Orange County Vegetation Mapping Update 2025
Final Vegetation Mapping Report
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Aerial Information Systems, Inc.
Redlands, California

California Native Plant Society

Natural Communities COALITION
restoration | management | partnership

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1.0 Introduction

Aerial Information Systems, Inc. (AIS) was contracted by the Natural Communities Coalition (NCC) to create an updated fine-scale vegetation map of the regional database developed by AIS in 2012-2015. The mapping area covers approximately 86,000 acres of open space and adjacent urban and agricultural lands, including habitat located in both the Central and Coastal Subregions of Orange County. The updated map was prepared over a baseline digital image created in 2022 by the U.S. Department of Agriculture – Farm Service Agency's National Agricultural Imagery Program (NAIP). Vegetation units were mapped using the National Vegetation Classification Standard (NVCS) to the alliance level, where possible, as depicted in the online version of A Manual of California Vegetation (MCV) (CNPS 2025).

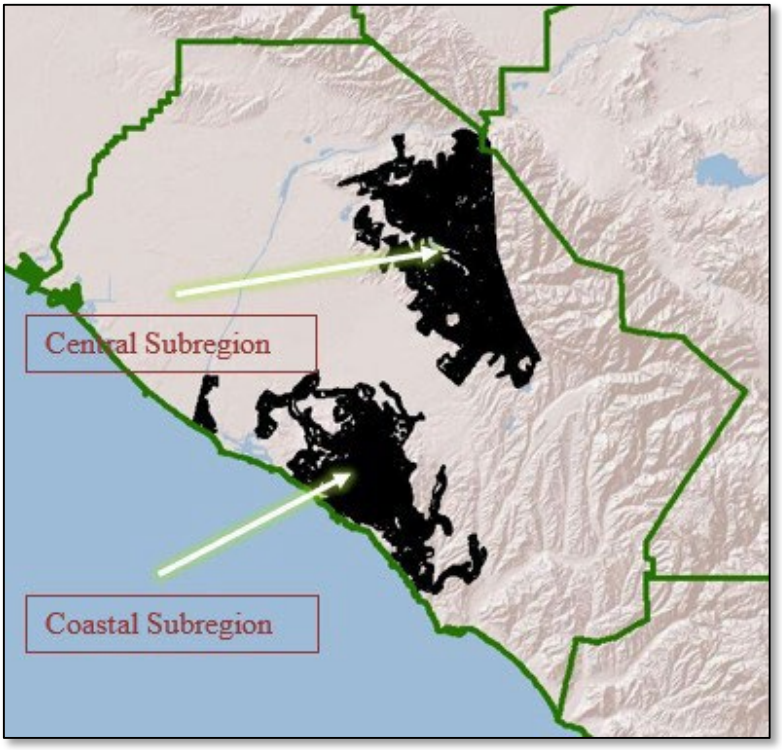
One of the most important data layers used to guide the conservation planning process for the 1996 Orange County Central & Coastal Subregion Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) was the regional vegetation map created in the early 1990s by Dave Bramlett and Jones & Stokes Associates, Inc. (1993). Up until 2015, this map was used to direct monitoring and management efforts in the NCCP/HCP Habitat Reserve. In 2013 AIS was contracted by the Nature Reserve of Orange County (NROC – now NCC) to create an updated regional vegetation map to 2012 conditions, completed in 2015. Refer to AIS (2015) for reporting on the 2012 update.

An updated map is necessary in order to address changes in vegetation composition due to widespread and multiple burns, urban expansion, and broadly occurring vegetation succession that has occurred over the past 30 years since the original map was created, and over the last 10 years since the last update of the vegetation map was completed.

The California Native Plant Society (CNPS) completed an accuracy assessment of the 2012 vegetation data and conducted a trend analysis comparison between the 1992 and 2012 vegetation maps, both of which were documented in a report produced by CNPS (Buck-Diaz & Evens 2015). For the current mapping effort, CNPS again conducted an accuracy assessment of the newly created 2022 image-based map and completed a change detection trend analysis between the 2012 vegetation map and the 2022 updated vegetation data, both of which are documented in a separate report produced by CNPS (Buck-Diaz et al., 2025).

