

UID:

GPS Name FRAX Projected? Yes / (No) / Base / Digitized

If Yes, enter: Bearing (°): _____ Distance (m): _____ Inclination (°): _____

If Yes or Digitized, enter: Base Waypoint ID: _____

Base UTMs / Projected UTMs (circle one)

UTME 36.757321 UTMN -119.147208 PDOP: +/- 5 m

Stand Size: <1 (1–5) >5

View Radius _____

Camera: FRAX Photos: 721-724 725 → NW

Field Alliance name: Platanus racemosa

Comments: Small Platanus racemosa stand north of HWY 180 in ravine w/ Quercus wislizeni, Cercis and Aesculus are in understory so difficult to see total covers. Sycamores mature, QUWI trees.

% Cover: Conifer — Hardwood 20 Total Tree 25 Regen Tree ____ Shrub 3 Herb 2 Total Veg 25 Exotics 3

Strata	Species	% cover	Strata	Species	% cover	Strata	Species	% cover
T	Plantanus r	10	T	Aesculus ca	1	S	Sambucus nigra	+
T	Quercus wis	12	H	Bromus mad diandrus	3	T	Fraxinus dipetala	+
S	Cercis occidentalis	1	S	Toxicodendron div	1			

Recorder: MLE Other Surveyors: JTC Date: 6/12/15 Return? ☐

Waypoint ID: F 15 06 12 1127

Location Name: HWY 180 Corridor

UID:

GPS Name FRAX Projected? Yes / (No) / Base / Digitized

If Yes, enter: Bearing (°): _____ Distance (m): _____ Inclination (°): _____

If Yes or Digitized, enter: Base Waypoint ID: _____

Base UTMs / Projected UTMs (circle one)

UTME 36.754382 UTMN -119.213187 PDOP: +/- 5 m

Stand Size: (<1) 1–5 >5

View Radius 10 m

Camera: FRAX Photos: (N) 726-729

Field Alliance name: Mixed riparian

Comments: Small riparian stand crossing bridge on Hwy 180 stand continues east, south of road for several miles with Platanus abundant in dry creek bed. Quercus also strong component.

% Cover: Conifer — Hardwood 14 Total Tree 14 Regen Tree — Shrub 4 Herb 10 Total Veg 24 Exotics 4

Strata	Species	% cover	Strata	Species	% cover	Strata	Species	% cover
T	Populus fremontii	4	T	Quercus lobata	2	T	Platanus racemosa	6
T	Salix laevigata	5	S	Salix exigua	2	H	Bromus diandrus	4
T	Quercus wislizeni	2	S	Baccharis salicifolia	1	T	Fraxinus dipetala	+

Accuracy Assessment – SSNF 2020

(6/11/2020)

Surveyor:	**Other Surveyors:**	**Date:**
Location Name:		
Waypoint ID:	**GPS Name** _____ **Projected? Yes / No / Base** If Yes, enter: **Bearing (°):** _____ **Distance (m):** _____ **Inclination (°):** _____ If Yes, enter: **Base Waypoint ID**: _____	
Polygon UID:	Record either UTMs or Decimal Degrees **Base** UTMs / **Projected** UTMs (circle one) GPS error: **ft / m / PDOP** _____ **UTME** ___ ___ ___ ___ ___ ___ **UTMN** ___ ___ ___ ___ ___ ___ ___ Decimal degrees: **LAT** __ __ . __ __ __ __ __ __ **LONG** __ __ __ . __ __ __ __ __ __	
Camera name:	**Photo #s:**	

Strata	Species	% cover	C	Strata	Species	% cover	C

Notes:

Map Unit Name:	Secondary:

Confidence in map unit ID: L M H Explain:

Describe above:	Linework problems: NO / YES	More than 1 vegetation type in this polygon: NO / YES	Vegetation change since imagery taken: NO / YES

Conifer Cover: _____ Hardwood Cover: _____ Total Tree Cover: _____ Shrub Cover: _____

Herb Cover Class 0–<2% 2–<10% 10–40% >40%

Tree Height <0.5m 0.5-1m 1-2m 2-5m 5-10m 10-15m 15-20m 20-35m 35-50m >50 m NA

Tree DBH <1" 1-6" >6-11" >11-24" >24" Multilayered, high density

Exotics (relative cover) Little to none visible (<5%) <33% 33-66% >66%

Conifer Dieback (not fire-related) No dead wood Dead wood present

Rough % of polygon viewed from point _____

Is this a "multiple" point assessment? NO YES if yes: _____ of ____ points for this polygon

Accuracy Assessment – SSNF 2020

(4/7/2020)

Surveyor: ALJ **Other Surveyors:** —	**Date:** 10/28/2021
Location Name: Mod 3- Avenue 404 & Millwood Dr	
Waypoint ID: SNF3412665	**GPS Name** Stipa **Projected? Yes / (No) Base**
	If Yes, enter: **Bearing (°):** _____ **Distance (m):** _____ **Inclination (°):** _____
	If Yes, enter: **Base Waypoint ID:** _____
Polygon UID: SNF3412665	Record either UTMs or Decimal Degrees
	Base UTMs / **Projected** UTMs (circle one) GPS error: (ft) / m / **PDOP** 16.4
	UTME _____ **UTMN** _____
	Decimal degrees: **LAT** 36.521718 **LONG** 119.131538
Camera name: Stipa **Photo #s:** 153, 155, 156, 157 (N)	

Strata	Species	% cover	C	Strata	Species	% cover	C
T	Platanus racemosa	8					
T/A/E	Salix laevigata	7/t/t					
T	Quercus wizlizeni	t					
S	Baccharis salicifolia	1					
T/A	Populus fremontii	4/t					

Notes: Large PLRA and Salix laevigata near northern end of polygon, consistent until very SE portion of polygon that transitions into more upland QUWI. All trees spread sporadically across, not in large clusters. BASA in the wash bottom.

Map Unit Name: Platanus racemosa-Quercus agrifolia Riparian	Secondary:
Confidence in map unit ID: L M (H) Explain:	

Describe above:	Linework problems ☐	More than 1 vegetation type in this polygon ☐	Vegetation change since imagery taken ☐

Conifer Cover: 0 Hardwood Cover: 18 Total Tree Cover: 18 Shrub Cover: 1

Herb Cover Class: 0–<2% (2–<10%) 10–40% >40%

Tree Height: <0.5m 0.5-1m 1-2m 2-5m 5-10m 10-15m (15-20m) 20-35m 35-50m >50 m NA

Tree DBH: <1" 1-6" >6-11" (>11-24") >24" Multilayered, high density

Exotics (relative cover): Little to none visible (<5%) <33% 33-66% >66%

Conifer Dieback (not fire-related): (No dead wood) Dead wood present

Rough % of polygon viewed from point 40

APPENDIX E: KEY TO THE VEGETATION OF SIERRA NEVADA FOOTHILLS

This is the vegetation key for Sierra Nevada Foothills Ecoregion (USDA). It is based on 3,661 vegetation samples; 1,847 surveys collected between 2003 and 2006 in the northern Sierra Nevada Foothills and 1,703 surveys collected between 2008 and 2016 in the southern Sierra Nevada Foothills. Data from other projects that intersected with the Sierra Nevada Foothills (the Foothills) were included adding 117 surveys.

This key follows the hierarchy from the *Manual of California Vegetation* (MCV) at the time of classification. This key is not dichotomous but instead may present more than two options for each key break. Users should read all options in each key break carefully and sequentially to arrive at the correct vegetation type. This vegetation key includes all expected vegetation types including those that are not accurately detectable in remotely sensed imagery.

Alliance and association names are frequently followed by a number, e.g. (n=5). An asterisk (*) following an alliance name indicates there were no samples classified to that type, but it is expected to occur in the region based on remotely sensed imagery, species distributions and/or personal communications. In some cases, the number of samples recorded for an alliance will equal the sum of the samples recorded for the associations below it. If this is not the case, then some samples could not be classified below the alliance level.

TERMS AND CONCEPTS USED THROUGHOUT THE KEY

Terms regarding vegetation types

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.

Hierarchical Units: The United States National Vegetation Classification (USNVC) is 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 USNVC is to produce uniform statistics about vegetation resources across the nation, based on vegetation data gathered at local, regional, or national levels. The *Manual of California Vegetation* hierarchy follows the USNVC hierarchy.
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 Modoc-Lassen Vegetation Map, map classes for trees and shrubs are typically at the alliance level of the USNVC hierarchy. Herbaceous stands are mapped at a higher level of the hierarchy.

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.

Plant community nomenclature: Species separated by "–" are within the same stratum; species separated by "/" are in different strata.

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.

Terms regarding species abundance/cover/constancy

Cover: The primary metric used to quantify the importance/abundance of a particular species or a particular vegetation layer within a stand. It 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 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., *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 of the survey that is 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 within a survey area that is covered either by one species relative to other species within the same physiognomic stratum (tree, shrub, herbaceous) or one stratum relative to the total vegetation cover in a 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 all the species within a stratum or each stratum within a stand of vegetation.

Dense/Continuous cover:– Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is greater than 66% absolute cover.

Intermittent cover: Used to describe individual layers of vegetation (tree,shrub, herb, or subdivisions of them) where there is 33-66% 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% 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 has low cover and rises above a layer that has more cover in the stand. For example, individual *Pseudotsuga menziesii* trees may comprise an emergent tree layer of 2% cover over dense *Gaultheria shallon* and *Rubus parviflorus* in the shrub understory; the stand would be considered within the *Gaultheria shallon – Rubus (ursinus)* 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.

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. See "dominance by layer," below, for further explanation.

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.

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

Sole dominant: No other species is co-dominant.

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 coastal scrub stand with 5% *Baccharis pilularis*, 4% *Frangula californica*, and 3% *Rubus ursinus* (total 13% shrub cover), technically only the *Baccharis* (5/13 = 39% relative cover) and the *Frangula* (4/13 = 31% relative cover) would be co-dominant because *Rubus* would only have 23% relative cover (3/13 = 23%).

Sub-dominant: Significant cover in a stratum that is typically greater than 10% but less than 30% relative cover.

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.

Terms regarding floristics

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 2015) to do this.

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 montanus*, *Fremontodendron californicum*, *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 subshrubs of various species are often difficult to categorize into a consistent life-form (e.g., *Eriogonum latifolium*, *Lupinus chamissonis*); in such instances, we refer to the PLANTS Database or “pick a lane” based on best available definitions.

Subshrub: 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.

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

KEY FOR DISTINGUISHING VEGETATION TYPES IN THE SIERRA NEVADA FOOTHILLS

Class A. Vegetation with an overstory of mesomorphic or xeromorphic trees. Tree canopy is generally greater than 10%, but occasionally may be less than 10% when overall vegetation cover is low (<20% total cover) and the trees are evenly distributed in the stand. = **Forest & Woodland Vegetation**

Class B. Vegetation characterized by woody mesomorphic and xeromorphic shrubs in the canopy. Tree species, if present, generally total less than 10% absolute cover. Occasionally tree cover may be >10% but shrub cover is >3 times the tree cover. Herbaceous species may total higher cover than shrubs. Shrubs are usually at least 10% cover = **Shrubland Vegetation**

Class C. Vegetation characterized by non-woody, herbaceous species in the canopy including grass, graminoid, and broad-leaved herbaceous species. Shrubs, if present, usually comprise <10% of the vegetation. Trees, if present, generally compose <5% cover: **= Herbaceous Vegetation**

Class A. Forest & Woodland Vegetation

Group I: Woodlands and forests characterized by needle or scale-leaved conifer trees, including the following genera: *Pinus*, *Abies*, *Calocedrus, Pseudotsuga, Juniperus,* and *Hesperocyparis*. Conifers generally are co-dominant to dominant in the overstory and may be associated with tree oaks or shrubs.

I.A The overstory is dominated by pine (*Pinus*) trees alone or co-dominant with broadleaf evergreen trees…

IA.1 *Pinus sabiniana* is the sole dominant tree in the overstory, mature trees of *P. sabiniana* generally >10% absolute cover. Shrub cover can range from sparse to intermittent, but shrub cover is not significantly higher (>3 times greater) than tree cover. If sparse foothill pine is over a denser shrub layer, key stand to the appropriate shrubland alliance…

***Pinus sabiniana* Alliance (n=46)**

IA1.a *Pinus sabiniana* occurs over a primarily herbaceous understory with a variety of non-native and native herbs. *Toxicodendron diversilobum* may be present in an open shrub layer…

Pinus sabiniana / herbaceous Association (n=12)

IA1.b *Pinus sabiniana* occurs over *Arctostaphylos viscida*. Other shrubs may also occur in the understory at lower cover than the manzanita. Found mostly on gabbro and other ultramafic substrates such as serpentinite…

Pinus sabiniana / *Arctostaphylos viscida* Association (n=6)

IA1.c *Pinus sabiniana* occurs over a diverse, open to intermittent shrub layer characterized by *Ceanothus cuneatus. A* variety of other shrubs including *Fremontodendron californica,*

Quercus wislizeni, Heteromeles arbutifolia, Eriodictyon californica, and *Toxicodendron diversilobum* are present and may be co-dominant. The herbaceous layer may be sparse to intermittent including native and non-native species. Stands are often post-fire on granitic soils…

Pinus sabiniana / *Ceanothus cuneatus* – *(Rhamnus ilicifolia)* Association (n=17)

IA1.d *Pinus sabiniana* occurs over an open shrub understory dominated by *Adenostoma fasciculatum*; found on a variety of substrates including metamorphic and ultramafic. Stands occur in the northern Sierra Nevada Foothills…

Pinus sabiniana / *Adenostoma fasciculatum* Association (n=7)

IA1.e *Pinus sabiniana* occurs scattered over an open shrub understory of *Ceanothus cuneatus* and other shrubs. The herbaceous understory has a high diversity and cover of native species, including *Plantago erecta* and *Vulpia microstachys*. Restricted to serpentine or other poor nutrient soils…

Pinus sabiniana / *Ceanothus cuneatus* / *Plantago erecta* Association (n=2)

IA.2 *Pinus ponderosa* is dominant in the tree canopy with >50% relative cover, while *Quercus* spp. are low in cover if present. *Calocedrus decurrens* and/or *Pseudotsuga menziesii* are absent…

***Pinus ponderosa* Alliance (n=3)**

IA2.a *Arctostaphylos viscida* is dominant in the understory. Stands are typical on convex middle slopes to ridgetops…

Pinus ponderosa / *Arctostaphylos viscida* Association (n=2)

IA.3 *Pinus ponderosa*, *Calocedrus decurrens* and/or *Pseudotsuga menziesii* is dominant or are co-dominant and together comprise >60% relative cover. These are mixed conifer stands with more than one conifer present. Oaks are characteristically present, but sub-dominant. Stands of this alliance are more typical of elevations greater than the foothill belt. Stands in the foothills are often on sheltered north-facing slopes or lower slopes and terraces near bottoms of canyons…

***Pinus ponderosa – Calocedrus decurrens – Pseudotsuga menziesii* Alliance (n=21)**

IA3.a *Pinus* ponderosa is dominant or co-dominant in the tree canopy with *Calocedrus decurrens*, which sometimes may have higher cover than *P. ponderosa. Quercus kelloggii* and/or *Q. chrysolepis* is present to sub-dominant. Stands usually form a multi-layered canopy with *Q. kelloggii* and *C. decurrens* underneath a canopy of *P. ponderosa*. Stands typically occur in mesic settings on northerly slopes or on terraces near streams…

Pinus ponderosa – Calocedrus decurrens – Quercus kelloggii Association (n=11)

IA3.b *Pinus ponderosa* is strongly dominant in the tree canopy. If *Calocedrus decurrens* is present, it has low cover. Shrub cover is typically sparse. Stands are found on terraces adjacent to streams or rivers…

Pinus ponderosa – (*Calocedrus decurrens*) stream terrace Association (n=5)

IA3.c *Pseudotsuga menziesii* occurs as the dominant tree in the overstory. *Pinus ponderosa* is present as a sub-dominant. A sub-canopy of hardwoods such as *Quercus chrysolepis* and *Q. kelloggii)* may be present…

Pinus ponderosa – Pseudotsuga menziesii – Quercus chrysolepis / Galium bolanderi Association (n=5)

IA.4 *Pinus jeffreyi* is dominant to co-dominant in the tree layer with any of the following species: *Quercus chrysolepis*, *Abies concolor* and/or *P. monophylla*. *A. concolor* may be dominant in the tree canopy but *P. jeffreyi* is at least 1% in cover. Found in the San Emigdio Mountains of the southern Sierra Nevada Foothills. The shrub layer is sparse to open with *Artemisia tridentata, Symphoricarpos molis,* and *Eriogonum wrightii*…

Pinus jeffreyi – Pinus monophylla Association (n=14)
of the ***Pinus jeffreyi*** **Alliance (n=14)**

IA.5 *Pinus ponderosa* and/or *P. sabiniana* are emergent and/or co-dominant in the tree layer with *Quercus kelloggii*…

Quercus kelloggii **Alliance (n=137)**

IA5.a *Quercus kelloggii* and *Pinus ponderosa* are co-dominant in the tree canopy. *Calocedrus decurrens* is absent or very low in cover. The shrub understory is sparse to open with *Toxicodendron diversilobum* often present…

Quercus kelloggii – Pinus ponderosa Association (n=6)

IA5.b The tree canopy is characterized by *Quercus kelloggii* and *Pinus ponderosa* with the two often co-dominant. The shrub understory is open to dense dominated by *Arctostaphylos viscida* with *Heteromeles arbutifolia* characteristically present to co-dominant…

Quercus kelloggii – Pinus ponderosa / Arctostaphylos viscida Association (n=35)

IA5.c The tree canopy is dominanted by *Quercus kelloggii* with *Pinus ponderosa* typically present to co-dominant. The shrub understory is open to intermittent with *Ceanothus integerrimus* present to dominant with other shrubs such as *Toxicodendron diversilobum* and *Heteromeles arbutifolia*…

Quercus kelloggii / Ceanothus integerrimus Association (n=14)

IA.6 *Pinus ponderosa* and/or *P. sabiniana* are co-dominant in the tree layer with *Quercus wislizeni*…

Quercus wislizeni – Quercus parvula **(tree) Alliance (n=478)**

IA6.a *Pinus ponderosa* is dominant to co-dominant with *Quercus wislizeni* in the tree canopy. The shrub layer is variable and ranges from sparse to open…

Quercus wislizeni – Pinus ponderosa Association (n=6)

IA6.b *Pinus sabiniana* is dominant to co-dominant with *Quercus wislizeni* in the tree canopy. *Quercus douglasii* cover is < 5% and the shrub layer is sparse to open…

Quercus wislizeni – Pinus sabiniana / annual grass – herb Association (n=28)

IA.7 *Quercus chrysolepis* is dominant to co-dominant in the tree canopy with emergent to co-dominant pines or other conifers. If co-dominant with *Pinus monophylla,* key to *P. monophylla. Q. kelloggii* may be present as a sub-dominant in the understory…

***Quercus chrysolepis* Alliance (n=147)**

IA7.a *Pinus ponderosa* is emergent in the tree layer with *Quercus chrysolepis*. Other conifers such as *Calocedrus decurrens* and *Pseudotsuga menzesii* may be present at higher cover than *P. ponderosa*…

Quercus chrysolepis – Pinus ponderosa Association (n=3)

IA7.b *Pinus jeffreyi* is emergent in the tree layer with *Quercus chrysolepis*. Other conifers such as *Abies concolor* and *Pinus lambertiana* may be present to co-dominant and have higher cover than *P. jeffreyi*…

Quercus chrysolepis – Pinus jeffreyi Association (n=2)

IA7.c *Pinus sabiniana* is co-dominant in the tree layer with *Quercus chrysolepis*. The sparse to intermittent shrub layer is variable with *Toxicodendron diversilobum, Ceanothus* spp., and *Cercocarpus montanus* often characteristic…

Quercus chrysolepis – Pinus sabiniana Association (n=1)

IA.8 *Pinus monophylla* is the dominant tree or is co-dominant (sometimes having as low as 5% absolute cover) with *Juniperus californica* or *Quercus* spp. in open woodlands. If larger confers, such as pines, firs, etc., are present they do not reach co-dominance. Understory shrubs may include *Q. john-tuckeri, Artemisia tridentata*, *Eriogonum fasciculatum*, and *Ephedra* spp. Found in southern Sierra Nevada Foothills…

***Pinus monophylla – (Juniperus osteosperma)* Alliance (n=17)**

IA8.a *Pinus monophylla* is dominant in the open to intermittent tree layer. *Quercus john-tuckeri* is dominant in the shrub layer. *Juniperus californica* and *Q. chrysolepis* are often present as trees or tall shrubs. Stands are typically found on steep slopes in the San Emigdio Mountains…

Pinus monophylla / *Quercus john-tuckeri* Provisional Association (n=9)

IA8.b *Pinus monophylla* is the dominant tree in the open tree canopy. *Eriogonum fasciculatum* is present in the sparse to open shrub layer…

Pinus monophylla / Eriogonum fasciculatum Association (n=1)

IA8.c *Cercocarpus ledifolius* is dominant or co-dominant in the shrub layer with *Hesperoyucca whipplei, Arctostaphylos parryana, Artemisia tridentata*, and *Purshia tridentata*…

Pinus monophylla – (Juniperus osteosperma) / Cercocarpus ledifolius Association (n=1)

IA8.d *Pinus monophylla* is dominant in the open to intermittent tree layer. The shrub layer is sparse. The herbaceous layer is typically sparse with *Poa secunda* and/or *Bromus tectorum* present…

Pinus monophylla – (Juniperus osteosperma) / Sparse Understory Association (n=4)

IA.9 *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

I.B The overstory is dominated by one or more non-pine conifers such as *Abies concolor, Calocedrus decurrens*, *Pseudotsuga menzesii*,or *Hesperocyparis* spp., or these conifers may share dominance with broadleaf evergreen trees or shrubs…

IB.1 *Abies concolor* is dominant with >60% relative cover in the tree canopy. If *Pinus jeffreyi* is present at 30% relative cover or greater, key to *Pinus jeffreyi* Alliance. *Quercus kelloggii* is sub-dominant in the tree layer under *Abies concolor*. *Calocedrus decurrens* may be present to co-dominant…

Abies concolor – Calocedrus decurrens – Quercus kelloggii Association (n=1)
of the ***Abies concolor* Alliance (n=1)**

IB.2 *Calocedrus decurrens* is strongly dominant in the tree canopy and *Quercus kelloggii* is present. *Pinus ponderosa* or *Pseudotsuga menziesii* are absent. These are small azonal stands limited by fire protection and moisture avilability along rivers or near seeps. Stands are likely be below the minimum mapping unit…

Calocedrus decurrens – Quercus chrysolepis – Quercus kelloggii Association (n=2)
of the ***Calocedrus decurrens* Allliance (n=2)**

IB.3 *Calocedrus decurrens* is co-dominant in the tree canopy with *Alnus rhombifolia.* Other riparian trees are often present at low cover. The open shrub layer is characterized by riparian species**.** Stands found along creeks…

Calocedrus decurrens – Alnus rhombifolia Association (n=3)
of the ***Alnus rhombifolia* Alliance (n=93)**

IB.4 *Pseudotsuga menziesii* is co-dominant with *Quercus kelloggii* and *Umbellularia californica. Quercus chrysolepis* is present at low cover. Shrub layer is intermittent with *Toxicodendron diversilobum* and occassionally *Heteromeles arbutifolia* …

Quercus kelloggii – Pseudotsuga menziesii – Umbellularia californica Association (n=5)
of the ***Quercus kelloggii* Alliance (n=137)**

IB.5 *Pseudotsuga menziesii* is co-dominant with *Acer macrophyllum* in the tree overstory or midstory. This hardwood-conifer mix has an understory of upland and riparian herbs, including *Dryopteris arguta* and *Adiantum jordanii*. Found in the Lassen volcanic foothills …

Acer macrophyllum – Pseudotsuga menziesii / Dryopteris arguta Association (n=1)
of the ***Acer macrophyllum – Alnus rubra*** **Alliance (n=3)**

IB.6 *Pseudotsuga macrocarpa* occurs as a dominant or co-dominant conifer in the overstory as a canopy tree, usually with at least 20% relative cover, and there may be an abundant (co-dominant or dominant) sub-canopy of oaks. Stands were not surveyed in the project area but have been observed…

Pseudotsuga macrocarpa **Alliance***

IB.7 *Hesperocyparis macnabiana* is the dominant tree in the overstory with *Arctostaphylos viscida* in the understory. Found in northern Sierra Nevada Foothills on volcanic or serpentine substrates…

Hesperocyparis macnabiana / *Arctostaphylos viscida* Woodland Provisional Association (n=2)
of the ***Hesperocyparis (sargentii, macnabiana)*** **Alliance (n=2)**

IB.8 *Hesperocyparis nevadensis* is the dominant to co-dominant tree in the overstory with at least 30% relative cover. In post-fire settings, *Hesperocyparis nevadensis* may be as seedlings or saplings. *Pinus monophylla* may be present to co-dominant. Found in the southern Sierra Nevada Foothills on granitic substrate …

Hesperocyparis nevadensis Association (n=2)
of the ***Hesperocyparis forbesii – Hesperocyparis nevadensis*** **Alliance (n=2)**

IB.9 *Juniperus californica* is evenly distributed and characterizes the tree or shrub canopy with >4% absolute cover. Oaks are typically absent or much lower in cover than *J. californica* in the overstory. Sites tend to be rocky and/or sandy…

Juniperus californica **Alliance (n=17)**

IB9.a *Juniperus californica* is dominant in the overstory as a short tree or tall shrub. *Cercocarpus montanus* and/or *Hesperoyucca whipplei* are characteristically present and may be co-dominant. Other chaparral shrub species are typically present...

Juniperus californica – (Cercocarpus montanus – Fraxinus dipetala) Association (n=5)

IB9.b *Juniperus californica* forms an open to intermittent canopy over grasses and forbs…

Juniperus californica / herbaceous Association (n=12)

Group II. Woodlands and forests characterized mainly by broad-leaved evergreen and deciduous tree species such as *Quercus* spp., *Salix* spp., etc. Conifers may be taller, and in some cases co-dominant with the broad-leafed trees.

II.A One or more oak (*Quercus* spp.) species are the primary overstory canopy tree, or oaks share dominance with conifers…

IIA.1 *Quercus douglasii (*or occasionally *Quercus ×alvordiana,* which is defined operationally by tree size and morphology, but with some leaf characteristics of *Q. john-tuckeri)* is the dominant oak species in the overstory. Other trees, such as *Pinus sabiniana* and *Aesculus californica*, or other oaks, may be present and co-dominant. If *Quercus wislizeni* or *Q. chrysolepis* are co-dominant, *Q. douglasii* must have at least twice as much cover as those oaks…

***Quercus douglasii* Alliance (n=347)**

IIA1.a *Aesculus californica* is present and conspicuous in the overstory at >2% cover with *Quercus douglasii*. Other tree species may be present, but at relatively lower cover. The understory is usually well-developed with herbs, and the shrub layer is often sparse but occasionally has higher cover of mesic shrubs such as *Toxicodendron diversilobum* and *Rhamnus ilicifolia*…

Quercus douglasii – Aesculus californicus / grass Association (n=17)

IIA1.b *Juniperus californica* is present and typically co-dominant with *Quercus douglasii. Ceanothus cuneatus* is characteristically present in the shrub layer. Other characteristic shrubs include *Rhamnus ilicifolia, Toxicodendron diversilobum,* and *Arctostaphylos manzanita.* If *Cercocarpus montanus* is present, it occurs at low cover…

Quercus douglasii – Juniperus californica / Ceanothus cuneatus – Cercocarpus montanus Association (n=5)

IIA1.c The understory has a defined shrub layer that is co-dominated by *Juniperus californica* and *Ericameria linearifolia,* though sometimes one of the two species may be dominant. Other shrubs may be present in lower cover…

Quercus douglasii – Juniperus californica / Ericameria linearifolia Association (n=1)

IIA1.d *Arctostaphylos viscida* is characteristically present in the understory at >2% cover. Other shrub species typically present include *Heteromeles arbutifolia and Rhamnus ilicifolia. Pinus sabiniana* may be emergent to co-dominant in the tree layer…

Quercus douglasii – Pinus sabiniana / Arctostaphylos viscida Association (n=11)

IIA1.e *Arctostaphylos manzanita* is the dominant shrub in the understory, typically with >10% cover, and the herb layer is usually intermittent to dense. This association occurs in the northern Sierra Nevada Foothills…

Quercus douglasii / *Arctostaphylos manzanita* / herbaceous Association (n=7)

IIA1.f *Pinus sabiniana* is co-dominant in the tree canopy with *Quercus douglasii.* The shrub layer is diverse and characterized by co-dominant *Ceanothus cuneatus* and *Cercocarpus montanus…*

Quercus douglasii – Pinus sabiniana / Ceanothus cuneatus – Cercocarpus montanus Association (n=4)

IIA1.g *Ceanothus cuneatus* is dominant in the shrub layer at >5% cover. Total shrub cover is typically >10% and the herbaceous layer is open to dense and generally dominated by non-native annual grasses. *Pinus sabiniana,* if present is sub-dominant…

Quercus douglasii / *Ceanothus cuneatus* Association (n=24)

IIA1.h *Quercus douglasii* occurs in the overstory as the main tree species; however, the understory is shared in dominance by *Toxicodendron diversilobum* in the shrub layer and annual grasses and forbs in the herb layer, both exhibit similar cover...

Quercus douglasii / *Toxicodendron diversilobum* / *grass* Association (n=14)

IIA1.i Annual native forbs such as *Navarretia pubescens*, *Centaurium muehlenbergii*, *Clarkia purpurea*, and *Selaginella hansenii* occur with non-native annuals such as *Avena barbata*, *Bromus hordeaceus*, and *Trifolium hirtum* in the understory. Typically found on volcanic substrates…

Quercus douglasii / *Selaginella hansenii – Navarretia pubescens* Association (n=7)

IA1.j Perennial grasses are characteristic in the understory, and shrubs are low in cover. Non-native annuals such as *Cynosurus echinatus* may be dominant but native perennial grasses, including *Nassella pulchra*, *Achnatherum lemmonii*, *Melica californica*, *Elymus glaucus*, and *E. elymoides* are characteristic, typically with at least 2% absolute cover. Found on volcanic mud or granitic parent materials…

Quercus douglasii / (Achnatherum lemmonii – Nassella pulchra) Association (n=18)

IIA1.k Annual grasses, forbs, and bulbs dominate the understory, and shrubs are low in cover. The most common species include non-natives *Bromus hordeaceus, Bromus diandrus, Trifolium hirtum, Torilis arvensis,* and *Avena* spp. However, annual species vary significantly both seasonally and annually…

Quercus douglasii / Bromus spp. – *(Daucus pusillus)* Association (n=203)

IIA1.l *Pinus sabiniana* is co-dominant in the tree layer. The stands are characterized by a grassy herbacous understory. The shrub layer is usually <10% absolute cover but *Toxicodendron diversilobum* can be higher in cover…

Quercus douglasii – Pinus sabiniana / grass Association (n=14)

IIA1.m Shrubs are sparse in the understory and the herbaceous layer is characterized by native annual forbs including *Amsinckia* sp., *Plagiobothrys nothofulvus, Madia elegans* although non-native grasses may be dominant. Perennial native bunch grasses are typically absent…

Quercus douglasii / Amsinckia (intermedia, menziesii) – Plagiobothrys nothofulvus Association (n=14)

IIA.2 *Quercus wislizeni* is dominant or co-dominant at >30% relative cover, with other tree species in the overstory. *Pinus sabiniana* or *P. ponderosa*, if present, may be conspicuous and have equal or higher cover than *Q. wislizeni*. If *Q. wislizeni* is co-dominant with *Umbellularia californica* key to the *Umbellularia californica* Alliance…

***Quercus wislizeni – Quercus parvula* Alliance[1] (n=478)**
(Also see Class B, IIB2.b. for key to shrub Associations)

IIA2.a *Quercus wislizeni* occurs as a riparian (or semi-riparian) forest/tall shrubland with riparian indicators such as *Salix laevigata*, *Acer macrophyllum*, *Vitis californica, Frangula californica*, *Artemisia douglasiana*, *Rubus armeniacus*, and others…

Quercus wislizeni – Salix laevigata / *Frangula californica* Association (n=44)

IIA2.b *Aesculus californica* occurs as a conspicuous member of the canopy with *Quercus wislizeni* and *Q. douglasii* may also be co-dominant…

Quercus wislizeni – Aesculus californica Association (n=92)

IIA2.c *Quercus wislizeni* and *Q. douglasii* are co-dominant in the the oversotry. *Pinus sabiniana* may be present at low cover. Shrub cover is typically sparse to open and herbaceous cover is variable…

Quercus wislizeni – Quercus douglasii / herbaceous Association (n=70)

IIA2.d *Pinus sabiniana* is dominant to co-dominant with *Quercus wislizeni* in the tree canopy. *Quercus douglasii* cover is < 5% and the shrub layer is sparse to open…

Quercus wislizeni – Pinus sabiniana / annual grass – herb Association (n=28)

IIA2.e *Quercus wislizeni* occurs as a tree or tall shrub in the overstory. *Pinus sabiniana* is often present at low cover. *Heteromeles arbutifolia* is dominant to co-dominant in the shrub layer with *Toxicodendron diversilobum. Arctostaphylos viscida* is often present but at half the cover of *H. arbutifolia*. Stands are typically of mesic settings (concavities and northerly-facing slopes)…

Quercus wislizeni / *Heteromeles arbutifolia* Association (n=65)

IIA2.f *Quercus wislizeni* occurs as a tree or tall shrub in the overstory. *P. sabiniana* is often present and may be co-dominant. *Arctostaphylos viscida* characterizes the shrub layer with >30% relative cover. *Heteromeles arbutifolia* and *Toxicodendron diversilobum* are often present but together have less cover than *A. viscida*. Stands are less mesic than the associations characterized by *H. arbutifolia* and *T. diversilobum.* Typically, of upper slopes and exposed upland settings…

Quercus wislizeni – (Pinus sabiniana) / *Arctostaphylos viscida* Association (n=21)

IIA2.g *Quercus wislizeni* occurs as an intermittent to dense forest or tall shrubland in mesic settings. The shrub layer is absent to continuous with *Toxicodendron diversilobum* as the major understory shrub species. If *Heteromeles arbutifolia* or *Arctostaphylos viscida*, are

present, they each comprise no more than 5% cover and *T. diversilobum* has two times the cover of either species…

Quercus wislizeni / *Toxicodendron diversilobum* Association (n=110)

IIA2.h *Quercus wislizeni* occurs as a large shrub or tree in the overstory. *Pinus sabiniana* is always present and *Quercus douglasii* may be co-dominant. *Arctostaphylos manzanita* is co-dominant, with greater than 30% relative cover, in a diverse and dense shrub layer. *Toxicodendron diversilobum, Lonicera hispidula* and *Heteromeles arbutifolia* are usually present…

Quercus wislizeni – Pinus sabiniana / *Arctostaphylos manzanita* Association (n=10)

IIA2.i *Arbutus menziesii* is co-dominant in the tree canopy. *Heteromoles arbutifolia* and *Toxicodendron diversilobum* are co-dominant in the open to continuous shrub layer…

Quercus (wislizeni, parvula) – Arbutus menziesii / Toxicodendron diversilobum Association (n=5)

IIA2.j *Pinus ponderosa* is dominant to co-dominant with *Quercus wislizeni* in the tree canopy. The shrub layer is variable and ranges from sparse to open…

Quercus wislizeni – Pinus ponderosa Association (n=6)

IIA2.k *Quercus chrysolepis* and *Quercus wislizeni* are co-dominant in the tree canopy with *Q. wislizeni* having higher cover than *Q. chrysolepis*. *Umbellularia californica* is typically present. Stands often occur on steep, rocky slopes…

Quercus wislizeni – Quercus chrysolepis tree Association (n=7)

IIA2.l Disturbance species such as *Eriodictyon californicum, Ceanothus leucodermis, Diplacus aurantiacus, Lotus scoparius, and Lupinus albifrons* are characteristic in an open to intermittent shrub layer. Stands are often found on rocky and sometimes steep sites…

Quercus wislizeni – Eriodictyon californicum Association (n=9)

IIA.3 *Quercus kelloggii* is dominant in the tree canopy or co-dominant with *Q. wislizeni*. Stands may have conspicuous tall conifers such as *Pseudotsuga menziesii* or *Pinus ponderosa* with equal or higher cover than *Q. kelloggii*…

***Quercus kelloggii* Alliance (n=137)**

IIA3.a The tree canopy is dominated by *Quercus kelloggii* with *Pinus ponderosa* often present. The shrub understory is sparse to continuous with *Toxicodendron diversilobum* always present with no other shrubs of greater cover…

Quercus kelloggii / *Toxicodendron diversilobum* Association (n=27)

IIA3.b The tree canopy is dominated by *Quercus kelloggii,* and *Pinus ponderosa* may be present. The shrub understory is open with *Styrax officinalis* present with *Toxicodendron diversilobum*, *Heteromeles arbutifolia*, and a variety of herbs. Found on Gabbro soils…

Quercus kelloggii / *Toxicodendron diversilobum – Styrax redivivus* / *Triteleia laxa* Association (n=3)

IIA3.c The tree canopy is dominated by *Quercus kelloggii* with *Pinus ponderosa* often present to sub-dominant. *Ceanothus integerrimus* is always present in the open to intermittent shrub understory with other shrubs such as *Toxicodendron diversilobum* and *Heteromeles arbutifolia*…

Quercus kelloggii / *Ceanothus integerrimus* Association (n=14)

IIA3.d *Quercus chrysolepis* is co-dominant in the overstory with *Q. kelloggii*, and the understory has strong presence of *Toxicodendron diversilobum* with other shrubs and herbs…

Quercus kelloggii – Quercus chrysolepis / *Toxicodendron diversilobum* Association (n=9)

IIA3.e *Quercus kelloggii* is co-dominant with *Pseudotsuga menziesii* and/or *Umbellularia californica*. Other conifers such as *Pinus ponderosa* or *Calocedrus decurrens* may also be present…

Quercus kelloggii – Pseudotsuga menziesii – Umbellularia californica Association (n=5)

IIA3.f *Quercus kelloggii* and *Pinus ponderosa* are co-dominant in the tree layer. The shrub understory is sparse to open…

Quercus kelloggii – Pinus ponderosa Association (n=6)

IIA3.g *Q. kelloggii* and *Pinus ponderosa* are co-dominant in the tree layer. The shrub understory is open to dense with *Arctostaphylos viscida* and *Heteromoles arbutifolia* characteristically present…

Quercus kelloggii – Pinus ponderosa / *Arctostaphylos viscida* Association (n=35)

IIA3.h *Quercus kelloggii* is co-dominant with *Q. wislizeni* in the overstory with at least 5% cover. Other trees may include *Pinus sabiniana*. The understory can have significant shrub cover with *Heteromeles arbutifolia*, *Frangula californica* and, *Toxicodendron diversilobum*…

Quercus wislizeni – Quercus kelloggii / Heteromeles arbutifolia – Toxicodendron diversilobum Association (n=16)

IIA3.i *kelloggii* is dominant in the tree canopy. *Q. lobata* is often present at low cover. The intemittent to continuous shrub layer is characterized by *Ribes roezlii…*

Quercus kelloggii – Ribes roezlii Provisional Association (n=6)

IIA3.j *Quercus kelloggii* is the sole dominant in the overstory, while other oaks or conifers may be present at low cover. A variety of herbs are present usually at moderate to high cover in the understory, and shrubs such as *Toxicodendron diversilobum* may also occur in at low cover…

Quercus kelloggii / annual grass-herb Association (n=11)

IIA.4 *Quercus chrysolepis* is usually the dominant species in the overstory. Other broad-leaf trees such *Aesculus californica*, *Umbellularia californica*, and *Q. wislizeni* can be co-dominant and even higher covers than *Q. chrysolepis*. If *Q. kelloggii* is present, it is sub-dominant or found in the understory of *Q. chrysolepis.* Conifers may be emergent and occasionally co-dominant. If *Pinus monophyla* or *Pseudotsuga menziesii* are co-dominant key to those alliances, respectively…

***Quercus chrysolepis* Alliance (n=147)**

IIA4.a *Quercus chrysolepis* is dominant in the tree canopy or may be co-dominant with *Umbellularia californica.* Riparian species such as *Calycanthus occidentalis* or *Vitis californica* are always present…

Quercus chrysolepis / Calycanthus occidentalis – Vitis californica Association (n=35)

IIA4.b *Quercus chrysolepis* and *Q. wislizeni* are co-dominant in the canopy. *Q. chrysolepis* has greater cover in the overstory and *Q. wislizeni* is typically in the sub-canopy as a shrub or tall tree. If the two are co-dominant both as shrubs in the southern Sierra Nevada Foothills, key to the *Quercus wislizeni – Quercus chrysolepis* (shrub) Shrubland Alliance…

Quercus chrysolepis / Quercus (wislizeni, parvula) Association (n=15)

IIA4.c *Quercus chrysolepis* is dominant in the tree canopy and *Pinus ponderosa* may be emergent. The shrub layer is dominated by *Arctostaphylos viscida* and *Heteromoles arbutifolia* is usually present to co-dominant…