1.1 Study Area – Subregional Descriptions

The Orange County mapping effort covers 85,705 acres and consists of two separate subregions, one located in the northern portion of the Santa Ana Mountains with adjacent inland portions of the coastal plain; the other to the south, which is located in the San Joaquin and Laguna Hills from Newport Beach south towards the town of Dana Point. The study area is bisected by two ecological sections as defined by the U.S. Department of Agriculture Ecological Sections of California. The Coastal Subregion falls entirely within the Southern California Coastal Section (261B) and the Central Subregion falls partially within the Section 261B, while the higher elevation portions of this subregion just overlap into the Southern California Mountains and Valleys Section (M262B).



1.1.1 The Central Subregion

The Central Subregion contains slightly over 48,670 acres, which includes extensive stands of chaparral and coastal scrub, riparian forests and woodlands, and higher elevation stands of cypress. The subregion is characterized by the Santa Ana Mountains, which is the major mountain chain of the coastal portions of the Peninsula Ranges in California. Elevations within this subregion range from just over 300’ in the southwestern corner to over 2700’ along the eastern perimeter of the study above Black Star Canyon. Santiago Creek bisects the subregion and parallels a portion of the southeastern boundary where it enters the mapping area near the town of Modjeska. The creek flows northwesterly, empties into the Santiago Reservoir, and finally exits the

study area just west of Rattlesnake Peak. Fremont Canyon, which is a major watershed of Santiago Creek, trends southwest and joins Santiago Creek just below the Santiago Reservoir. In the northernmost reaches of the Central Subregion, Gypsum and Coal Canyons trend nearly due north and exit the study area just south of the Santa Ana River.

Virtually all of the vegetation within the California Xeric Chaparral Group (~7500 acres) falls within this subregion and includes all four of the major alliances; *Adenostoma fasciculatum, Ceanothus crassifolius, C. megacarpus,* and the mixed *A. fasciculatum – Salvia mellifera* Alliance. Small stands of the higher elevation pre-montane chaparral are also found along the eastern margins of the subregion. Oak woodlands are broadly represented in both riparian and more xeric canyon side slopes with over 2900 acres mapped in all. Perhaps the most unique vegetation in the mapping area occurs in the higher elevations of the northeastern portion of the subregion; that being the stands of Tecate cypress, which burned in the 2006 Sierra Peak Fire. Nearly 35% of the southern portion of the Central Subregion burned in 2020 and an additional 20% burned in the north in 2017.

1.1.2 The Coastal Subregion

The Coastal Subregion contains slightly over 37,000 acres of maritime chaparral and coastal scrub, coastal saltmarsh, and riparian (thicket, woodland, and forest) vegetation.

The landscape is dominated by the San Joaquin Hills consisting of numerous small coastal canyons and hills from Buck Gully on the north and Niguel Hill to the south. Outlier areas include San Juan Canyon to the south and Upper Newport Bay and the Santa Ana River wetlands to the north. Over a quarter of the vegetation mapped within this subregion falls within the Central & South Coastal Californian Coastal Sage Scrub Group (~10,290 acres), as defined by the NVCS and include all of the major drought deciduous alliances found in the mapping area. The Coastal Subregion includes about 2500 acres of maritime chaparral communities, dominated by, but not limited to, the *Rhus integrifolia* Alliance. Included in this maritime chaparral are patches of the relatively uncommon *Quercus dumosa* Alliance. This subregion also contains stands dominated by coastal occurrences of the *Ceanothus megacarpus* Alliance.

2.0 Orange County Vegetation Mapping Methodology

2.1 Overview

Since the current project is an update of the 2012 vegetation map, the project retained the same mapping classification (Appendix A) and mapping criteria used in the 2012 mapping endeavor. The goal was to update the vegetation map units based on the 2022 NAIP imagery for changes that had occurred since the previous mapping.