Quercus chrysolepis / *Arctostaphylos viscida* Association (n=21)

IIA4.d *Pinus ponderosa* is characteristically present and usually has low cover compared to *Quercus chrysolepis*; *Calocedrus decurrens* also may be present in the overstory. *Quercus kelloggii* is absent or has very low cover. Usually on lower to mid slopes…

Quercus chrysolepis – Pinus ponderosa Association (n=3)

IIA4.e *Pinus jeffreyi* is emergent in the tree layer with *Quercus chrysolepis*. Other conifers such as *Abies concolor* and *Pinus lambertiana* may be present to co-dominant and have higher cover than *P. jeffreyi*…

Quercus chrysolepis – Pinus jeffreyi Association (n=2)

IIA4.f *Pinus sabiniana* is co-dominant in the tree layer with *Quercus chrysolepis*. The sparse to intermittent shrub layer is variable with *Toxicodendron diversilobum, Ceanothus* spp., and *Cercocarpus montanus* is often characteristic…

Quercus chrysolepis – Pinus sabiniana Association (n=1)

IIA4.g *Quercus kelloggii* is sub-dominant in the overstory with *Q. chrysolepis.* If *Q. kelloggii* is in the understory, below *Q. chrysolepis*, it may have higher cover than *Q. chrysolepis*. *Pinus ponderosa* is also often present. Usually occurs on upland, northerly-facing slopes…

Quercus chrysolepis – Quercus kelloggii Association (n=10)

IIA4.h *Umbellularia californica* occurs as a sub-dominant to co-dominant with *Quercus chrysolepis. Toxicodendron diversilobum* and *Heteromeles arbutifolia* are typically present in the understory. Found in upland settings on steep slopes with rocky soils…

Quercus chrysolepis – Umbellularia californica Association (n=12)

IIA4.i *Quercus chrysolepis* is typically strongly dominant in the overstory (>60% relative cover), and sometimes conifers such as *Pinus sabiniana* are emergent at low cover. No significant indicator species are identified in the understory, though shrubs may be intermittent in cover. Usually on northerly slopes…

Quercus chrysolepis Association (n=47)

IIA.5 *Quercus chrysolepis* shares cover with *Pseudotsuga menziesii*, which is usually >30% cover in the overstory and higher in cover than canyon live oak…

Pinus ponderosa – Pseudotsuga menziesii – Quercus chrysolepis / Galium bolanderi Association (n=5)

of the ***Pinus ponderosa – Calocedrus decurrens – Pseudotsuga menziesii*** **Alliance (n=21)**

IIA.6 *Quercus lobata* is co-dominant to dominant tree in riparian settings. Riparian influences may be minor including draws, drainages, ditches, or areas where water may collect. Other riparian species are typically present however in areas that have been disturbed (i.e. grazing) other riparian species may be absent and the shrub layer is dominated by *Toxicodendron diversilobum, Rhus trilobata*, and/or *Rubus armeniacus*.…

Quercus lobata **Riparian Alliance (n=115)**

IIA6.a *Quercus lobata* is dominant or co-dominant with *Alnus rhombifolia*. *Rubus armeniacus* and *Vitis californica* are often present and variable in cover. Found in riparian settings…

Quercus lobata – Alnus rhombifolia Association (n=13)

IIA6.b *Quercus lobata* and *Fraxinus latifolia* generally co-dominate, although the latter may have low cover. *Vitis californica* is present and characterizes the shrub layer. Found strictly in riparian settings…

Quercus lobata – Fraxinus latifolia / Vitis californica Association (n=9)

IIA6.c *Quercus lobata* is usually dominant to co-dominant with *Q. wislizeni* in the overstory. *Toxicodendron diversilobum* is usually present and variable in cover, while *Rubus armeniacus* is sometimes present with low cover. Other trees may be present, including *Aesculus californica*, *Pinus sabiniana* and *Platanus racemosa*. Found in riparian settings…

Quercus lobata – Quercus wislizeni Association (n=29)

IIA6.d *Quercus lobata* is the sole dominant over a grassy or herbaceous understory (especially *Bromus diandrus*). Shrubs may sometimes be present with usually <10% cover. Usually associated with small creeks, stream terraces, bottomlands, and other low-lying features…

Quercus lobata / herbaceous semi-riparian Association (n=18)

IIA6.e *Quercus lobata* is dominant in the overstory. The open to continuous shrub layer has >10% cover and is usually characterized by *Rubus armeniacus* or *Rhus trilobata*. Found in riparian or semi-riparian settings…

Quercus lobata / Rubus armeniacus Association (n=23)

IIA6.f *Quercus lobata* is usually dominant in the overstory. *Salix lasiolepis* and/or *S. laevigata* or other willows are present and dominant to co-dominant in the understory. *Rubus armeniacus* may also be characteristic in the shrub layer…

Quercus lobata – Salix lasiolepis Association (n=6)

IIA6.g *Quercus lobata* and *Q. chrysolepis* are co-dominant in the tree canopy. Shrub layer is often characterized by *Vitis californica* or *Toxicodendron diversilobum…*

Quercus lobata – Quercus chrysolepis / Vitis californica Association (n=12)

IIA.7 *Quercus lobata* is the dominant large tree in upland (non-riparian) settings. *Quercus kelloggii* or *Quercus douglasii* may be co-dominant. Stands are found on slopes or in broad valleys with no riparian influence…

***Quercus lobata* Alliance (n=21)**

IIA7.a *Quercus lobata* is the dominant tree in upland settings. Shrubs are typically absent and herbaceous layer is often dense and dominated by non-native annual grasses…

Quercus lobata / grass Association (n=11)

IIA7.b *Quercus kelloggii* is co-dominant with *Q. lobata.* Other trees are often present at lower cover. Shrub cover is typically low and riparian species are not characteristic. If there is a riparian influence or riparian species are characteristic of the stand the stand should be keyed to *Quercus lobata* Riparian Alliance…

Quercus lobata – Quercus kelloggii Association (n=6)

IIA7.c *Quercus douglasii* is co-dominant with *Q. lobata.* Other trees may be present at lower cover. Shrub cover is sparse…

Quercus douglasii – Quercus lobata Association (n=3)

II.B Stands characterized or dominated by broad-leafed tree species other than oaks

IIB.1 *Umbellularia californica* is strongly dominant or co-dominant with *Quercus wislizeni* in the overstory as a tree or tall shrub; If *U. californica* is co-dominant with *Alnus rhombifolia*, *Arbutus menziesii*, or *Quercus chrysolepis,* key to those alliances…

***Umbellularia californica* Alliance (n=25)**

IIB1.a *Umbellularia californica* is strongly dominant in the overstory. *Quercus wislizeni* and *Aesculus californica* may be present at low cover. Shrub and herbaceous cover are typically sparse to open…

Umbellularia californica Association (n=12)

IIB1.b *Umbellularia californica* and *Quercus wislizeni* are co-dominant in the overstory as trees or tall shrubs. Stands are typically intermittent to continuous in cover and occur on northerly facing slopes post-disturbance…

Umbellularia californica – Quercus wislizeni Association (n=12)

IIB.2 *Arbutus menziesii* is dominant in the overstory, usually with *Umbellularia californica* and/ *Quercus kelloggii*. This is a localized uncommon type (appears to be below minimum mapping unit size) that may transition to the *Q. kelloggii* or *Quercus chrysolepis* Alliance without significant disturbance…

Arbutus menziesii – Umbellularia californica Association (n=1)
of the ***Arbutus menziesii*** **Alliance (n=1)**

IIB.3 *Aesculus californica* is strongly dominant (>60% relative cover) as a tree or tall shrub in the overstory. If it is co-dominant with an oak species, see the *Quercus douglasii* and *Quercus wislizeni* Alliances…

Aesculus californica **Alliance (n=72)**

IIB3.a *Aesculus californica* is the sole dominant tree in the overstory. The shrub layer is typically sparse and the understory is characterized by herbs such as *Bromus diandrus, B. hordeaceus, Avena* spp. and *Torilis arvensis…*

Aesculus californica Association (n=21)

IIB3.b *Aesculus californica* is dominant as a tree or shrub; oaks may be present but do not reach co-dominance. *Toxicodendron diversilobum* and other mesic shrubs such as *Cercis occidentalis,* and *Rhamnus ilicifolia* characterize the shrub layer. Sites are usually rocky with bedrock and large boulders covered with moss, lichen and/or *Selaginella* spp.…

Aesculus californica / *Toxicodendron diversilobum* / moss Association (n=44)

IIB3.c *Umbellularia californica* is present to co-dominant with *Aesculus californica…*

Aesculus californica – Umbellularia californica Association (n=4)

IIB.4 *Acer macrophyllum* is dominant or co-dominant with >30% relative cover in the canopy. *Quercus chrysolepis* is typically present and stands may include equal or higher cover of *Pseudotsuga menziesii*. Found in the Lassen volcanic foothills or occasionally southward, usually on lower slopes of rocky, shady canyons …

Acer macrophyllum – Alnus rubra **Alliance (n=3)**

IIB4.a *Pseudotsuga menziesii* is co-dominant with *Acer macrophyllum* in the tree overstory or midstory. This hardwood-conifer mix has an understory of upland and riparian herbs, including *Dryopteris arguta* and *Adiantum jordanii*. Found in the Lassen volcanic foothills…

Acer macrophyllum – Pseudotsuga menziesii / Dryopteris arguta Association (n=1)

IIB4.b *Acer macrophyllum* is dominant (with >60% relative cover) in the tree or shrub layer; other trees may include *Quercus* spp. as sub-dominants. The understory is variable with shrubs and herbs, including *Frangula californica*, *Toxicodendron diversilobum, Elymus glaucus*, and *Cynosurus echinatus*…

Acer macrophyllum / (Rubus ursinus) Association (n=2)

IIB.5 *Juglans hindsii* is strongly dominant in the overstory. If it is co-dominant with other riparian trees, key to the appropriate riparian alliance. All stands in the Foothills are planted or of hybrid origin…

Juglans hindsii Association (n=3)

of the ***Juglans hindsii* and Hybrids Special Stands and Semi-Natural Alliance (n=3)**

IIB.6 Non-native tree species such as *Ailanthus altissima, Eucalyptus* spp. or *Prunus* spp. dominates in planted or naturalized stands. Often found in groves, windbreaks, uplands, and along stream courses. Stands were observed and mapped but not sampled in the region…

Eucalyptus* spp. – *Ailanthus altissima* – *Robinia pseudoacacia* Semi-Natural Alliance

IIB.7 Stands dominated or characterized by other typical riparian winter deciduous trees or tall shrubs in the following genera: *Populus*, *Salix*, *Fraxinus*, *Platanus*, or *Alnus*…

IIB7.a *Populus fremontii* has equal or greater than 5% absolute cover in overstory, usually as a dominant or co-dominant in the overstory with willows or other riparian tree species. If *Salix gooddingii* is >50% relative cover in the tree canopy key to the *Salix gooddingii – Salix laevigata* Forest & Woodland Alliance. If *P. fremontii* is co-dominant with *Platanus racemosa* key to the *Platanus racemosa – Quercus agrifolia* Riparian Woodland Alliance…

***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance (n=51)**

IIB7a.1 *Populus fremontii* occurs in association with *Salix laevigata*, where *S. laevigata* usually has ≥5% absolute cover but can be absent. Other riparian trees may be present and sometimes co-dominant, including *Quercus lobata*, *Alnus rhombifolia*, and/or *Fraxinus latifolia*…

Populus fremontii – Salix laevigata Association (n=37)

IIB7a.2 *Salix lasiolepis* is characteristic in the shrub/ low tree layer and has ≥5% absolute cover. Other riparian trees may be present at low cover, including *Quercus lobata* and/or *Fraxinus latifolia. Salix laevigata* is absent or low in cover…

Populus fremontii – Salix lasiolepis Association (n=2)

IIB7a.3 *Salix gooddingii* is present in the tree canopy and is typically co-dominant. Other riparian trees may be present including *Quercus lobata.* The shrub layer is variable, and the herbaceous layer is characterized by annual grasses including *Bromus diandrus* and *Cynodon dactylon…*

Populus fremontii – Salix gooddingii Association (n=4)

IIB7a.4 *Populus fremontii* occurs in an association with *Salix exigua*, where *Salix exigua* has ≥5% absolute cover. Other riparian trees may be present including *Alnus rhombifolia*…

Populus fremontii / Salix exigua Association (n=4)

IIB7a.5 *Populus fremontii* is the sole dominant tree. *Vitis californica* is conspicuous and usually has >10% cover…

Populus fremontii / Vitis californica Association (n=1)

IIB7.b *Platanus racemosa* has >5% absolute cover in the overstory. Other species may intermix in the overstory, including *Quercus wislizeni*, *Aesculus californica*, *Umbellularia californica*, and/or *Fraxinus latifolia*. If *Alnus rhombifolia* is present, *P. racemosa* is dominant or co-dominant and *A. rhombifolia* has < 3 times the cover of *P. racemosa*…

***Platanus racemosa – Quercus agrifolia* Alliance (n=60)**

IIB7b.1 *Platanus racemosa* is the sole dominant tree. Other trees may be present but are sub-dominant. Occasionally non-native trees such as *Ailanthus altissima* may reach co-dominance. Annual grasses and forbs are present, including *Amsinckia menziesii* and *Bromus diandrus,* and are variable in cover. Shrub cover is typically <10% and include *Cephalanthus occidentalis* and *Vitis californica*…

Platanus racemosa / annual grass Association (n=12)

IIB7b.2 *Platanus racemosa* occurs in association with *Quercus lobata*. *Rubus armeniacus* and *Vitis californica* are usually present (at >5% absolute cover). Found strictly in riparian settings…

Platanus racemosa – Quercus lobata Association (n=16)

IIB7b.3 *Salix* spp. may share dominance with *Platanus racemosa* in the overstory and shrubby *Salix* spp. characterize the understory with other riparian shrubs including *Rubus* spp. and *Baccharis salicifolia*. *Populus fremontii* is absent or very low in cover…

Platanus racemosa – Salix laevigata / Salix lasiolepis – Baccharis salicifolia Association (n=10)

IIB7b.4 *Populus fremontii* has at least 5% absolute cover in the tree canopy and may reach co-dominance with *Platanus racemosa. Salix gooddingii* is often present…

Platanus racemosa – Populus fremontii / Salix lasiolepis Association (n=4)

IIB7b.5 *Platanus racemosa* is dominant or co-dominant in the tree canopy. *Populus fremontii* and *Salix* spp. are absent. The shrub layer is characterized by *Baccharis salicifolia* which is usually dominant or co-dominant…

Platanus racemosa / *Baccharis salicifolia* Association (n=1)

IIB7b.6 *Aesculus californica* as a tree or sapling is co-dominant with *Platanus racemosa. Quercus wislizeni* is typically present and is often co-dominant and may have higher cover than *P. racemosa* or *A. californica*…

Platanus racemosa – Aesculus californica Association (n=15)

IIB7b.7 *Umbellularia californica* occurs along streams or in ravines with co-dominance to a low cover presence of *Platanus racemosa*…

Umbellularia californica – Platanus racemosa Association (n=1)

IIB7.c *Alnus rhombifolia* is typically dominant or co-dominant with other riparian species in the tree overstory. If co-dominant with *Fraxinus latifolia* or *Platanus racemosa*, key to those alliances…

***Alnus rhombifolia* Alliance (n=93)**

IIB7c.1 *Alnus rhombifolia* is co-dominant in the canopy with *Umbellularia californica* and/or *Quercus chrysolepis*. *Toxicodendron diversilobum* in present in the shrub layer with riparian species including *Vitis californica* and *Calycanthus occidentalis*…

Alnus rhombifolia – Umbellularia californica – (Quercus chrysolepis) Association (n=14)

IIB7c.2 *Alnus rhombifolia* is usually the dominant tree with *Salix exigua* >5% cover in the shrub layer. Other riparian shrubs such as *Salix* spp. and *Rubus armeniacus* are usually also present…

Alnus rhombifolia / *Salix exigua – (Rosa californica)* Association (n=9)

IIB7c.3 *Carex nudata* and/or other *Carex* or *Juncus* spp. are present at >5% cover and *Alnus rhombifolia* is the sole dominant tree. Shrubby *Salix lasiolepis* may be present, and *A. rhombifolia* may be low and shrubby or young. Usually in active, rocky stream channels…

Alnus rhombifolia / *Carex (nudata)* Association (n=13)

IIB7c.4 *Salix laevigata* is >5% cover in the tree and/or shrub layer, and it may be higher in cover than *Alnus rhombifolia.* There is not significant cover of *Platanus racemosa, Populus fremontii,* or *Fraxinus latifolia* in the overstory…

Alnus rhombifolia – Salix laevigata Association (n=10)

IIB7c.5 *Alnus rhombifolia* is the dominant tree in the overstory. Other riparian trees may be present but are sub-dominant. A variety of riparian shrubs or herbs may be present in the understory and variable in cover…

Alnus rhombifolia Association (n=37)

IIB7c.6 *Darmera peltata* is characteristically present with >2% cover as an understory herb. *Alnus rhombifolia* is the sole dominant tree in the canopy…

Alnus rhombifolia / *Darmera peltata* Association (n=1)

IIB7c.7 *Calocedrus decurrens* is co-dominant in the tree canopy with *Alnus rhombifolia.* Other riparian trees are often present at low cover. The open shrub layer characterized by riparian species**.** Stands found along creeks…

Calocedrus decurrens – Alnus rhombifolia Association (n=3)

IIB7c.8 *Platanus racemosa* is present but not co-dominant in the canopy with *Alnus rhombifolia…*

Alnus rhombifolia – Platanus racemosa Association (n=3)

IB7.d *Fraxinus latifolia* makes up at least 5% absolute cover in the overstory canopy. This species is a strong indicator as a dominant or co-dominant tree…

***Fraxinus latifolia* Alliance (n=33)**

IIB7d.1 *Fraxinus latifolia* mixes with *Alnus rhombifolia* and the two species often co-dominate…

Fraxinus latifolia – Alnus rhombifolia Association (n=14)

IIB7d.2 *Fraxinus latifolia* is dominant in the tree canopy, and other trees may be present at low cover including *Quercus lobata* and *Populus fremontii*. Riparian shrubs are present including *Cephalanthus occidentalis* and *Rubus armeniacus*. *Salix laevigata* is absent…

Fraxinus latifolia Association (n=8)

IIB7d.3 *Salix laevigata* is dominant in the shrub layer under *Fraxinus latifolia…*

Fraxinus latifolia – Salix laevigata Association (n=9)

IIB7.e *Salix gooddingii* or *S. laevigata* are typically dominant in the canopy with at least 10% absolute cover. *S. laevigata* often occurs as a shrub and other willows may be co-dominant. *Quercus wislizeni* may be present at low cover, <5% absolute cover. If *Populus fremontii* is co-dominant with *S. gooddingii,* key to the *Populus fremontii – Fraxinus velutina – Salix gooddingii* Forest & Woodland Alliance…

***Salix gooddingii – Salix laevigata* Alliance (n=64)**

IIB7e.1 *Salix gooddingii* is the sole dominant in the tree canopy. Shrubby willow species, *Cephalanthus occidentalis*, or other shrubs and/or herbs may have high cover in the understory…

Salix gooddingii Association (n=17)

IIB7e.2 *Salix laevigata* is dominant in the overstory with at least 10% cover and *S. lasiolepis* is absent or has very low cover. Other riparian shrubs are often present typically at low cover…

Salix laevigata Association (n=40)

IIB7e.3 *Salix laevigata* and *Salix lasiolepis* are co-dominant in the shrub layer, while *Rubus armeniacus* is usually present in the understory with a variety of other herbs and shrubs, including *Typha* spp.…

Salix laevigata – Salix lasiolepis Association (n=6)

IIB7.f *Salix exigua* is characteristically present as a dominant or co-dominant shrub. It forms an open to continuous canopy along riparian corridors. Other willows or riparian tree species may be present as sub-dominants with low cover…

***Salix exigua* Alliance (n=31)**

IIB7f.1 *Salix exigua* is dominant or co-dominant with *Salix lasiolepis* and *Rubus armeniacus,* and *R. armeniacus* is typically greater than 5% cover. Other shrubs and herbs may also be present to co-dominant, such as *Vitis californica*, *Cephalanthus occidentalis*, and *Brickellia californica*…

Salix exigua – (Salix lasiolepis) – Rubus armeniacus Association (n=10)

IIB7f.2 *Salix melanopsis* is dominant or co-dominant with *S. exigua* forming an open to intermittent shrub canopy along exposed, sandy, or cobbled river terraces…

Salix exigua – Salix melanopsis Shrubland Association*

IIB7f.3 *Salix exigua* is the sole dominant and forms an intermittent to continuous shrub canopy over a variety of wetland herbs including *Artemisia douglasiana*. Other riparian shrubs may be present at low cover…

Salix exigua Association (n=20)

IIB7.g *Salix lasiolepis* is dominant as a shrub or low tree, with at least 10% absolute cover (and at least 50% relative cover)…

***Salix lasiolepis* Alliance (n=8)**

IIB7g.1 *Rubus armeniacus*, is characteristic in the understory with a variety of wetland shrubs and herbs. *Rosa californica* and other willow species may be present at low cover…

Salix lasiolepis / *Rubus* spp. Association (n=6)

IIB7g.2 Other riparian shrubs are present at low cover. *Artemisia douglasiana* often characterizes the herbaceous layer with other wetland species including *Mimulus guttatus* and *Stachys albens…*

Salix lasiolepis – Artemisia douglasiana Association (n=1)

Group III. *Yucca brevifolia* evenly distributed at ≥ 1% cover, *Juniperus californicus* and/or *Pinus monophylla* < 1% absolute cover in the tree canopy. This type is rare in the Foothills but may be found at the edge of the ecoregion in the Tehachapi Mountains and in the upper Kern River Watershed near Kelso Valley…

***Yucca brevifolia* Alliance (n=1)**

No Associations defined

Class B. Shrubland Vegetation

Group I. Shrub-dominated vegetation typical of temperate riparian or bottomland settings. Except for the introduced *Tamarix*, most characteristic species in the foothills are broad-leafed winter deciduous, and include the following genera: *Salix, Cephalanthus, Rubus, Baccharis, Ribes, Sambucus* and *Toxicodendron*.

I.A Stands dominated by non-native riparian shrubs…

IA.1. *Tamarix* spp. dominates in the shrub canopy. Other trees or shrubs may be present at low cover, including *Quercus* spp., *Salix* spp., and *Rubus* spp.…

***Tamarix* spp. Semi-Natural Alliance (n=1)**
No Associations defined

IA.2 Stands in riparian settings dominated by non-native *Rubus armeniacus* or *Ficus carica…*

***Rubus armeniacus – Sesbania punicea – Ficus carica* Semi-Natural Alliance (n=10)**

IA2.a *Rubus armeniacus* forms dense briar patches in openings between trees and shrubs in riparian settings. This species may also form dense understories in adjacent riparian woodlands and forests, where it is considered part of the treed stands…

Rubus armeniacus Association (n=9)

IA2.b Stand dominated by naturalized *Ficus carica*…

Ficus carica Ruderal Association (n=0)

I.B Stands in riparian or wetland settings dominated by one or more of the following species: *Cephalanthus occidentalis*, *Calycanthus occidentalis, Baccharis salicifolia*, *Rosa* spp*., Rhus trilobata, Frangula californica*, *Cornus sericea, Vitis* spp., or *Salix* spp. If any of these species are dominant in a mesic upland setting, see **II.A** below. For desert wash settings see **III.B**…

IB.1 *Baccharis salicifolia* is dominant in the shrub layer. Riparian trees may be emergent at low cover. Other shrubs if present are low cover, and annual herbs, including *Bromus diandrus*, *B. hordeaceus,* and *B. madritensis,* are usually present and may be abundant in the understory. Found in gravelly, sandy washes periodically disturbed by flooding…

Baccharis salicifolia Association (n=9)
of the ***Baccharis salicifolia* Alliance (n=9)**

IB.2 *Cephalanthus occidentalis, Calycanthus occidentalis,* or *Rosa californica* are the dominant shrub forming an open to intermittent shrub canopy along rocky riparian settings. Riparian trees may be emergent or intermix in the canopy…

***Cephalanthus occidentalis – Rosa californica* Alliance (n=21)**

IB2.a *Cephalanthus occidentalis* is the dominant shrub forming an open to intermittent shrub canopy along exposed sandy/cobbly streambeds. Occasionally *Baccharis salicifolia* may be present and co-dominant…

Cephalanthus occidentalis Association (n=13)

IB2.b *Rosa californica* is dominant in the shrub canopy. *Salix* spp. is typically present at low cover. Stands are small and found typically in rocky riparian settings…

Rosa californica Association (n=4)

IB2.c *Calycanthus occidentalis* is dominant in the shrub overstory. *Quercus wislizeni* is often emergent in the overstory. Other riparian shrubs are present including *Salix* spp., *Sambucus nigra,* and *Vitis californica…*

Calycanthus occidentalis Provisional Association (n=4)

IB.3 *Cornus sericea* dominates the shrub overstory. Other shrubs such as *Cercis occidentalis* and *Toxicodendron diversilobum* may be sub-dominant in the understory. Stands are small patches found in riparian settings…

Cornus sericea Association (n=1)
of the ***Cornus sericea – Rosa woodsii – Ribes*** **spp. Alliance (n=1)**

IB.4 *Frangula californica* is the dominant shrub in a riparian setting. *Hoita macrostachya* and/or other riparian shrubs are also present. *F. californica* dominated stands not in riparian settings are being treated under the *Ribes quercetorum – Rhus trilobata – Frangula californica* Alliance (see **II.A** below)…

Frangula californica ssp. *tomentella – Hoita macrostachya* Association (n=1)
of the ***Frangula californica – Rhododendron occidentale – Salix breweri*** **Alliance (n=1)**

IB.5 *Rhus trilobata* or *Forestiera pubescens* is dominant in an open to continuous shrub canopy with a sparse to open herbaceous layer. Stands are typically small and can be found on stream banks or other riparian settings…

Rhus trilobata – Crataegus rivularis – Forestiera pubescens **Alliance (n=3)**

IB5.a1 *Forestiera pubescens* is dominant in the shrub overstory, and associates with *Sambucus nigra*, *Ribes quercetorum,* and other shrubs in riparian settings…

Forestiera pubescens – Sambucus nigra Association (n=2)

IB5.b *Rhus trilobata* is dominant in the shrub overstory. Other riparian indicators are also present including *Vitis californica…*

Rhus trilobata Association (n=1)

IB.6 Stands composed of dense liana thickets of *Vitis californica*, spreading across gravel and sand on river or creek terraces, or in some rocky, lower slope concavities. Most stands are < 0.5 ha, but have a distinctive signature…

Vitis californica provisional Association (n=6)
of the ***Vitis arizonica – Vitis girdiana*** **Alliance (n=6)**

IB.7 One or more willow species (*Salix spp*.) dominate the shrub layer, generally considered to be 5 m or less in height. (Note: some shrub willows may be tall enough to be identified as trees in the Foothills and thus, are also included in the tree-overstory section of this key)…

IB7.a *Salix lasiolepis* is dominant as a shrub or low tree, with at least 10% absolute cover (and at least 50% relative cover)…

Salix lasiolepis **Alliance (n=8)**

IB7a.1 *Rubus armeniacus* is characteristic to co-dominant in the shrub layer with *Salix lasiolepis. Rosa californica* and other willow species may be present at low cover…

Salix lasiolepis – Rubus spp. Association (n=6)

IB7a.2 *Salix lasiolepis* is dominant in the overstory. *Artemisia douglasiana* is characteristic to dominant in the understory. Riparian trees may be emergent in the overstory…

Salix lasiolepis – Artemisia douglasiana Association (n=1)

IB7.b *Salix exigua* is characteristically present as a dominant or co-dominant shrub. It forms an open to continuous canopy along riparian corridors. Other willow species may be present as sub-dominants with low cover…

Salix exigua **Alliance (n=31)**

IB7b.1 *Salix exigua* is dominant or co-dominant with *Salix lasiolepis* and *Rubus armeniacus,* and *R. armeniacus* is typically greater than 5% cover. Other shrubs and herbs may also be present, such as *Vitis californica*, *Cephalanthus occidentalis*, and *Brickellia californica*…

Salix exigua – (Salix lasiolepis) –Rubus armeniacus Association (n=10)

IB7b.2 *Salix exigua* is the sole dominant and forms an intermittent to continuous shrub canopy over a variety of wetland herbs including *Artemisia douglasiana*. Other riparian shrubs may be present at low cover…

Salix exigua Association (n=20)

IB7.c *Salix laevigata* is dominant or co-dominant in the overstory layer as a tall shrub or short tree with at least 10% cover. *Salix lasiolepis* may occur as a sub- or co-dominant…

Salix gooddingii – Salix laevigata **Alliance (n=64)**

IB7c.1 *Salix lasiolepis* has at least 10% cover in the shrub layer, while *Rubus armeniacus* and *Artemisia douglasiana* are usually present in the understory with a variety of other herbs and shrubs including cattail *Typha* spp.…

Salix laevigata **–** *Salix lasiolepis* Association (n=6)

IB7b.2 *Salix laevigata* is dominant in the overstory with at least 10% cover and *S. lasiolepis* is absent or has very low cover. *Rubus armeniacus* is often present with variable cover in the understory…

Salix laevigata Association (n=40)

Group II. **Shrub dominated stands in upland, non-riparian settings. Sites may be mesic to xeric, but vegetation is temperate and not common of desert settings...**

II.A Mesic shrublands often found at higher and cooler elevations of the foothills or moist, cool settings. Except for *Frangula californica,* dominant shrubs are non-sclerophyll species that are strongly drought-deciduous including *Quercus garryana* var. *breweri, Ceanothus integerrimus*, *Prunus* spp., *Ribes quercetorum, Rhus trilobata, Sambucus nigra, Cercis occidentalis, Baccharis pilularis,* and *Toxicodendron diversilobum.* If these species are dominant in a riparian setting, see **I.B**...

IIA.1 Stands of low shrubs to short clonal trees of *Quercus garryana* var. *breweri* dominate or co-dominate the shrub canopy with other shrubs including *Cercocarpus montanus* and *Toxicodendron diversilobum*. Emergent trees are often present and may reach > 10% absolute cover but shrub cover is at least 3 times greater than tree cover…

***Quercus garryana* (shrub) Alliance (n=21)**

IIA1.a *Quercus garryana* is strongly dominant in the shrub layer. Other shrubs are frequently present but do not reach co-dominance…

Quercus garryana (shrub) Association (n=14)

IIA1.b *Quercus garryana* is dominant to co-dominant with other shrubs in the canopy. *Cercocarpus montanus* is characteristic and often co-dominant…

Quercus garryana – Cercocarpus montanus Association (n=6)

IIA.2 *Ceanothus integerrimus* is dominant or co-dominant in the shrub canopy. Found in the northern Sierra Nevada Foothills…

***Ceanothus integerrimus* Alliance[2] (n=11)**

IIA2.a *Ceanothus integerrimus* dominates or co-dominates with *Heteromeles arbutifolia* and *Arctostaphylos* spp.…

Ceanothus integerrimus Association (n=2)

IIA2.b *Quercus garryana* var. *fruticosa* is typically present as a sub-dominant shrub to *Ceanothus integerrimus*. *Cercis occidentalis* and *Fraxinus dipetala* are frequently present with low to moderate cover…

Ceanothus integerrimus – Quercus garryana var. *fruticosa* Provisional Association (n=9)

IIA.3 *Prunus virginiana* or *Prunus subcordata* is dominant in the shrub layer. Stands are often dense and growing in or around large boulder outcrops…

***Prunus virginiana* Alliance (n=4)**

IIA3.a *Prunus virginiana* is dominant in the shrub layer. *Sambucus nigra* and other mesic shrubs are typically present at low cover…

Prunus virginiana Association (n=3)

IIA3.b *Prunus subcordata* is strongly dominant in the shrub layer. Other shrubs may be present at low cover…

Prunus subcordata Association (n=1)

IIA.4 Stands are dominated by mesic shrubs such as *Ribes quercetorum*, *Rhus trilobata, Frangula californica, Sambucus nigra,* and *Cercis occidentalis* in mesic upland settings. Stands are often small, less than 1 acres found on rocky outcrops and north-facing slopes…

***Ribes quercetorum – Rhus trilobata – Frangula californica* Alliance**

IIA4.a *Ribes quercetorum* is strongly dominant in the shrub canopy often occurring with *Sambucus nigra* on steep, rocky, or concave northerly-facing slopes…

Ribes quercetorum Association (n=21)

IIA4.b *Rhus trilobata* is the dominant shrub in the canopy. Other shrubs may be present but in lower cover, including *Sambucus nigra*, *Prunus* sp*.,* or *Toxicodendron diversilobum*…

Rhus trilobata Sierran Association (n=10)

IIA4.c *Sambucus nigra* is dominant in the shrub canopy. Stands may be found on moist north-facing slopes but are uncommon in the study area…

Sambucus nigra Association (n=1)

IIA4.d *Frangula californica* is dominant in the shrub canopy. Other shrubs may be present at low cover. Stands are in upland settings often on rocky outcrops…

Frangula californica ssp. *tomentella* Association (n=12)

IIA4.e *Cercis occidentalis* is dominant in the shrub canopy. The shrub layer is diverse with other mesic shrubs at low cover…

Cercis occidentalis Provisional Association (n=6)

IIA.5 *Baccharis pilularis* dominates the shrub overstory in disturbed areas that may have been cleared or burned. Emergent trees, other shrub species, and a variety of forbs and grasses often intermix with low cover. Found in the northern Sierra Nevada Foothills…

Baccharis pilularis Association (n=2)
of the ***Baccharis pilularis* Alliance (n=2)**

IIA.6 *Toxicodendron diversilobum* is dominant in the shrub overstory. Other shrubs such as *Rhamnus ilicifolia*, *Ceanothus cuneatus*, and *Sambucus mexicana* may intermix at low cover or sub-dominate…

***Toxicodendron diversilobum* Alliance (n=42)**

IIA6.a *Toxicodendron diversilobum* is strongly dominant in the shrub overstory. …

Toxicodendron diversilobum / Herbaceous Shrubland Association (n=38)

II.B Non-riparian shrublands dominated by sclerophyllous (with leaves hardened by a waxy cuticle) temperate shrubs. Stands are dominated by typical chaparral shrub genera, including *Adenostoma fasciculatum*, *Arctostaphylos*, *Ceanothus*, shrubby *Quercus*, etc.…

IIB.1 Chaparral stands dominated or co-dominated by *Arctostaphylos* spp. Stands often occur on upper convex slopes of hills and mountains…

IIB1.a One or more of the following three manzanita species are dominant or co-dominant: *Arctostaphylos glandulosa, Arctostaphylos parryana, and/or Arctostaphylos glauca*. Stands are limited to the southernmost portions of the Sierra Nevada Foothills in the Tehachapi and San Emigdio Mountains …

IIB1a.1 *Arctostaphylos glandulosa* is dominant in the shrub layer with *Adenostoma fasciculatum* sub-dominant. Shrub layer is intermittent to continuous and herbaceous layer is sparse. Vegetation type is uncommon in the foothills and found only in the Tehachapi Mountains above Antelope Valley…

Arctostaphylos glandulosa – Adenostoma fasciculatum Association (n=2)
of the ***Arctostaphylos glandulosa* Alliance (n=2)**

IIB1a.2 *Arctostaphylos parryana* is dominant in the shrub canopy, though other shrubs may be present with low to moderate cover. Found in the San Emigdio Mountains and occasionally in the Tehachapi Mountains…

Arctostaphylos parryana Shrubland Association (n=9)
of the ***Arctostaphylos pungens – Arctostaphylos pringlei* Alliance (n=9)**

IIB1a.3 *Arctostaphylos glauca* is dominant in the shrub canopy, though other shrubs may be present with low cover. Shrub cover is open to intermittent and herb cover is sparse. Found in the southern Sierra Nevada Foothills in the San Emigdio Mountains and the foothills west of Isabella Lake…

Arctostaphylos glauca Association (n=4)
of the ***Arctostaphylos glauca* Alliance (n=4)**

IIB1.b Stands are dominated or co-dominated by *Arctostaphylos viscida*, or *A. manzanita* and can be found throughout the Sierra Nevada Foothills. In some localized stands, on ultramafic soils, *Adenostoma fasciculatum* may be dominant with *A. viscida* merely present…

IIB1b.1 *Arctostaphylos viscida* intermixes with a variety of associated shrubs, including *Adenostoma fasciculatum, Heteromeles arbutifolia,* and *Ceanothus* spp., in the canopy. In some cases, particularly in older stands on ultramafic substrate, *A. viscida* ranges from co-dominant to sub-dominant with some stands dominated at least locally by *Adenostoma fasciculatum.* If *Quercus wislizeni* is co-dominant in the overstory see **IIB.2b**…

***Arctostaphylos viscida* Alliance (n=110)**

IIB1b.1a *Arctostaphylos viscida* forms an intermittent to continuous canopy as the sole dominant shrub. *Adenostoma fasciculatum* is typically absent. Other chaparral shrubs such as *Heteromeles arbutifolia* and *Quercus wislizeni* may occur with <5% cover…

Arctostaphylos viscida Association (n=31)

IIB1b.1b *Adenostoma fasciculatum* characterizes an open to continuous shrub overstory while *Salvia sonomensis* characterizes the understory. *Arctostaphylos viscida* is typically co- to sub-dominant, but sometimes merely present and may occasionally be absent. Occasionally *Ceanothus lemmonii* or *C. roderickii* are the dominant shrub in the overstory with these characteristic species. If *Quercus wislizeni* is present, it typically has lower relative cover than *A. fasciculatum*. Found primarily on gabbro substrate from Butte County to southern portion of study area…

(*Arctostaphylos viscida – Adenostoma fasciculatum*) / *Salvia sonomensis* Association (n=30)

IIB1b.1c *Salvia sonomensis* and *Carex brainerdii* are characteristically present with variable in cover in the understory. *Adenostoma fasciculatum* and *Quercus wislizeni* are typically absent but may be present with sparse cover. This association is a regionally defined type that occurs on gabbro substrate…

Arctostaphylos viscida / Salvia sonomensis – Carex (brainerdii, xerophilla) Provisional Association (n=7)

IB1b.1d *Arctostaphylos viscida* is present as a co-dominant or sub-dominant shrub with *Adenostoma fasciculatum*. *Heteromeles arbutifolia* is often present and may be similar in cover to the manzanita. *Salvia sonomensis* is absent. Found primarily on sedimentary, volcanic, and serpentine substrates (not found on gabbro substrate)…

Arctostaphylos viscida – Adenostoma fasciculatum Association (n=35)

IIB1b.1e *Arctostaphylos viscida* is typically dominant in the shrub layer with *Quercus wislizeni* is characteristically present with >5% cover in the shrub and/or tree layer(s). If *Adenostoma fasciculatum* is present, it usually has lower relative cover than *Q. wislizeni*…

Arctostaphylos viscida – Quercus wislizeni Association (n=5)

IIB1b.2 *Arctostaphylos manzanita* is dominant to co-dominant in the shrub canopy, though other shrubs may be present with moderate cover. Stands may exist in the northern and central portions of the Sierra Nevada Foothills, although the species is present, there is some uncertainty about the identity of the diagnostic species mentioned in some stands assigned to this alliance…

Arctostaphylos manzanita Association (n=2)
of the ***Arctostaphylos (canescens, manzanita, stanfordiana)*** **Alliance (n=2)**

IIB.2 Evergreen shrubby oaks are dominant or co-dominant in the overstory often mixing with other chaparral shrub species…

IIB2.a *Quercus john-tuckeri* is dominant in the overstory as a low tree or shrub. Emergent conifers including *Pinus monophylla* and *Juniperus californica* may be present. Other shrubs are present as sub-dominants including *Cercocarpus montanus, Garrya flavescens,* and *Ceanothus* spp. Stands occur in the southern Sierra Nevada foothills from the Kern River watershed, southward to the San Emigdio Mountains and Tehachapi Mountains.…

Quercus john-tuckeri Association (n=11)
of the ***Quercus john-tuckeri*** **Alliance (n=11)**

IIB2.b *Quercus wislizeni* is dominant or co-dominant as a shrub or small tree at >30% relative cover, with other species in the overstory. *Q. berberidifolia* and *Q. chrysolepis*, if present, occur at low cover. Stands occur in the southern Sierra Nevada Foothills east of Fresno south to the San Emigdio Mountains…

Quercus wislizeni – Quercus chrysolepis **(shrub) Alliance[1] (n=38)**

IIB2b.1 *Quercus wislizeni* (var. *frutescens*) is the sole dominant shrub or tree in the overstory. Other shrubs may be present at low cover. The herbaceous layer is typically sparse and non-native annual grasses are common in the stand…

Quercus wislizeni var. *frutescens* Association (n=10)

[1] Stands of shrubby statured, multi-stemmed *Quercus wislizeni* belong to the *Quercus wislizeni − Quercus chrysolepis* shrubland alliance. However, due to inconsistencies in the classification of these stands by the NVC and MCV and to maintain constancy between the northern and southern Sierra Nevada Foothills maps, these stands were mapped as ***Quercus wislizeni (S*****hort Stature) Mapping Unit.**