The initial step of the mapping effort was the review and comparison of the original dataset to the 2022 NAIP base imagery by the photo interpreters. Areas of substantial change and/or questionable photo signatures were noted and flagged so that they could be visited during the field reconnaissance trip. During the field reconnaissance effort AIS staff, accompanied by ecologists, reviewed the existing vegetation mapping classification and floristic key, collected GPS waypoints and associated ground photos, observed image-based photo signatures correlated to ground conditions, and visited flagged problematic areas.

After the field reconnaissance trip the production-level mapping and update process commenced. Using the field data, the information was correlated to the existing 2012 vegetation database and new base imagery. Existing collateral reference datasets depicting topography, climate, and past field surveys, aided photo interpreters in their delineations and floristic assignments during the production effort. Mappers also had at their disposal the 2012 floristic classification ground data, the final floristic vegetation key, and the vegetation type descriptions from the 2012 project.

During the map production effort, one ground-based verification trip was undertaken to validate the general trends and models established by the photo interpreters, and to answer any mapping questions that arose during the mapping phase of the project. Any flawed assumptions were corrected during this effort and any mapping completed thus far was subsequently adjusted accordingly.

After the field verification data revisions were completed, the draft map product was then finalized and delivered to CNPS for Accuracy Assessment (AA). CNPS, under a separate contract, completed the AA field data collection, analysis, and scoring. Results from the AA effort were then analyzed by photo interpreters, and any ensuing questions were addressed by CNPS ecologists. The AA was then finalized by CNPS and a final AA score recorded. The final AA database was delivered to AIS, who then updated the vegetation map with the AA information, i.e., incorrect map calls were corrected to the ground-based AA point calls and, where appropriate, additional corrections and refinements were made to other polygons based on trends established from the AA database results.

2.2 Project Materials

2.2.1 Imagery Sources

All vegetation delineations and floristic assignments are referenced spatially and temporally to the 2022 NAIP 1-meter resolution natural color imagery. The 2022 NAIP imagery captures conditions in the mapping area shortly after the onset of the dry season in the month of June and, additionally, depicts conditions after a lower-than-normal rainfall season. Also available was the 2022 Hexagon 15cm resolution natural color and color infrared imagery that is based on the 2022 NAIP imagery.

Although the NAIP 2022 imagery serves as the baseline dataset, other image datasets, such as Google Earth (GE) of various dates, aided photo interpreters in defining floristic types, delineating vegetation stands, and helped to finalize vegetation coding decisions. The 2012 NAIP 1-meter imagery that was the base for the 2012 mapping was also used for reference, as was the 2012 high resolution 3-inch imagery (HR-2012).

2.2.2 Ancillary Data

The following is a list of other datasets used by the photo interpreters in the mapping process.