IIB2b.2 *Cercocarpus montanus* is present to co-dominant with *Quercus wislizeni* in the shrub overstory. Other chaparral species may also be present including *Ceanothus cuneatus*…

Quercus wislizeni – Cercocarpus montanus Association (n=17)

IIB2b.3 *Ceanothus leucodermis* is typically co-dominant in the shrub layer with *Quercus wislizeni* with *Keckiella breviflora* and *Lonicera interrupta* present to co-dominant…

Quercus wislizeni – Ceanothus leucodermis Association (n=7)

IIB2b.4 *Carpenteria californica* is co-dominant with *Quercus wislizeni* in the shrub layer. *Aesculus californica* is usually emergent in the tree layer…

Quercus wislizeni – Carpenteria californica Provisional Association (n=4)

IIB2b.5 *Quercus wislizeni* is the primary species in the overstory, usually occurring as a tree, but occasionally as a tall shrub with *Arctostaphylos viscida*. Both species typically have at least 5% absolute cover. *Heteromeles arbutifolia* and other shrubs. Typically of upper slopes and relatively exposed, upland settings…

Quercus wislizeni – (Pinus sabiniana) / Arctostaphylos viscida Association (n=21)
of the ***Quercus wislizeni – Quercus parvula*** **(tree) Alliance (n=478)**

IIB2.c *Quercus durata* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*. *Arctostaphylos viscida* may be present at low cover and *Salvia sonomensis* is present in the understory with native forbs and grasses Found primarily on gabbro or serpentine substrates in the northern Sierra Nevada Foothills…

Quercus durata – Adenostoma fasciculatum / *Salvia sonomensis* Shrubland Provisional Association (n=4)
of the ***Quercus durata*** **Alliance (n=4)**

IIB2.d *Quercus berberidifolia* is dominant or co-dominant with other shrubs in the canopy. Trees may be emergent but have relatively low cover compared to shrubs…

Quercus berberidifolia **Alliance (n=26)**

IIB2d.1 *Quercus berberidifolia* is the sole dominant shrub in the intermittent to continuous shrub layer…

Quercus berberidifolia Association (n=5)

IIB2d.2 *Quercus berberidifolia* and *Adenostoma fasciculatum* are co-dominant in the shrub canopy. *A. fasciculatum* typically has higher cover that *Q. berberidifolia* and other shrubs are present to co-dominant as well…

Quercus berberidifolia – Adenostoma fasciculatum Association (n=1)

IIB2d.3 *Quercus berberidifolia* and *Cercocarpus montanus* are co-dominant in the shrub layer…

Quercus berberidifolia – Cercocarpus montanus Association (n=3)

IIB2d.4 *Ceanothus cuneatus* and *Quercus berberidifolia* form an open to continuous shrub canopy with other chaparral shrubs such as *Cercocarpus montanus*, *Eriodictyon californicum*, and *Arctostaphylos* spp.…

Quercus berberidifolia – Ceanothus cuneatus Association (n=11)

IIB2d.5 *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 co-dominant…

Quercus berberidifolia – Heteromeles arbutifolia Association (n=4)

IIB.3 Stands are dominated by sclerophyllous shrubs other than *Arctostaphylos* spp. or *Quercus* spp. including *Cercocarpus montanus, Heteromeles arbutifolia, Ceanothus* spp., *Fremontodendron californica,* and *Adenostoma fasciculatum*…

IIB3.a *Cercocarpus montanus* is dominant or co-dominant in the shrub layer with *Ceanothus cuneatus*, *Adenostoma fasciculatum*, or *Juniperus californica* as a small tree or shrub, forming an open to intermittent canopy. Occasionally other shrubs such as *Arctostaphylos viscida* and *Artemisia tridentata* can reach co-dominance…

***Cercocarpus montanus* Alliance (n=34)**

IIB3a.1 *Cercocarpus montanus* is typically the sole dominant in the overstory with a variety of other shrubs such as *Brickellia californica* and *Cercis occidentalis* occurring at sparse cover. The herb understory is open…

Cercocarpus montanus var. *glaber* Association (n=18)

IIB3a.2 *Cercocarpus montanus* and *Ceanothus cuneatus* form an open to intermittent shrub canopy, where the two species usually co-dominate. Other shrub species including *Toxicodendron diversilobum* may intermix at low cover. Found primarily on volcanic soils in the northern portion of the study area…

Cercocarpus montanus – Ceanothus cuneatus Association (n=6)

IIB3a.3 *Cercocarpus montanus* is co-dominant with *Adenostoma fasciculatum*. While both shrubs exhibit at least 30% relative cover in the shrub layer, other shrubs such as *Arctostaphylos* spp. and *Rhamnus ilicifolia* are present…

Cercocarpus montanus – Adenostoma fasciculatum Association (n=1)

IIB3a.4 *Cercocarpus montanus* is co-dominant in a diverse shrub layer. Other shrubs present include *Toxicodendron diversilobum, Eriodictyon californicum, Rhamnus ilicifolia,* and *Fremontodendron californicum.* Stands are typically post-disturbance such as fire…

Cercocarpus montanus – Fremontodendron californicum Association (n=4)

IIB3a.5 *Ceanothus cuneatus* and *Quercus john-tuckeri* are co-dominant with *Cercocarpus montanus.* Stands are found in the southern Sierra Nevada Foothills…

Cercocarpus montanus – Ceanothus cuneatus – Quercus john-tuckeri Association (n=2)

IIB3.b *Heteromeles arbutifolia* dominates the shrub canopy, though *Ceanothus cuneatus* is typically present and may be co-dominant. Found primarily on serpentine substrate in the northern Sierra Nevada Foothills…

Heteromeles arbutifolia Serpentine Association (n=7)
of the ***Prunus ilicifolia*** – ***Heteromeles arbutifolia*** – ***Ceanothus spinosus*** **Alliance (n=7)**

IIB3.c *Fremontodendron californicum* is typically dominant in the shrub layer but may be co-dominant with *Ceanothus greggii.* Other shrubs including *Cercocarpus montanus, Eriodictyon californica,* and *Ephedra viridis* may be present at low cover…

Ceanothus greggii – Fremontodendron californica **Alliance (n=14)**

IIB3c.1 *Fremontodendron californicum* is dominant in the shrub layer or co-dominant with *Ceanothus greggii, C. cuneatus,* or *Cercocarpus montanus* but *F. californicum* has higher cover than any other shrub species…

Fremontodendron californicum Association (n=13)

IIB3.d *Adenostoma fasciculatum* is dominant to co-dominant in the overstory with other chaparral species such as *Arctostaphylos manzanita* and *Heteromeles arbutifolia*, and disturbance related chaparral species such as *Eriodictyon californicum* and *Lotus scoparius.* If *A. fasciculatum* co-dominates with *Arctostaphylos viscida*, *Ceanothus* spp., or shrubby oak species, key to those alliances….

Adenostoma fasciculatum **Alliance (n=66)**

IIB3d.1 *Eriodictyon californicum* and/or (*Lotus scoparius)* form an open to continuous shrub canopy with *Adenostoma fasciculatum*. *Heteromeles arbutifolia* is often present and may reach a level of co-dominance but no other shrub species has significant cover in the overstory. The understory is comprised of non-native forbs and grasses…

Adenostoma fasciculatum – (Lotus scoparius – Eriodictyon spp.*)* Association (n=15)

IIB3d.2 *Adenostoma fasciculatum* is strongly dominant in the shrub canopy and other chaparral species if present, are relatively low in cover, including *Arctostaphylos* spp., *Ceanothus cuneatus*, and/or *Eriodictyon californicum*. Found typically on sedimentary and igneous substrates, and occasionally on ultramafic substrate…

Adenostoma fasciculatum Association (n=43)

IIB3d.3 *Arctostaphylos manzanita* is characteristically present, having similar or lower cover to *Adenostoma fasciculatum*. *Heteromeles arbutifolia* is often present, sometimes having higher cover than A*denostoma fasciculatum*. *A. viscida* and *Ceanothus cuneatus* are typically absent, but may occasionally have sparse cover…

A*denostoma fasciculatum – Arctostaphylos manzanita* Association (n=6)

IIB3.e *Ceanothus cuneatus* is typically dominant in the shrub layer or may be co-dominant with *Adenostoma fasciculatum* or *Eriodictyon californicum*. If it is co-dominant with *Cercocarpus montanus,* key to that alliance. Trees such as *Pinus sabiniana* may be present in the overstory but have significantly less cover than the shrubs…

***Ceanothus cuneatus* Alliance (n=156)**

IIB3e.1 *Ceanothus cuneatus* forms an open to intermittent shrub canopy as the sole dominant shrub. Other chaparral shrubs may occur occasionally with low cover. Native herbs that are characteristically present in the open to intermittent understory include *Plantago erecta* and *Vulpia microstachys*. Found on serpentine substrate…

Ceanothus cuneatus / *Plantago erecta* Association (n=20)

IIB3e.2 *Ceanothus cuneatus* and *Adenostoma fasciculatum* co-dominate in an intermittent to continuous shrub canopy. Other chaparral shrubs are usually present at low cover. *Aira caryophyllea* and other herbs comprise a sparse to open understory…

Ceanothus cuneatus – Adenostoma fasciculatum Association (n=4)

IIB3e.3 *Ceanothus cuneatus* forms on open to continuous shrub canopy as the sole dominant shrub with at least 50% relative cover. Other chaparral shrubs may occur but are sub-dominant. Emergent trees are also often present at low covers. The understory is comprised mostly of non-native grasses and forbs…

Ceanothus cuneatus Association (n=118)

IIB3e.4 *Ceanothus cuneatus* is co-dominant with other chaparral shrub species including *Eriodictyon californicum*. *Fremontodendron californicum* is often present but at lower cover than *C. cuneatus*. The understory is comprised mostly of non-native grasses and forbs…

Ceanothus cuneatus – Eriodictyon californicum – (Fremontodendron californicum) Association (n=12)

IIB3.f *Ceanothus leucodermis* is dominant to co-dominant with other chaparral shrubs in the shrub layer. Trees may be emergent, and the herbaceous layer is typically sparse to open. Stands typically occur on relatively early post-fire sites in the southern Sierra Nevada Foothills…

Ceanothus leucodermis Association (n=10)
of the ***Ceanothus leucodermis* Shrubland Alliance (n=10)**

II.C Non-riparian shrublands dominated by drought and cold deciduous shrubs (with the exception of *Hesperoyucca whipplei*) that are largely restricted to cis-montane California west of the deserts.

Dominant shrubs include *Eriogonum fasciculatum, Ericameria linearifolia, Eriodictyon* spp., *Cleome isomeris, Lotus scoparius, Lupinus albifrons, Diplacus aurantiacus,* and *Cytisus* spp.…

IIC.1 *Ericameria linearifolia*, *Cleome isomeris*, or *Eastwoodia elegans* are dominant or co-dominant in the shrub layer. Typically found on north-facing, steep slopes in the southern Sierra Nevada Foothills in the Tehachapi Mountains…

***Ericameria linearifolia – Cleome isomeris* Alliance (n=9)**

IIC1.a *Cleome isomeris* is dominant in the shrub overstory. Found often on steep slopes and in washes…

Cleome isomeris Provisional Association (n=6)

IIC1.b *Ericameria linearifolia* is primarily dominant or co-dominant with other shrubs in the shrub overstory…

Ericameria linearifolia Association (n=3)

IIC.2 *Eriogonum fasciculatum* and/or *Hesperoyucca whipplei* are dominant or co-dominant in the shrub layer together usually accounting for >50% of the shrub cover. Stands are found on steep slopes typically west of the Sierra crest from west of Sequoia NP to the Tehachapi and San Emigdio Mountains. Occasionally, *Encelia actonii* is dominant on steep gravelly slopes with *H. whipplei* present. *E. actonii* dominant in washes is keyed out as *Encelia (actonii, virginensis) – Viguiera reticulata* Alliance…

***Eriogonum fasciculatum* Alliance (n=57)**

IIC2.a *Eriogonum fasciculatum* is dominant shrub in the canopy. Other shrubs may be present as sub-dominants…

Eriogonum fasciculatum Association (n=28)

IIC2.b *Hesperoyucca whipplei* is present with at least 2% cover, and it is sometimes co-dominant with *Eriogonum fasciculatum*...

Eriogonum fasciculatum var. *foliolosum – Hesperoyucca whipplei* Association (n=15)

IIC2.c *Hesperoyucca whipplei* or *Encelia actonii* is dominant or may be co-dominant with other shrubs such as *Ribes quercetorum*, *Ceanothus cuneatus, Eriodictyon californica* or *Toxicodendron diversilobum*. *Eriogonum fasciculatum* is noticeably absent from these stands or has very low cover…

Hesperoyucca whipplei Association (n=13)

IIC.3 *Eriodictyon californicum*, *E. crassifolium*, *E. parryi, Lupinus* spp., *Lotus scoparius*, or other disturbance related shrubs dominate the shrub canopy with low to moderate cover. *Adenostoma fasciculatum* is typically absent…

***Lotus scoparius – Lupinus albifrons – Eriodictyon* spp. Alliance (n=91)**

IIC3.a *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 recently disturbed sites including those recently burned, and tolerates serpentinite substrates…

Eriodictyon californicum / herbaceous Association (n=42)

IIC3.b *Eriodictyon crassifolium* occurs as the dominant shrub in an open to intermittent overstory while other shrubs may be present at low cover…

Eriodictyon crassifolium Association (n=4)

IIC3.c *Lotus scoparius* is dominant to co-dominant with other short-lived shrubs in the shrub overstory including *Eriodictyon californicum* in the shrub overstory, forming an open to intermittent canopy. Found in recently disturbed areas, often from fire and/or mining…

Lotus scoparius Association (n=11)

IIC3.d Low shrublands in open dry alluvial and fluvial terraces, dominated by *Lupinus albifrons* var. *albifrons*. Other shrubs present at low cover may include *Lotus scoparius*. The understory herbaceous layer generally includes *Senecio flaccidus, Bromus hordeaceus, Bromus diandrus*, or *Bromus madritensis*…

Lupinus albifrons **–** *Senecio flaccidus* var. *douglasii* Association (n=5)

IIC3.e Usually steep or alluvial, rocky surfaces dominated by *Lupinus albifrons* in the overstory. The herbaceous layer may be diverse and high in cover with native and non-native species…

Lupinus albifrons Association (n=24)

IIC3.f *Eriodictyon parryi* is dominant in the shrub canopy. Stands have not been widely surveyed but may be found in the southern Sierra Nevada foothills and the Transverse and Peninsular ranges …

Eriodictyon parryi Provisional Association (n=1)

IIC.4 Shrublands on moderate to abrupt slopes on most aspects, often unstable, or recently burned, or a product of recent land or rockslides, and dominated by *Diplacus aurantiacus.* Other shrubs may be present with low cover, such as *Eriodictyon californicum, Toxicodendron diversilobum,* or *Lotus scoparius.* Moss and lichen are always present and can be quite abundant in the understory…

Diplacus (aurantiacus, puniceus) Association (n=3)
of the ***Diplacus aurantiacus*** **Alliance (n=3)**

IIC.5 *Malacothamnus fremontii* or *M. fasciculatus* is the dominant or codominant shrub species in the canopy. These stands typically arise following fire or other disturbance events and do not persist for more than a decade or so…

Malacothamnus fasciculatus – Malacothamnus **spp. Alliance (n=1)**

No Associations defined

IIC.6 *Cytisus scoparius* is dominant in the overstory. Stands occur in disturbed areas and often have a high cover of other non-natives…

Cytisus scoparius Association (n=1)
of the ***Cytisus scoparius – Genista monspessulana – Cotoneaster*** **spp. Semi-Natural Alliance (n=1)**

Group III. Shrublands dominated or characterized by plants with xeromorphic adaptations typical of deserts or the drier warmer parts of interior California, west of the deserts, including such genera as: *Ambrosia*, *Artemisia, Atriplex, Encelia, Ephedra, Ericameria, Eriogonum, Isocoma* and *Lepidospartum…*

III.A Stands in alkaline settings found in warmer interior California west of the deserts and dominated by *Isocoma acradenia.* Shrub canopy is open and other shrubs may be sub-dominant. The herb layer is usually well-developed, including natives and non-natives…

Isocoma acradenia Association (n=1)
of the ***Suaeda moquinii*** **Alliance (n=1)**

III.B Stands found in desert washes characterized by species such as *Encelia actonii, Lepidospartum squamatum, Prunus fasciculata, Ambrosia salsola, Ephedra californica.* Stands are not common in the Sierra Nevada Foothills but can be found in the southern part of the ecoregion where desert influences occur…

IIIB.1 *Encelia actonii* has ≥2% cover and other wash indicator species such as *Ambrosia salsola* are present. No other shrub species has greater or equal cover. Stands occur in washes in the study area near Lake Isabella…

Encelia actonii Association (n=1)
of the ***Encelia (actonii, virginensis) – Viguiera reticulata*** **Alliance**

IIIB.2 Vegetation characterized by *Lepidospartum squamatum.* Stands are concentrated along washes on the western foothills from the Kern River south in the Sierra Nevada foothills. Usually in larger washes with regular flooding, the substrate texture is coarse sand to small cobbles to gravel. Some old senescent stands have been isolated on higher terraces adjacent to rapidly downcutting stream channels…

Lepidospartum squamatum Alliance **(n=9)**

IIIB2.a *Lepidospartum squamatum* is dominant in the shrub canopy. Other shrubs, if present, are at low cover and a variety of herbs are present in the understory…

Lepidospartum squamatum / ephemeral annuals Association (n=5)

IIIB2.b *Lepidospartum squamatum* is characteristically present with a diverse mix of species including the presence of one or more of the following species, *Eriodictyon* spp., *Hesperoyucca whipplei*, and *Lupinus albifrons*. Stands occur on more recently disturbed

alluvial fans, with disturbance from fire and flood…

Lepidospartum squamatum – Eriodictyon trichocalyx – Hesperoyucca whipplei Association (n=2)

IIIB2.c *Baccharis salicifolia* is sub-dominant to co-dominant in the shrub canopy…

Lepidospartum squamatum – Baccharis salicifolia Association (n=2)

IIIB.3 *Prunus fasciculata* is dominant in the shrub layer. Typically, of washes and arroyos but may occur on wash terraces or on rocky concave slopes. Occurs in the Tehachapi and San Emigdio Mountains…

Prunus fasciculata Association (n=1)
of the ***Prunus fasciculata – Salazaria mexicana*** **Alliance (n=1)**

IIIB.4 *Ambrosia salsola* is dominant or co-dominant in the shrub layer. Stands are uncommon in the region but may be found in washes or other disturbed areas…

Ambrosia salsola – Bebbia juncea **Alliance (n=1)**
No Association defined

IIIB.5 *Ephedra californica* is dominant or co-dominant in the shrub overstory, forming a sparse to open canopy. Typically found in disturbed areas…

Ephedra californica – Ephedra trifurca **Alliance***

IIIB.6 *Atriplex polycarpa* is dominant in the open shrub layer with >50% relative cover. Non-native annuals are dominant in the herbaceous layer ranging from sparse to open. Found at lower elevations in southern Sierra Nevada Foothills in washes and ravines above the Central Valley, or uplands with alkaline substrate as in the foothills east of Bakersfield…

Atriplex polycarpa / annual herbaceous Association (n=3)
of the ***Atriplex polycarpa*** **Alliance (n=3)**

IIIB.7 *Atriplex canescens* is dominant or co-dominant in the shrub layer along washes with other disturbance or wash indicator shrubs including *Ericameria nauseosa* and *Ambrosia salsola*…

Atriplex canescens desert wash Association (n=1)
of the ***Atriplex canescens*** **Alliance (n=1)**

III.C Shrublands dominated by upland species commonly found in the cool semi-deserts of the Great Basin and/or the Mojave Desert including *Artemisia tridentata, Prunus andersonii, Cercocarpus ledifolius, Ephedra* spp.*, Ericameria* spp.*,* and *Eriogonum wrightii…*

IIIC.1 Semi-arid shrublands dominated or co-dominated by *Artemisia tridentata*. In disturbed settings *Prunus andersonii* dominant or co-dominant with other disturbance related species…

IIIC1.a *Artemisia tridentata* is dominant in the shrub layer. *Ceanothus* spp., *Ericameria nauseosa, Eriogonum fasciculatum, Eriogonum wrightii,* or *Ribes quercetorum* may be co-dominant. Other shrubs are typically present at low cover. Trees such as *Juniperus californica*, *Quercus douglasii*, and *Pinus monophyla* may be emergent. Found in the southern Sierra Nevada Foothills…

***Artemisia tridentata* Alliance (n=25)**

IIIC1a.1 *Eriogonum wrightii* is sub-dominant to co-dominant in the shrub canopy. Stands can be found in the southern Sierra Nevada Foothills in desert transitional zones…

Artemisia tridentata – Eriogonum wrightii Association (n=6)

IIIC1a.2 *Artemisia tridentata* is dominant in the shrub overstory and *Ericameria nauseosa* and/or other disturbance related shrubs are characteristic…

Artemisia tridentata – Ericameria nauseosa Association (n=5)

IIIC1a.3 *Artemisia tridentata* is dominant in the shrub canopy and *Ceanothus cuneatus* is characteristic to co-dominant. Other shrub species are also present including *Fremontodendron californicum, Sambucus nigra,* and *Keckiella breviflora*…

Artemisia tridentata – Ceanothus cuneatus Association (n=14)

IIIC1.b *Prunus andersonii* is dominant to co-dominant in the shrub layer with disturbance related shrubs such as *Tetradymia canescens, Chrysothamnus viscidiflorus,* and *Ericameria nauseosa.* The herbaceous layer is sparse to open and often characterized by *Bromus tectorum* or other non-native species. *Eriogonum* spp. are often present. Disturbance such as fire is usually evident…

Purshia tridentata – Artemisia tridentata – (Tetradymia canescens / Eriogonum umbellatum) Association (n=1)
of the ***Purshia tridentata – Artemisia tridentata* Alliance (n=1)**

IIIC1.c The low shrub *Eriogonum wrightii* is characteristic and is usually dominant or co-dominant with native perennial and non-native annual herbs in rocky sites on ridges and upper slopes that often have experienced some disturbance. *Eriogonum wrightii* is found on nutrient poor, gravelly slopes in the southern Sierra Nevada Foothills…

***Eriogonum wrightii – Eriogonum heermannii – Buddleja utahensis* Alliance (n=13)**

IIIC1c.1 *Eriogonum wrightii* is dominant in the stand although other shrubs such as *Ericameria nauseosa* may be present…

*Eriogonum wrightii (*ssp. *subscaposum,* ssp. *wrightii)* Association (n=11)

IIIC1c.2 *Eriogonum wrightii* is characteristic in the stand with *Eriophyllum confertiflorum*, which may have greater cover. A variety of herbaceous species also occur, including *Poa secunda* and *Avena* spp.…

Eriogonum wrightii – Eriophyllum confertiflorum / Monardella antonina ssp. *benitensis* Association (n=1)

IIIC1.d *Eriogonum fasciculatum* is dominant in the shrub layer with other desert scrub species including *Ericameria* spp., *Ephedra* spp., and *Opuntia* spp. Cis-montane shrub species including *Hesperoyucca whipplei* and *Ceanothus cuneatus* are typically absent. Stands occur in areas transitioning to desert in the San Emigdio Mountains and near Lake Isabella…

***Eriogonum fasciculatum – Viguiera parishii* Alliance (n=3)**

IIIC1d.1 *Ericameria linearifolia* is co-dominant with *Eriogonum fasciculatum* in the shrub layer…

Eriogonum fasciculatum – Ericameria (laricifolia, linearifolia) Association (n=1)

IIIC1d.2 *Eriogonum fasciculatum* is dominant in alluvial wash settings. *Ericameria nauseosa* is usually present…

Eriogonum fasciculatum (Wash) Association (n=2)

IIIC1.e Species of *Ephedra* are co-dominant to dominant with other desert shrubs…

IIIC1e.1 Stands of the *Ephedra nevadensis* **–** *Lycium andersonii* **–** *Grayia spinosa* Alliance occupy the transition between warm desert and cool desert vegetation in the Tehachapi Mountains, and in the upper Kern River Valley south-east of Lake Isabella. *G. spinosa* does resprout after fire, and along with *Salazaria mexicana, Encelia actoni,* and *Lycium andersonii,* may replace *Coleogyne ramosissima* stands as a result. There are many post-fire seral stands that have strong mixtures of multiple species. If *Ephedra viridis* is present at ≥ 2% cover and evenly distributed, please see *E. viridis* Alliance…

Ephedra nevadensis – Lycium andersonii – Grayia spinosa* Alliance

IIIC1e.2 *Ephedra viridis* is dominant with > 50% relative cover in the shrub layer. *Eriogonum fasciculatum* is present with other shrubs including *Hesperoyucca whipplei*, Herbaceous cover is sparse…

Ephedra viridis Association (n=5)
of the ***Ephedra viridis* Alliance (n=5)**

IIIC1.f *Ericameria nauseous* dominates stands in recently burned or otherwise disturbed portions of the southern foothills. If *E*. *nauseosa* is co-dominant with *Eriogonum fasciculatum*, key to the *E*. *fasciculatum* Alliance. If present, *Juniperus californica* has trace cover. Several

subspecies are included in this type (e.g., *E*. *nauseosa* var. *mohavensis* in the cismontane or desert sides of the study area, or *E*. *nauseosa* var. *hololeuca* in some semi-riparian stands In the Tehachapi Mountains) …

Ericameria nauseosa Association (n=16)
of the ***Ericameria nauseosa*** **Alliance (n=16)**

IIIC1.g *Ericameria teretifolia* is dominant in the shrub layer. Stands may occupy shallow rocky post-fire stands associated with *Juniperus californica* or other upland alliances or in washes. In our area it is usually found as low cover shrubland in granitic or other rocky uplands on south- or north-facing steep, boulder slopes, and is more warm-tolerant than *Ephedra viridis* and thus usually at lower elevations. When co-dominant with *Grayia* spp.*, E. viridis, Coleogyne* spp.*,* or *Salazaria* spp., key to those alliances. Stands are in the southern Sierra Nevada foothills near the desert margins (Lake Isabella, Tehachapi Mountains, and San Emigdio Mountains), usually on rocky slopes or at bases of outcrops…

Ericameria teretifolia Association (n=1)
of the ***Ericameria teretifolia*** **Alliance (n=1)**

IIIC1.h *Cercocarpus ledifolius* is codominant as a shrub layer or short tree in the overstory. Conifers such as *Pinus jeffreyi* or *P. monophylla* may be emergent at low cover…

Cercocarpus ledifolius **Alliance (n=1)**
No Associations defined

Group IV. Sparsely vegetated (<10% absolute cover) stands occurring on steep boulder covered slopes or on steep canyon slopes. *Ericameria cuneata* is dominant or co-dominant with *Toxicodendron diversilobum*, *Diplacus aurantiacus* or *Eriodictyon californicum.* A high cover of lichen, moss and/or *Selaginella* spp. is usually present.

Californian Cliff, Scree & Rock Vegetation Group

Class C. Herbaceous Vegetation

Group I. Grasslands and broad-leafed herbaceous stands restricted to upland settings usually with only ambient precipitation (no additional moisture due to proximity to permanent or intermittent streams, rivers, ponds, etc.).

I.A Vegetation characterized by native or non-native grasses and herbs adapted to a summer-dry, Mediterranean climate…

California Annual and Perennial Grassland Macrogroup
Note: stands that are assumed to contain native species especially without wildflower signatures have been mapped at the Macrogroup level.

IA.1 Stands characterized by native grasses and herbs, though they may be low in cover. Native grasses and herbs are characteristic and evenly distributed across the herbaceous layer, though non-native forbs and grasses may be dominant. If non-native herbs and grasses are present, they are not strongly dominant, with the native species evenly distributed and generally at least 10%

relative cover throughout the stand…

IA1.a Stands dominated or characterized by annual grasses and forbs. Cover and composition vary from year to year depending upon timing and quantity of available moisture, but native herbs and grasses areusually present in sufficient amounts or with low cover but high diversity of native species to differentiate from non-native stands. Diagnostic species include *Amsinckia* spp., *Eschscholzia* spp., *Lupinus* spp., *Lasthenia* spp., *Plantago erecta* and *Vulpia microstachys.* Stands are variable from year to year. Many stands are difficult to determine to finer floristic levels, except during peak phenology following adequate rainfall…

California annual herb/grass Group

IA1a.1 *Eschscholzia californica, E. caespitosa*, or *E. lobbii. and/or Lupinus bicolor, L. nanus, L. microcarpus,* or *L. benthamii* are seasonally dominant on upland slopes or flats with well-drained sandy to loamy soils. A variety of other native and non-native forbs and grasses may be present. In the southern foothills stands are often associated with perennial stands of the *Poa secunda, Achnatherum speciosum, Eriogonum fasciculatum, Ericameria linearifolia – Cleome isomeris,* and/or *E. nauseosa* Alliances. If *Plagiobothrys nothofulvus* is co-dominant with *Eschscholzia* spp., key here. If *P. nothofulvus* is co-dominant with *L. bicolor*, key to the *Plagiobothrys nothofulvus* Alliance…

***Eschscholzia (californica) – Lupinus (nanus)* Alliance (n=60)**

IA1a.1a *Lupinus nanus* is dominant to co-dominant in the herb layer with *Bromus hordeaceus* and diverse *Trifolium* species including *T. hirtum, T. dubium, T. depauperatum, and T. microcephalum*…

Bromus hordeaceus – Lupinus nanus – Trifolium spp. Association (n=7)

IA1a.1b *Eschscholzia californica,* or similar *Eschscholzia* spp., is dominant in the herbaceous layer with a variety of non-native forbs and grasses which may be higher in cover**.** If *Lupinus bicolor* is present, it has less than half the cover of the *Eschscholzia* spp. cover…

Eschscholzia californica Association (n=11)

IA1a.1c *Lupinus bicolor* is always present and characteristic and may be co-dominating with *Erodium botrys. Eschscholzia* spp. and *Plagiobothrys* spp. are typically absent…

Lupinus bicolor Association (n=6)

IA1a.1d *Lupinus benthamii* and/or *Chorizanthe membranacea* are characteristic in the herb layer with variable cover and a high herbaceous species diversity (native or not)**.** Typically found on hot, dry, south-facing slopes with well-draining rocky or sandy substrates…

Lupinus benthamii – Chorizanthe membranacea Association (n=32)

IA1a.2 *Eschscholzia* spp. and/or *Lupinus* spp*.* are not conspicuous in the spring flowering

season. Other wildflower species characteristic of Mediterranean California are present. *Amsinckia menziesii, A. tessellata, A. vernicosa,* and/or annual species of *Phacelia* are seasonally characteristic in the herbaceous layer with greater than or equal to 10% relative cover. Soils are often well-drained and loamy and may have high levels of bioturbation (*e.g.,* rodent burrows) and/or high levels of (past/current) grazing…

***Amsinckia (menziesii, tessellata) – Phacelia* spp. Alliance (n=30)**

IA1a.2a *Amsinckia menziesii* or *A. tessellata* are present and typically dominant to co-dominant with non-native annual grasses and herbs such as *Bromus diandrus, B. hordeaceus*, and *Erodium* spp. Other natives present may include *Lupinus bicolor, Thysanocarpus curvipes*, and *Claytonia perfoliata*. If *Lupinus bicolor* dominant, see the *Eschscholzia (californica) – Lupinus (nanus)* Alliance…

Amsinckia (intermedia, menziesii) Association (n=14)

IA1a.2b *Phacelia cicutaria* is present and strongly dominant in the herb layer…

Phacelia cicutaria Provisional Association (n=9)

IA1a.2c *Phacelia tanacetifolia* and/or *Amsinckia eastwoodiae* is present and often co-dominant in the herb layer with non-native annual grasses and herbs such as *Bromus diandrus* and *Erodium cicutarium,* though native herb diversity is often high…

Phacelia tanacetifolia Association (n=6)

IA1a.3 *Vulpia microstachys*, *Plantago erecta, Lasthenia californica and/*or *L. gracilis* are characteristically present in stands and usually at least 10% relative herb cover. Other native species such as *Castilleja exserta, Lupinus* spp.*,* and *Trifolium* spp. are often well-represented and sometimes co-dominant. Soils may be clayey, wet to moist in spring and dry by summer. Generally occurring on loamy soils, compared to the *Monolopia (lanceolata) – Coreopsis (calliopsidea)* Alliance. If *Achyrachaena mollis* and/or *Layia fremontii* are characteristically present, see *Layia fremontii – Achyrachaena mollis* Alliance…

***Lasthenia californica – Plantago erecta – Vulpia microstachys* Alliance (n= 190)**

IA1a.3a *Lasthenia californica* is strongly dominant in the herbaceous layer with *Plantago erecta, Triphysaria eriantha, Trifolium depauperatum,* and *Layia fremontii* on vernally wet depressions on volcanic mud flow or basalt. If *Layia fremontii* is co-dominant, see the *Layia fremontii – Achyrachaena mollis* Alliance of the Californian mixed annual / perennial freshwater vernal pool / swale bottomland Group…

Lasthenia (californica, gracilis) Association (n=26)

IA1a.3b *Layia pentachaeta* is strongly dominant to co-dominant to *Plagiobothrys* spp.

and/or *Vulpia myuros* in the herbaceous layer…

Layia pentachaeta – Plagiobothrys (canescens) Association (n=2)

IA1a.3c *Lepidium nitidum* is co-dominant with or without *Trifolium gracilentum* and *Vulpia microstachys* and is often with non-native annual grasses and herbs such as *Bromus* spp., *Avena* spp., and *Erodium* spp.…

Lepidium nitidum – Trifolium gracilentum – Vulpia microstachys Association (n=2)

IA1a.3d *Vulpia microstachys* is co-dominant in the herbaceous layer with *Bromus hordeaceus*, *Vulpia myuros*, and *Avena* spp. *Plantago erecta* and *Lasthenia* spp. are absent. Native *Trifolium* spp. commonly occur in stands…

Vulpia microstachys Association (n=5)

IA1a.3e *Vulpia microstachys* is co-dominant with *Elymus elymoides* and/or *Achnatherum lemmonii. Lessingia virgata*, *Petrorhagia dubia*, and *Minuartia* spp. may also have significant cover…

Vulpia microstachys – Elymus elymoides – Achnatherum lemmonii Association (n=8)

IA1a.3f *Vulpia microstachys* and *Plantago erecta* occur with characteristic species *Navarretia tagetina, Bromus hordeaceus*, and *Hemizonia fitchii.* Other mesic species indicating vernally wet, clay soils may be present including *Triphysaria eriantha, Juncus bufonius,* and *Centaurium muhlenbergia*. If *Lasthenia californica* is present, it is sub-dominant to *Vulpia microstachys.* In late spring, *Calycadenia* spp. may have significant cover. *Navarretia tagetina* is limited in distribution as species to northern California, as a result this type is only known to occur in the Northern Sierra Nevada foothills…

Vulpia microstachys – Navarretia tagetina Association (n=28)

IA1a.3g *Vulpia microstachys* and *Plantago erecta* occur with a high diversity of other native and non-native species including *Trifolium depauperatum, Gilia tricolor, Bromus hordeaceus*, and *Hypochaeris glabra*. In late spring, *Calycadenia* spp. may have significant cover. *Lasthenia californica* can be similar in cover with *Vulpia microstachys* and *Plantago erecta* when relative herb cover is dominated by *Calycadenia* spp*.* or when the cover of *Lasthenia californica, Plantago erecta,* and *Vulpia microstachys* are all low (typically less than 1% absolute cover)*.* Key to *Vulpia microstachys – Navarretia tagetina* Association if *Navarretia tagetina* is present or *Plantago erecta* is conspicuously absent. While this type is ecologically similar to the *Vulpia microstachys – Navarretia tagetina* Association, it is a broader ranging association, occurring in both the northern and southern Sierra Nevada Foothills…

Vulpia microstachys – Plantago erecta Association (n=20)

IA1a.3h *Vulpia microstachys* and *Sedella pumila* are co-dominant to characteristic in the herb layer with *Lasthenia californica, Plantago erecta*, and *Selaginella* spp.…

Vulpia microstachys – Sedella pumila – Lasthenia californica Association (n=23)

IA1a.3i *Selaginella hansenii* and *Vulpia microstachys* occur on rocky volcanic substrate, intermixing with other native species such as *Plantago erecta, Lessingia virgata, Lupinus nanus, Lupinus spectabilis, Minuartia californica, Dichelostemma capitatum, Hypochaeris glabra*, and *Triphysaria eriantha. Sedella pumila* is typically absent or, when present, uncharacteristic and trace in cover. Generally, restricted to rocky substrates, including slate, metamorphic, ultramafic, or volcanic rock…

Vulpia microstachys – Selaginella hansenii Association (n=71)

IA1a.4 *Monolopia stricta* and/or *Coreopsis calliopsidea* or *C. stillmanii are* seasonally dominant or co-dominant on fine-textured soil on moderate to steep slopes. Less than 2% absolute shrub cover and/or shrubs not evenly distributed. Stands of C. *stillmanii* form bright golden-yellow patches on fine textured serpentine soils in the central Foothills in Mariposa and Tuolumne counties (near Coulterville). More broadly throughout this alliance's range in Central and Southern California, *Coreopsis* spp. can occur without *Monolopia* spp.…

***Monolopia (lanceolata) – Coreopsis (calliopsidea)* Alliance (n=1)**

IA1a.4a *Coreopsis calliopsidea, Mentzelia pectinata, Monolopia* spp., and/or *Camissonia boothii* seasonally dominant or co-dominant with a variety of other native herbs. Due to the limited range of these species within the Sierra Nevada Foothills, this type is likely limited in range to the far southern portions of the Sierra Nevada Foothills…

Coreopsis calliopsidea – Mentzelia pectinata Association (n=1)

IA1a.5 *Plagiobothrys nothofulvus* or other *Plagiobothrys* spp. are dominant and/or characteristic in spring season with good rainfall. Species such as *Daucus pusilis* and *Trifolium* spp are often a characteristic. In late spring/summer season, stands are characterized by *Madia elegans* and *Clarkia* spp., which may occur with or without *Plagiobothrys nothofulvus*. Stands are mappable in the study area on well-drained gentle to steep slopes. Stands with *Plagiobothrys* spp. or other ecologically similar species (e.g., *Cryptantha* or *Pectocarya* sp.) are often a component of and may co-dominate in other alliances such as *Eschscholzia (californica) – Lupinus (nanus), Lasthenia californica – Plantago erecta – Vulpia microstachys*, etc. Key to this alliance, if other species such as *Amsinkia* spp*., Phacelia* spp*., Lasthenia* spp*., Vulpia microstachys, Plantago erecta, Lupinus* spp*., Eschscholzia* spp*.* are absent or low in cover, not reaching sub- or co-dominance. If *Lupinus bicolor* is co-dominant with *P. nothofulvus*, key to this alliance…

***Plagiobothrys nothofulvus* Alliance (n=61)**

IA1a.5a Stands characterized by annual late spring flowering herbs such as *Clarkia* spp. and *Madia* spp., often in small openings in *Quercus douglasii* or *Q. wislizeni* woodlands. *Madia elegans* is dominant to sub-dominant in the herbaceous layer. *Plagiobothrys nothofulvus* is typically present, often sub-dominant to trace in cover. Other species present that may share dominance include non-native annual grasses and herbs such as *Bromus diandrus, Bromus hordeaceus,* and *Vulpia myuros*…

Madia elegans – Plagiobothrys nothofulvus Association (n=16)

IA1a.5b *Plagiobothrys nothofulvus* is characteristically present to co-dominant in the herbaceous layer with *Castilleja exserta* and/or *Lupinus* spp. Other species present that may co-dominate include *Holocarpha heermannii, Dichelostemma capitatum,* and *Amsinckia eastwoodiae*…

Plagiobothrys nothofulvus – Castilleja exserta – (Lupinus nanus) Association (n=3)

IA1a.5c *Plagiobothrys nothofulvus* is characteristically present to co-dominant in the herbaceous layer with *Daucus pusillus* and/or *Trifolium microcephalum*. *Daucus pusillus* and/or *Trifolium microcephalum* need only be consistent in the stand and may only be trace in cover. Non-native annual grasses and herbs such as *Bromus hordeaceus, Erodium botrys, Bromus diandrus*, and *Hypochaeris glabra* are often dominant, but native herb diversity is abundant and may include various native *Trifolium* species, *Lupinus bicolor, Amsinckia menziesii, Dichelostemma capitatum*, and *Vulpia microstachys*. If an *Amsinckia* spp. is co-dominant, key to *Amsinckia* (*menziesii*, *tessellata*) – *Phacelia* spp. Alliance…

Plagiobothrys nothofulvus – Daucus pusillus – Trifolium microcephalum Association (n=41)

IA1a.6 *Holocarpha virgata* and/or *Holocarpha heermannii* is present and typically between 5 and 30% absolute cover and is co-dominant in the herbaceous layer. On occasion, *Holocarpha* spp. will be sub-dominant or even <1% when with non-native grasses and herbs or disturbance related natives such as *Bromus* spp., *Centaurea melitensis*, and *Croton setigerus*…