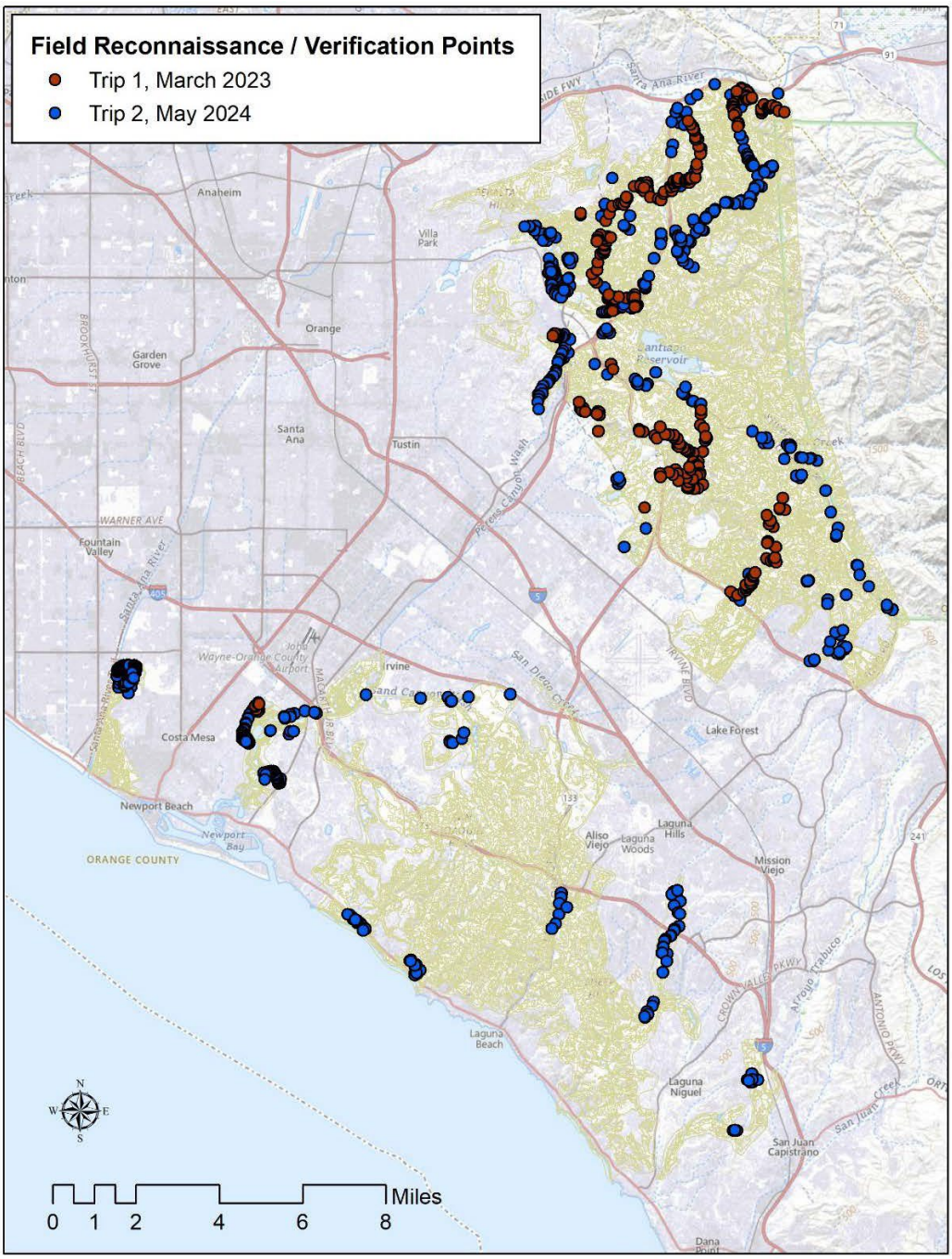
- NROC Vegetation Update 2012 database – provided by NCC
- Orange County Fire Authority fire history map database – provided by NCC
- NROC Vegetation Map 2012 Floristic Classification plot data – AIS
- AIS 2012 Reconnaissance and Verification field data - AIS
- CNPS 2012 Accuracy Assessment field data - AIS
- USGS topographic DRG – AGOL
- 2020 updated Upper Newport Bay habitat map database – Merkel and Associates through NCC

2.2.3 Mapping Classification

The 2022 vegetation update used the same mapping classification as the 2012 project (Appendix A) and is based on the floristic classification (AECOM, 2013), Manual of California Vegetation Second Edition (Sawyer et al., 2009), and the updated project floristic vegetation key (see Buck-Diaz et al., 2025). However, the final mapping classification reflects what the photo interpreters can identify from existing imagery. The mapping classification typically mirrors the floristic key, but more detailed map unit descriptions for the project are tailored to represent nuances within the NCC study area (Appendix C). Mapped types were characterized generally to the alliance-level in the NVCS hierarchy where possible, and to more generalized categories (e.g., group or macrogroup) for most herbaceous vegetation or where the photo interpreters were unable to assign shrub and tree types to a specific alliance.