***Holocarpha (heermannii, virgata)* Alliance (n=55)**

IA1a.6a *Holocarpha virgata* is characteristic in the herbaceous layer with variable cover. Other herbs such as *Bromus hordeaceus, Erodium botrys, Juncus bufonius, Lupinus bicolor, Taeniatherum caput-medusae,* and *Vulpia bromoides* are present. Klein et al. (2007) previously defined this association as *Bromus hordeaceus–Holocarpha virgata–Taeniatherum caput-medusae*…

Holocarpha virgata Association (n=13)

IA1a.6b *Holocarpha heermannii* is characteristic in the herbaceous layer with variable cover. Other herbs such as *Bromus hordeaceus, Bromus diandrus, Erodium* spp., *Croton setigerus,* and *Vulpia* spp. are present…

Holocarpha heermannii Association (n=39)

IA1a.6 The annual, pink-flowered herb *Lotus unifoliatus* dominates vernally moist sites with shallow rocky soils as along edges of seeps, small streams. Stands are generally less than 1 acre in size…

Lotus unifoliolatus Association (n=16)
of the ***Lotus unifoliolatus*** **Provisional Alliance (n=16)**

IA1.b Stands of grassland settings characterized by native perennial bunch grasses such as *Nassella pulchra* or *N. cernua* and/or tall perennial forbs such as *Eriogonum* spp. or *Corethrogyne filaginifolia.* Non-native annual component variable, but never strongly dominated by non-native herbs or grasses…

California perennial grassland Group

IA1b.1 Stands dominated or characterized by perennial native bunch grasses in the genus *Nassella* or *Melica*, often with a number of native and non-native annuals present…

Nassella **spp. –** ***Melica*** **spp. Alliance (n=24)**

IA1b.1a *Melica californica* is typically co-dominant in the herbaceous layer though occasionally it will only be characteristically present and evenly distributed…

Melica californica Association (n=1)

IA1b.1b *Nassella cernua* is typically co-dominant in the herbaceous layer though occasionally it will only be characteristically present and evenly distributed…

Nassella cernua Provisional Association (n=7)

IA1b.1c *Nassella pulchra* is typically co-dominant in the herbaceous layer with non-native grasses such as *Taeniatherum caput-medusae, Bromus hordeaceus, Lolium perenne*, and *Avena* spp.…

Nassella pulchra Association (n=14)

IA1b.1d *Nassella pulchra* is sub-dominant but characteristic in the herbaceous layer and may have as little as 2% overall cover. Non-native annual grasses such as *Brachypodium distachyon*, *Taeniatherum caput-medusae, Bromus hordeaceus, Lolium perenne*, and *Avena* spp. will be present and dominate the herbaceous layer…

Nassella pulchra – *Avena* spp. – *Bromus* spp. Association (n=2)

IA1b.2 *Achnatherum speciosum* is dominant in stands. Shrubs may be present with up to 5% absolute cover…

of the ***Achnatherum speciosum*** **Grassland Alliance (n=4)**
in the **Southern Great Basin semi-desert grassland Group**

IA1b.2a *Achnatherum speciosum* is dominant in the herbaceous layer and shrubs are present with up to 5% absolute cover. Stands are typically the result of fire that were formerly *Coleogyne filaginifolia*, *Eriogonum fasciculatum*, etc. Persistence is unknown but stands probably develop shrub dominance in <50 years, without fire or other disturbance. Stands are typically sandy…

Achnatherum speciosum Shrub Association (n=2)

IA1b.3 Herbaceous perennial forbs such as *Corethrogyne filaginifolia*, *Eriogonum elongatum,* and/or *E. nudum* dominate or characterize the stands, which often occur on shallow soils in the interface between grasslands and shrublands…

***Corethrogyne filaginifolia – Eriogonum (elongatum, nudum)* Alliance (n=17)**

IA1b.3a *Eriogonum nudum* is characteristic in the herbaceous layer with variable cover. Other herbs, including *Bromus hordeaceus,* may be co-dominant. The shrub layer is sparse…

Eriogonum nudum Association (n=3)

IA1b.3b *Eriogonum elongatum* is co-dominant in the herb layer with *Bromus tectorum* and other herbs on low hills and mounds…

Eriogonum elongatum Association (n=1)

IA1b.3c *Corethrogyne filaginifolia* is dominant in the herb layer with *Poa secunda* and annuals such as *Erodium cicutarium, Bromus madritensis, Chaenactis* spp., *Plagiobothrys* spp., and *Asclepias* spp. Found on gentle to moderately slopes with sandy soils possibly with scattered, emergent shrubs including *Eriogonum fasciculatum, Ericameria nauseosa*, and *Eriophyllum confertiflorum*…

Corethrogyne filaginifolia Association (n=9)

IA1b.3d *Lupinus excubitus* is dominant to co-dominant in the subshrub layer with *Eriogonum* spp. *Bromus tectorum* and *Chaenactis xantiana* are present in a diverse herbaceous layer. Stands occur on steep, dry sandy slopes…

Lupinus excubitus – Mentzelia albicaulis – Eriogonum spp. Association (n=3)

IA1b.4 Small stands of the tall *Leymus condensatus* in mesic sites in the southern ecological subsections between the Tehachapi and San Emigdio mountains. Some individuals appear to be closely related to the *Leymus cinereus*…

Leymus condensatus* Alliance

(Note: the few small stands sampled bear similarities to *L. cinereus* stands in the eastern Sierra, and this could also be placed in cool season grasslands along with Vancouverian types like *Poa secunda*, etc.)

IA.2 Herbaceous vegetation **strongly dominated** by non-native grasses and forbs in the genera *Avena*, *Brachypodium*, *Brassica*, *Briza*, *Bromus*, *Centaurea*, *Cynosurus*, *Erodium*, *Nassella,* and *Raphanus*. **Native herbaceous species have insignificant cover in these stands (generally < 10% relative cover)**, especially during the active growing season. Stands occur in foothills, rangelands, fallow fields, woodland openings, riparian areas, and disturbed settings…

Mediterranean California naturalized annual and perennial grassland Group

IA2.a Stands, individually or in combination, are strongly dominated by non-native annual species of the following genera: *Avena*, *Brachypodium*, or *Bromus*, and/or by leafy herbs of the genus *Erodium*…

***Avena* spp. – *Bromus* spp. Semi-Natural Alliance (n=109)**

IA2a.1 *Avena barbata* or *A. fatua* is strongly dominant in the herb layer typically with other non-native grasses and herbs such as *Bromus hordeaceus, Bromus diandrus, Erodium cicutarium*, and *Centaurea melitensis*…

Avena barbata – Avena fatua Association (n=12)

IA2a.2 *Avena* spp. and *Bromus hordeaceus* are co-dominating the herb layer and together are >60% relative cover. Very little total native herb cover present…

Avena barbata – Bromus hordeaceus Association (n=2)

IA2a.3 *Brachypodium distachyon* is strongly dominant to co-dominant in the herb layer with *Bromus hordeaceus* or other non-native annual grasses and herbs…

Brachypodium distachyon Association (n=6)

IA2a.4 *Bromus diandrus* is typically co-dominating with *Bromus hordeaceus* in the herb layer with other non-native grasses and herbs such as *Avena* spp., *Erodium botrys*, *Centaurea solstitialis* occurring as sub-dominants…

Bromus diandrus – Mixed herbs Association (n=15)

IA2a.5 *Trifolium hirtum* is typically strongly dominant to co-dominant with *Bromus hordeaceus* in the herb layer with sub-dominant *Avena* spp., *Bromus diandrus*, and *Erodium botrys*. *Lolium perenne* and *Vicia villosa* may or may not be present and co-dominant. *Taeniatherum caput-medusae* is absent or insignificant…

Bromus hordeaceus – (Vicia villosa – Lolium perenne) – Trifolium hirtum Association (n=15)

IA2a.6 *Bromus hordeaceus* is co-dominating with *Erodium* spp. and together typically make up >60% relative cover in the herb layer. *Bromus diandrus*, *Hypochaeris glabra*, and *Avena* spp. are often present as sub-dominants…

Bromus hordeaceus – Erodium botrys Association (n=43)

IA2a.7 *Bromus hordeaceus, Hordeum murinum*, and *Medicago polymorpha* together are typically strongly dominating the herb layer though *Medicago polymorpha* may or may not be present. Other non-natives such as *Erodium* spp., *Bromus diandrus*, and *Bromus madritensis* are often present as sub-dominants…

Bromus hordeaceus – *Hordeum* spp. – *Medicago polymorpha* Association (n=3)

IA2a.8 *Bromus hordeaceus* and *Taeniatherum caput-medusae* are co-dominating and together are strongly dominant in the herb layer. *Lolium perenne* is often present and may co-dominate. Co-dominance of *T. caput-medusae* and *L. perenne* are indicative of high clay soil content leading to soil moisture retention until mid-season…

Bromus hordeaceus – *Taeniatherum caput-medusae* Association (n=12)

IA2.b Annual grasslands dominated by the non-native *Lolium perenne.* Generally, stands occur on heavier (clay) soils than the previous alliance…

***Lolium perenne* Alliance (n=21)**

IA2b.1 *Lolium perenne* is strongly dominant to co-dominant in the herbaceous layer with other non-native grasses and herbs such as *Taeniatherum caput-medusae, Avena* spp*., Bromus hordeaceus, Bromus diandrus*, and *Carduus pycnocephalus.* Native species are typically less than 10% relative cover…

Lolium perenne Association (n=2)

IA2b.2 *Lolium perenne* is strongly dominant to co-dominant in the herbaceous layer with high native herb diversity (though low in cover) that often includes *Centaurium muehlenbergii* as well as *Clarkia purpurea, Brodiaea elegans, Navarretia pubescens, Castilleja attenuata, Madia gracilis, Calochortus luteus*, and *Nassella pulchra*…

Lolium perenne – *(Centaurium muehlenbergii*) Association (n=14)

IA2b.3 *Lolium perenne* is co-dominant in the herbaceous layer with *Hordeum marinum* and/or *Ranunculus californicus*. Other herbs present may include *Leontodon taraxacoides, Vicia villosa, Bromus hordeaceus, and Vulpia bromoides*…

Lolium perenne – *Hordeum marinum* – *Ranunculus californicus* Association (n=5)

IA2.c Tall to mid-sized (0.5-3 m height) non-native annual or biennial herb-dominated stands characterized by species in Brassicaceae such as *Brassica* spp., *Hirschfeldia incana*, or *Sisymbrium* spp. or by species in the genus *Centaurea*, including *C. solstitialis*, *C. stoebe* ssp*. micranthos,* and *C. calcitrapa…*

***Brassica nigra – Centaurea (solstitialis, melitensis)* Alliance (n=12)**

IA2c.1 *Brassica nigra* is strongly dominant in the tall herb layer with other non-native grasses and herbs such as *Hordeum murinum, Avena,* and *Silybum marianum* co-dominating the short herb layer…

Brassica nigra Association (n=4)

IA2c.2 *Centaurea solstitialis* is strongly dominant in the tall herb layer often with *Lolium perenne. O*ther non-native grasses and herbs such as *Trifolium hirtum, Bromus hordeaceus, Medicago polymorpha* often co-dominate the short herb layer…

Centaurea solstitialis Association (n=8)

I.B Herbaceous vegetation characteristic of mesic or somewhat xeric upland settings in mountains or higher foothills, experiencing less summer drought and moisture stress than those types in section 1A (above). Includes cool season annual or perennial upland grassland associated with recent clearings or fires, persistent openings in upland mesic woodlands or shrublands (as found on northerly facing slopes), or of grazed and/or modified edges of meadows and seasonally irrigated pastures (similar to drier conditions of seasonally moist meadows in **1A**)…

Western North American Temperate Grassland and Meadow Macrogroup

IB.1 The non-native annual grasses *Bromus tectorum* and/or *Elymus caput-medusae*, strongly dominate stands. *B. tectorum* is an upland annual most frequently occurring above about 3000 ft in elevation on loamy to sandy soil*. E. caput-medusae* tolerates a wider range of temperatures, and a broader elevation range, but is most common on heavy soils. They are currently placed in the same alliance in the NVC. Most mappable stands will be of *B. tectorum,* in the southern Sierra Foothills study area…

***Bromus tectorum – Taeniatherum caput-medusae* Alliance (n=3)**
in the **Vancouverian and Rocky Mountain naturalized annual grassland Group**

IB1.a *Bromus tectorum* is dominating the herb layer with other non-native grasses and herbs such as *Croton setigerus, Erodium* spp., and *Hordeum murinum*…

Bromus tectorum Association (n=3)

IB.2 Stands are composed of native and non-native perennial turf-forming species or bunchgrasses…

IB2.a Grasslands strongly dominated by non-native perennial grasses of the genera: *Anthoxanthum, Festuca*, *Holcus*, or *Phalaris*. Most stands in the foothills are adjacent to moist, often irrigated pasturelands or meadows that have been grazed regularly by livestock…

Vancouverian and Rocky Mountain naturalized perennial grassland Group

IB2a.1 Grasslands dominated by medium to large bunchgrasses of the genus *Phalaris*…

***Phalaris aquatica – Phalaris arundinacea* Alliance (n=3)**

IB2a.1a *Phalaris aquatica* is co-dominant in the herbaceous layer with *Centaurea solstitialis* and/or *Bromus hordeaceus…*

Phalaris aquatica – Bromus hordeaceus – Centaurea solstitialis Association (n=3)

IB2a.2 Grasslands composed of mostly perennial turf-formers or sub-cespitose grasses…

IB2a.2a Non-native species of *Agrostis* or *Festuca or Poa pratensis* dominant…

***Poa pratensis – Agrostis gigantea – Agrostis stolonifera* Alliance (n=2)**
No Associations defined

IB2a.2b Grasslands dominated by either *Holcus lanatus, Anthoxanthum odoratum*, or both…

Holcus lanatus – Anthoxanthum odoratum* Alliance

IB2.b Grasslands characterized by native perennial species with at least 10% relative cover and with even distribution throughout the stands. They often contain co-dominant non-native annual or perennial species…

Western dry upland perennial grassland Group

IB2b.1 Mesic grasslands typically locally distributed within small openings in oak woodlands and adjacent to moist meadows. Stands characterized or dominated by *Bromus carinatus, Elymus glaucus, and/or Pteridium aquilinum…*

***Bromus carinatus – Elymus glaucus* Alliance (n=4)**

IB2b.1a *Pteridium aquilinum* is always present and typically strongly dominating the herb layer with other native grasses and herbs such as *Bromus carinatus, Elymus glaucus, Asclepias* spp., and *Collinsia heterophylla* though these species tend to be low in cover. Non-native grasses such as *Bromus tectorum* and *B. diandrus* are often present…

Pteridium aquilinum – Grass Association (n=3)

IB2b.1a *Elymus glaucus* is dominant to co-dominant in the herbaceous layer...

Elymus glaucus Association (n=1)

IB2b.2 Grasslands dominated or characterized by small bunchgrasses such as *Poa secunda* and/or *Elymus elymoides*, often with a greater variety of native and non-native annual species in-between. Stands are typical of relatively dry, low precipitation areas in the southern foothills or of rocky, sometimes nutrient-poor soils elsewhere…

***Aristida purpurea – Elymus elymoides – Poa secunda* Alliance (n=15)**

IB2b.2a *Poa secunda* and/or *Elymus elymoides* is characteristic to co-dominant in the herbaceous layer with *Eschscholzia californica, Clarkia cylindrica, and/or Platystemon californicus*. Non-native annual grasses and herbs such as *Erodium cicutarium, Bromus diandrus*, and *Bromus hordeaceus* often have higher cover. This type is more common in southern Sierra Nevada Foothills, less common in northern Sierra Nevada Foothills…

Poa secunda – (Elymus sp.) – Clarkia cylindrica Association (n=15)

GROUP II. Vegetation characterized by grasses, graminoids, or herbs growing in settings that retain moisture for longer periods than surrounding uplands. These conditions may result from temporary to permanent accumulation of water through water flow, seeps and springs, or ponding in seasonally flooded depressions, or in more persistently flooded marshes and shallow lakes. Sites include marshes, vernal pools, wet and moist meadows, irrigated pastures, and alkaline bottomland vegetation.

II.A Seasonally flooded or saturated soils with relatively high salt or alkaline chemistry, often occurring in large basins, or associated with springs emerging from alkaline or salty underlying geologic strata. Often whitish surface deposits or salt/alkaline-tolerant species associated. Most stands in the foothills are small, often near or below the minimum mapping unit…

IIA.1 Small stands dominated or co-dominated with *Distichlis spicata*. Occasionally associated with alkaline springs and seeps in the foothills…

Distichlis spicata Association (n=4)
of the ***Distichlis spicata*** **Alliance (n=4)**
in the **Temperate Pacific tidal salt and brackish meadow Group**

IIA.2 Stands dominated by the perennial fleshy-leafed herb *Suaeda moquinii* or *Isocoma acradenia*. Not common within the ecoregion, usually in small stands in saline settings in lower foothills belt...

Suaeda moquinii **Alliance (n=1)**
in the **Southwestern North American Salt Basin and High Marsh Group**

IIA2.a *Isocoma acradenia* dominates an open shrub canopy, and other shrubs may be sub-dominant. The herb layer is usually well-developed, including natives and non-natives…

Isocoma acradenia Association (n=1)

IIA.3 Alkaline or brackish marsh and meadow stands characterized by non-fleshy-leaved herbs and graminoids…

Southwestern North American alkali marsh/seep vegetation Group

IIA3.a Stands of moist to wet alkaline or saline meadows characterized by broad-leafed flowering herbs including *Anemopsis californica, Helianthus* spp., and/or *Solidago* spp.…

Anemopsis californica – Helianthus nuttallii – Solidago spectabilis **Alliance (n=2)**

IIA3a.1 *Anemopsis californica* is strongly dominant in the herb layer…

Anemopsis californica Association (n=2)

IIA3.b *Sporobolus airoides* is dominant in the herbaceous layer of alkali or saline wetlands. Stands may occur at hot, warm, or cool springs; stands are typically small (below minimum mapping unit)…

Sporobolus airoides Association (n=2)
of the ***Sporobolus airoides – Muhlenbergia asperifolia – Spartina gracilis*** **Alliance (n=2)**

IIA3.c Stands of medium to tall grasses either dominated by the rhizomatous *Leymus triticoides* or by the bunchgrass *L. cinereus*. *Leymus* spp. may be sub-dominant when with non-native annual grasses. Stands are often associated with edges of seeps, marshes, and riparian terraces…

Leymus cinereus – Leymus triticoides **Alliance (n=10)**

Note: *L. cinereus* and *L. condensatus*. (treated under couplet **IA1b.4**) are similar ecologically and morphologically, and may hybridize).

IIA3c.1 *Leymus cinereus* is dominant to co-dominant in the herbaceous layer with *Bromus hordeaceus, Claytonia perfoliata,* and *Leymus condensatus...*

Leymus cinereus Association (n=5)

IIA3c.2 *Leymus triticoides* is dominant in the herbaceous layer with *Bromus diandrus, Lactuca serriola*, and *Bromus tectorum*…

Leymus triticoides Association (n=4)

IIA3c.3 *Leymus triticoides* is co-dominant to sub-dominant in the herbaceous layer with non-native grasses and forbs such as *Bromus diandrus, Bromus hordeaceus, Lactuca serriola*, and *Avena* spp….

*Leymus triticoides – Bromus s*pp. *– Avena* spp. Association (n=1)

IIA3.d Stands dominated by the moderately tall emergent American bulrush (*Schoenoplectus americanus*). Usually of brackish marshes which remain flooded or saturated through the growing season...

Schoenoplectus americanus Association (n=1)
of the ***Schoenoplectus americanus*** **Alliance (n=1)**

II.B Vegetation characteristic of fresh water of varying depth and persistence including, brief-inundation vernal pools, long-persisting shallow lakes, and seasonally saturated soils of wet meadows and seeps, and flooded emergent wetlands…

IIB.1 Vegetation characteristic of vernally moist or flooded swales, ponds, or pools; often underlain by a restrictive soil layer (e.g., claypan, hardpan, or volcanic flow). Characteristic species are native annuals which sort ecologically by different tolerances to inundation and pool depth. Individual stands are often small and form narrow bands, hence, the group level is the most likely mapped unit throughout the study area…

Californian mixed annual / perennial freshwater vernal pool / swale bottomland Group

IIB1.a Stands characterized by the prickly summer-annual genus *Centromadia*, usually of clay-rich soils flooded or saturated in for short periods in the winter…

***Centromadia (pungens)* Alliance (n=3)**
No Associations defined

IIB1.b Stands of deeper vernal pools, or stock ponds, with water persisting later into the dry season, and dominated or co-dominated by stands of *Eleocharis* spp.…

***Lasthenia glaberrima* Alliance (n=9)**

IIB1b.1 *Eleocharis acicularis* and *Eryngium castrense* are both present and often co-dominant in the herbaceous layer…

Eleocharis acicularis – Eryngium castrense Association (n=6)

IIB1b.2 *Eleocharis macrostachya* is dominant in the herbaceous layer in vernal pool settings often with *Hordeum marinum, Damasonium californicum*, and *Orcuttia tenuis*. For non-vernal pool settings see the *Eleocharis macrostachya* Association of the *Calamagrostis canadensis – Carex utriculata* Alliance…

Eleocharis macrostachya Vernal Pool Association (n=3)

IIB1.c Stands of vernal pools of moderate depth and inundation characterized by *Lasthenia fremontii, Downingia bicornuta,* and other *Downingia* species…

***Lasthenia fremontii – Downingia (bicornuta)* Alliance (n=37)**

IIB1c.1 *Downingia cuspidata* and/or *Downingia bicornuta* is co-dominant to characteristically present in the herbaceous layer with *Navarretia leucocephala, Eleocharis macrostachya, Psilocarphus brevissimus*, and *Lasthenia californica*…

Downingia (bicornuta, cuspidata) Association (n=10)

IIB1c.2 *Eryngium castrense* is co-dominant to characteristically present in the herbaceous layer with *Plagiobothrys stipitatus, Navarretia leucocephala*, *Psilocarphus* spp., and *Deschampsia danthonioides. Eleocharis macrostachya, Lasthenia fremontii, Downingia ornatissima,* and other *Downingia* spp. are typically absent or inconspicuous…

Eryngium (vaseyi, castrense) Association (n=12)

IIB1c.3 *Lasthenia fremontii* is dominant to characteristically present in the herbaceous layer with *Deschampsia danthonioides*, *Limnanthes douglasii, Eryngium* spp., and *Navarretia leucocephala*…

Lasthenia fremontii Association (n=6)

IIB1c.4 *Lasthenia fremontii* and *Downingia bicornuta* are together and characteristically present in the herbaceous layer with *Psilocarphus tenellus, Deschampsia danthonioides*, and *Plagiobothrys stipitatus*…

Lasthenia fremontii – Downingia bicornuta Association (n=2)

IIB1c.5 *Downingia ornatissima* is characteristically present in the herbaceous layer with *Lasthenia fremontii, Deschampsia danthonioides, Navarretia leucocephala*, and *Eryngium castrense*…

Lasthenia fremontii – Downingia ornatissima Association (n=7)

IIB1.d Stands of vernal pool margins and swales, generally in the northern Sierra Nevada foothills**…**

***Layia fremontii – Achyrachaena mollis* Alliance (n=29)**

IIB1d.1 *Layia fremontii* and/or *Achyrachaena mollis* is co-dominant to characteristically present in the herbaceous layer with *Triphysaria eriantha, Lasthenia californica, Vulpia microstachys*, and *Taeniatherum caput-medusae*…

Layia fremontii – Achyrachaena mollis Association (n=24)

IIB1d.2 *Zigadenus fremontii* is characteristically present in the herbaceous layer with non-native grasses and forbs such as *Lolium perenne, Taeniatherum caput-medusae*, and *Geranium dissectum…*

Zigadenus fremontii – Lolium perenne Association (n=4)

IIB1.e Stands of shallow vernal pools and pool margins throughout the Sierra foothills, characterized by *Montia fontana* and *Sidalcea calycosa*…

Montia fontana – Sidalcea calycosa Association (n=1)
of the ***Montia fontana – Sidalcea calycosa* Alliance (n=1)**

IIB1.f Stands of swales and moist rocky vernal pool margins throughout the foothills with *Trifolium variegatum*. *T. variegatum* is dominant in the herbaceous layer or co-dominant with a variety of other native and non-native herbs…

***Trifolium variegatum* Alliance (n=47)**

IIB1f.1 *Hypochaeris glabra* and/or *Leontodon saxatilis* are present to co-dominant with *Trifolium* spp. in the herbaceous layer. Other species present may include *Vulpia bromoides, Lupinus bicolor, Erodium botrys, Bromus hordeaceus*, and *Castilleja attenuata*…

(*Trifolium variegatum – Vulpia bromoides*) – *Hypochaeris glabra – Leontodon saxatilis* Association (n= 8)

IIB1f.2 *Trifolium variegatum* is dominant to strongly dominant in the herbaceous layer with *Lolium perenne, Juncus bufonius*, and *Mimulus guttatus*. *Juncus bufonius, Hypochaeris glabra, Leontodon taraxacoides, Vulpia bromoides,* and/or *Lolium perenne* may be present as sub-dominants. *If Juncus bufonios co-dominates with T. variegatum, key to the T. variegatum – J. bufonius Association*…

Trifolium variegatum Association (n=21)

IIB1f.3 *Juncus bufonius* is dominant or co-dominant with *Trifolium variegatum*. *Hordeum*

marinum is characteristically present. This type may reflect wetter conditions or a longer period of inundation than the *T. variegatum* Association, and *Juncus bufonius* can be sub-dominant to *Trifolium variegatum* when other species of wetter conditions are present such as *Isoetes* spp., *Limnanthes alba*, *Eleocharis macrostachya* and/or *Lythrum hyssopifolia* …

Trifolium variegatum – Juncus bufonius Association (n=18)

IIB.2 Stands of native herbs and graminoids not of small isolated or shallow pools, but of wet to moist meadows, and riparian margins, typically seasonally flooded or saturated and may dry mid- to late summer, and typically not of alkaline or saline areas…

Californian Warm Temperate Marsh/Seep Group

IIB2.a Stands of moist meadows or upper edges of marshes dominated by broad-leafed wetland herbs such as *Euthamia occidentalis* or *Artemisia douglasiana*…

Artemisia douglasiana Association (n=2)
of the ***Bidens cernua – Euthamia occidentalis – Ludwigia palustris*** **Alliance (n=2)**

IIB2.b Stands associated with moist to seasonally flooded alluvial terraces of rivers and streams, dominated by *Carex barbarae,* which forms a coarse turf often adjacent to riparian woody alliance stands…

Carex barbarae Association (n=2)
of the ***Carex barbarae*** **Alliance (n=2)**

IIB2.c Stands are open, usually associated with rocky or bouldery active stream channels, characterized and typically dominated by cespitose tufts of *Carex nudata*. *C. praegracilis* or *C. serratodens* may be co-dominating…

Carex nudata Association (n=2)
of the ***Carex nudata*** **Alliance (n=2)**

IIB2.d Stands characterized by *Juncus effusus, J. patens*, *Carex praegracilis*, *C. pansa*, *C. serratodens* and/or *C. densa*…

Juncus (effusus, patens) – Carex (pansa, praegracilis) **Alliance (n=8)**

IIB2d.1 *Carex densa* is strongly dominant to co-dominant in the herb layer with *Eleocharis macrostachya, Lolium perenne*, and/or *Mimulus guttatus*…

Carex densa Association (n=2)

IIB2d.2 *Carex praegracilis* is strongly dominant in the herb layer…

Carex praegracilis Association (n=1)

IIB2d.3 Stands dominated by the tufted large rush *Juncus effusus*, of moist to wet meadows and swales…

Juncus effusus Association (n=3)

IIB2d.4 Stands characterized by the turf forming to sub-cespitose serpentine wetland species, *Carex serratodens*, often restricted to serpentinite soils…

Carex serratodens Association (n=1)

IIB2.e Stands characterized by *Eleocharis macrostachya.* Stands are not of vernal pools…

Eleocharis macrostachya Association (n=22)
of the ***Carex utriculata – Calamagrostis canadensis*** **Alliance (n=22)**

IIB2.f Stands are characterized by persistently saturated or moist soil well into the summer months and dominated by turfs of "Iris-leafed" rushes such as *Juncus oxymeris*, or *J. xiphioides*…

Juncus (oxymeris, xiphioides) **Alliance (n=4)**

IIB2f.1 *Juncus oxymeris* is present and characteristic in the herbaceous layer with *Symphyotrichum eatonii, Poa trivialis, Carex densa* and *Phalaris aquatica*…

Juncus oxymeris Association (n=2)

IIB2f.2 *Juncus xiphioides* is present and characteristic in the herbaceous layer with *Eleocharis acicularis, Eryngium castrense,* and *Hordeum marinum*…

Juncus xiphioides Association*

IIB2.g Stands are usually of moist meadows or edges of more permanently saturated meadow sites characterized by turfs of rhizomatous *Juncus* in the *Juncus arcticus* complex (including *J. balticus* and *J. mexicanus*)…

Juncus arcticus **(var. *balticus*, *mexicanus*) Alliance (n=23)**

IIB2g.1 *Juncus balticus, Juncus mexicanus*, and/or *Juncus arcticus* is strongly dominant to co-dominant in the herbaceous layer with *Lolium perenne, Hordeum marinum*, and *Geranium dissectum*…

Juncus arcticus var. *balticus* – (var. *mexicanus*) Association (n=16)

IIB2g.2 *Juncus arcticus* and *Carex praegracilis* are co-dominant in the herbaceous layer. Other species such as *Leymus triticoides, Distichlis spicata,* and *Solidago velutina* may also be present and are typically sub-dominant…

Juncus arcticus var. *balticus – Carex praegracilis* Association (n=4)

IIB2.h Stands are characterized by conspicuous large tufts *Muhlenbergia rigens* often near seeps or moist banks of small streams or on riparian terraces. In some cases, may signify former Native American occupancy sites…

Muhlenbergia rigens **Alliance (n=10)**

IIB2h.1 *Muhlenbergia rigens* is co-dominant in the herbaceous layer with *Bromus hordeaceus*, *Trifolium hirtum*, and/or *Lolium perenne…*

Muhlenbergia rigens Association (n=9)

IIB2.i Stands characterized by horsetails (*Equisetum* spp.), usually in areas frequently disturbed by flooding, mowing, or other mechanical disturbances (often on levee margins, or on sand bars of streams)…

***Equisetum (arvense, variegatum, hyemale)* Alliance (n=1)**
No Associations defined

IIB2.j Stands dominated by the *Mimulus guttatus*, associated with seasonally wet or flowing streams, seeps, and moist rock outcrops. Most stands are small (below minimum mapping unit size)…

***Mimulus guttatus – Cirsium* spp. – *Stachys* spp. Alliance (n=20)**

IIB2j.1 *Mimulus guttatus* is typically co-dominant in the herbaceous layer with other moist herbs such as *Lolium perenne, Polypogon monspeliensis, Trifolium variegatum*, and *Juncus bufonius.* Often associated with stream sides or perennial springs…

Mimulus guttatus Association (n=10)

IIB2j.2 *Mimulus guttatus* is co-dominant in the herbaceous layer with *Vulpia microstachys*. Other herbs present may include *Lotus unifoliolatus, Pseudobahia heermannii*, and *Eschscholzia californica*. This type is often found in moist, rock outcrop settings or on serpentine where soils may dry out more quickly than the stream side settings and perennial springs that the *Mimulus guttatus* Association above often occurs in…

Mimulus guttatus – Vulpia microstachys Association (n=7)

IIB2.k Stands are dominated by coarse broad-leafed annual or biennial herbs including *Xanthium strumarium, Melilotus officinalis,* and *Polypogon monspeliensis* associated with wetland borders such as river margins, reservoir margins, or managed marshes with fluctuating water levels…

***Polygonum lapathifolium – Xanthium strumarium* Alliance (n=8)**

IIB2k.1 *Xanthium strumarium* is characteristic and often dominant in the herbaceous layer.…

Xanthium strumarium Association (n=4)

IIB2.l The perennial herb *Artemisia dracunculus* is dominant to co-dominant with an assortment of other annual and perennial herbs, including *Achillea millefolium, Bromus diandrus, Clarkia cylindrica*, and *Claytonia perfoliata*. Stands are small and associated with sandy riparian terraces and alluvial benches along streams, rivers, and meadow edges.

Artemisia dracunculus Association (n=4)
of the ***Artemisia dracunculus* Alliance (n=4)**

in the **California annual herb/grass Group**

IIB.3 Stands are characterized by strong dominance of non-native ruderal grasses often in human-disturbed sites that are moist to wet areas…

Naturalized warm-temperate riparian and wetland Group

IIB3.a *Cynodon dactylon* is dominant in the herbaceous layer. Other non-native and disturbance related species are abundant. Non-native cover is typically >80% relative cover. Stands are usually found in wet areas and riparian margins. Other wetland graminoids (*Juncus* spp., *Carex* spp.) may also be present…

Cynodon dactylon Association (n=1)
of the ***Cynodon dactylon – Crypsis* spp. – *Paspalum* spp. Alliance (n=1)**

IIB.4 Vegetation of regularly flooded freshwater sites including marshes with emergent vegetation, and shallow ponds and lakes, with floating or submerged vegetation…

IIB4.a Stands dominated by the moderately tall emergent American bulrush (*Schoenoplectus americanus*). Usually of brackish marshes which remain flooded or saturated through the growing season.

Schoenoplectus americanus Association (n=1)
of the ***Schoenoplectus americanus* Alliance (n=1)**
in the **Southwestern North American alkali marsh/seep vegetation Group**

IIB4.b Stands of marshes with persistent standing water through much of the growing season…

Western North American Freshwater Marsh Macrogroup
Arid West freshwater emergent marsh Group

IIB4b.1 *Schoenoplectus acutus* and/or *Schoenoplectus californicus* is dominant in the herbaceous layer or co-dominant when with *Typha* spp.…

***Schoenoplectus (acutus, californicus)* Alliance (n=7)**

IIB4b.1a *Schoenoplectus acutus* is dominant in the herbaceous layer…

Schoenoplectus acutus Association (n=5)

IIB4b.1b *Schoenoplectus acutus* is co-dominant in the herbaceous layer with *Typha* spp…

Schoenoplectus acutus – Typha domingensis Association (n=2)

IIB4b.2 *Typha domingensis* and/or *T. latifolia* dominant in the herbaceous layer. If *Schoenoplectus acutus* is present it is sub-dominant…

Typha (domingensis, latifolia) Association (n=7)
of the ***Typha (angustifolia, domingensis, latifolia)* Alliance (n=7)**

IIB4.c Stands are characterized by the shorter emergent or aquatic grass *Glyceria x occidentalis*, which appears to be of hybrid origin and occupies some shallow ponds and other wetlands scattered in the Sierra Nevada Foothills. May be below minimum mapping unit size…

Western Cordilleran montane-boreal summer-saturated meadow Group
Glyceria* ×*occidentalis* Provisional Alliance

IIB4.d Stands of vegetation dominated by aquatic plants, having leaves or stems supported at least in part by the water column…

Western North American Freshwater Aquatic Vegetation Macrogroup

IIB4d.1 Stands dominated by floating or attached mats of introduced *Ludwigia* spp.…

Ludwigia (hexapetala, peploides) Association (n=2)
of the ***Ludwigia (hexapetala, peploides) – Eichhornia crassipes* Alliance (n=2)**
in the **Naturalized temperate Pacific freshwater vegetation Group**

IIB4d.2 *Azolla filiculoides* or *Azolla mexicana* (*A. microphylla*) dominates or characterizes stands on water or wet ground surfaces. If *Lemna* is co-dominant, key to this alliance…

Azolla* (*filiculoides, microphylla*) Alliance
in the **Western North American Temperate Freshwater Aquatic Vegetation Group**

IIB4d.3 Stands characterized by native floating or submerged-leafed species such as *Ranunculus aquatilis* or *Callitriche* spp. Generally, below minimum mapping unit size…

***Ranunculus aquatilis – Callitriche palustris – Callitriche heterophylla* Alliance (n=2)**
in the **Western North American Temperate Freshwater Aquatic Vegetation Group**

IIB4d.3a *Ranunculus aquatilis* is co-dominant with *Callitriche heterophylla…*

Ranunculus aquatilis Association (n=2)

IIB4d.4 *Lemna* spp. is dominant in stands. Other aquatic species are often present at low cover…

***Lemna (minor)* and Relatives Alliance (n=1)**
No Associations defined

Group III. Sparsely vegetated (<10% absolute cover) stands occurring on steep boulder covered slopes or on steep canyon slopes. *Ericameria cuneata* is dominant or co-dominant with *Toxicodendron diversilobum*, *Diplacus aurantiacus* or *Eriodictyon californicum.* A high cover of lichen, moss and/or *Selaginella* spp. is usually present.

Californian Cliff, Scree & Rock Vegetation Group

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 moister 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

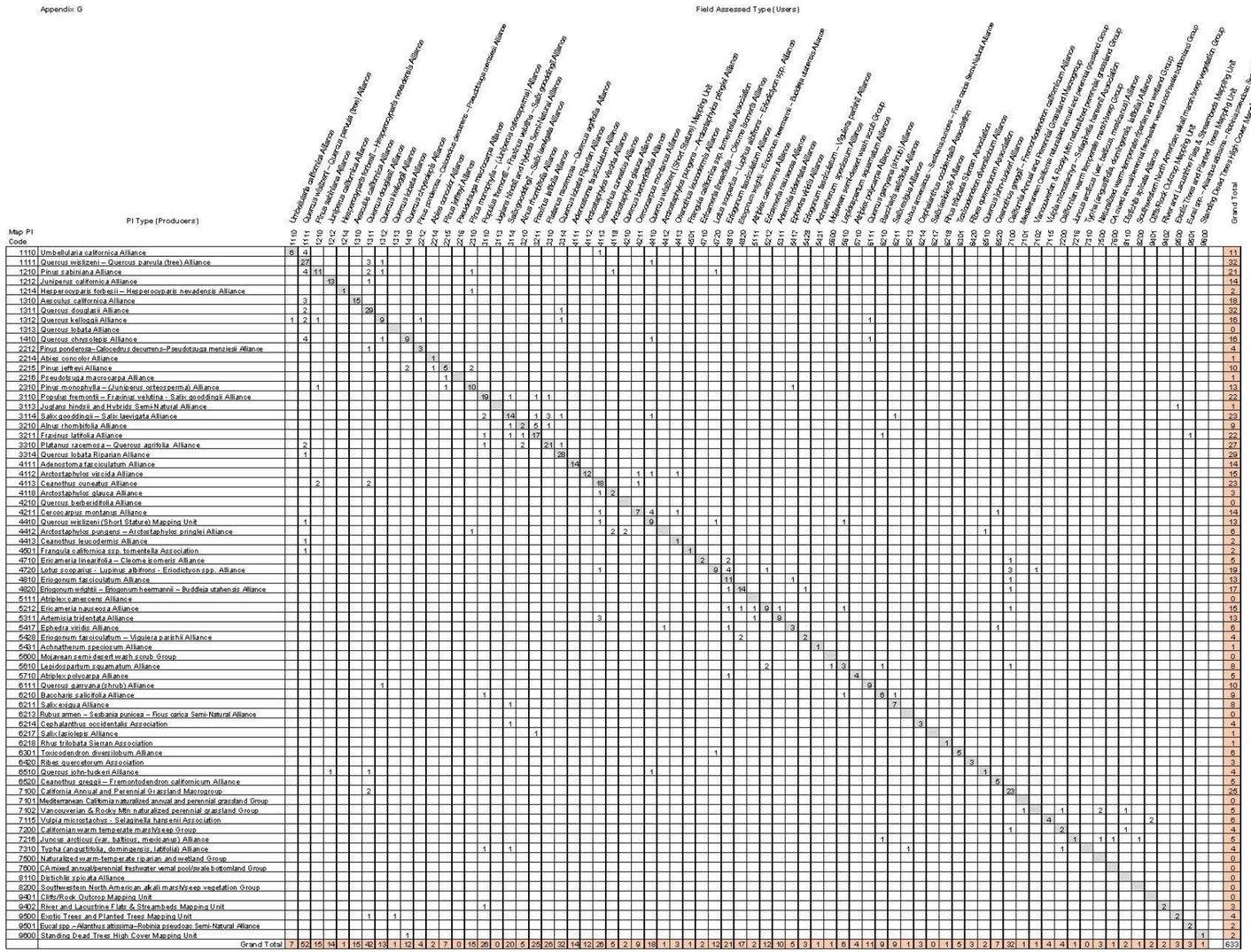
- **G3 and S3** – Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors. Often 21–100 viable occurrences and/or 2,590–12,950 hectares.
- **G4 and S4** – Apparently Secure—Uncommon but not rare; some cause for 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

APPENDIX G - Contingency Tables for the Southern Sierra Nevada Study Area

The following contingency table is for the Southern Sierra Nevada Foothills study area, giving the user a regional perspective of the types encountered in the region. Contingency tables are only for the mapped Alliance and Association levels of the classification.

Contingency Table for the Southern Sierra Nevada Study Area



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