2.3 Field Reconnaissance and Verification

The field reconnaissance trip took place in June of 2023 and the field verification effort of the preliminary updated map occurred in May of 2024. The field crew for both trips consisted of two photo interpreters from AIS, Todd Keeler-Wolf, a private consulting ecologist, and Jennifer Buck-Diaz, an ecologist from CNPS. The figure below shows the locations of the field reconnaissance/verification sites:



Field reconnaissance/verification visits serve two major functions. First, they enable photo interpreters to relate the vegetation ground conditions at each observation site to the signatures on the aerial imagery. Second, with guidance from ecologists in the field, the photo interpreters become familiar with the flora, vegetation assemblages, and local ecology of the study area to understand the ecological nuances of the vegetation. At the same time, ecologists gain understanding from the photo interpreters' perspective about assessing vegetation through the framework of map production forming better collaboration and communication to create a better vegetation map of the region.

Prior to the field reconnaissance AIS staff reviewed the 2012 and 2022 digital imagery, fire data maps, and the floristic classification in order to target areas that have changed since the 2012 vegetation map was created and other areas of interest. Additionally, targeted areas to visit during the reconnaissance trip included polygons that were originally mapped as seral types on the 2012 database to ascertain the change in vegetation, and obtain a better understanding of the types of change that might occur in previously burned areas.

During field trips, the crew traversed the area stopping at sites to observe the vegetation assemblages of interest. Field site locations visited were recorded on a tablet using the Field Maps application software for ArcGIS. Ground photos were taken at selected locations and later compared to the imagery and the field site notes. Areas encountered in transit, as well as areas of floristic or biogeographical significance, were visited in the field as observation points. A single observation point may have contained information about more than one stand. It was also possible for a given stand to be assessed in multiple places. In addition, observation points were frequently taken to mark the transition between vegetation types, with the intent of helping photo interpreters to determine the edges of stands. Some stands of vegetation were remotely observed at a distance with the aid of binoculars with the location and corresponding information recorded on the tablet. At the completion of the field visit, the records collected were input into a geodatabase for easy reference by the photo interpreters.

The field verification visit served to confirm the interpretations of vegetation units mapped in the office and to answer mapping questions related to troublesome photo signatures or confusing vegetation assemblages. In addition, during the trip the field team spent time using and testing the mapping classification and key for modifications by CNPS, as necessary.

It should be noted that coordinating the verification trip was challenging. Following a decade of extreme drought the project area experienced two recent years of wet winter weather with the occurrence of a series of intense successional storm events making it difficult to schedule the field verification effort. Road conditions after each storm event made field travel impossible with most vehicle-accessible roads in the preserves being

closed by the authorizing agencies. This delayed the verification effort by a few months allowing for sufficient time for the roads to reopen. Even after the roads were reopened the field crews were hampered by damaged roads not scheduled for repairs in the near future.

2.4 Photo Interpretation and Mapping Procedures

The photo interpretation and mapping procedures for the 2022 update is the same as those used for the 2012 mapping effort. The following is a brief synopsis of the process:

2.4.1 Photo Interpretation Process

Photo interpretation is the process of identifying map units based on their photo signature. All land cover features have a range of photo signatures that 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 on the digital image or map.

It should be noted that vegetation stature as well as the scale and resolution of the aerial imagery determine the visibility of individual plants for photo interpretation. 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, play an important part in the photo interpretation decision-making process. Knowledge of these factors, and how plant communities respond to them, guides a photo interpreter in choosing from among plant types with similar photo signatures. Ultimately, 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 color, clarity, and ground conditions.

The detailed descriptions of each vegetation type mapped in the study area, found in Appendix C, include examples of the types of information the photo interpreters incorporate into their understanding of the models. Some examples of these models include how one alliance may favor broad floodplains, while another is found in the immediate fringe of narrow well-defined channels. Some alliances may flourish on disturbed sites, while others cannot tolerate multiple frequencies of high intensity disturbance events such as fire. Moreover, some alliances are ubiquitous and found in a variety of settings.

These descriptions also discuss the importance 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 membership rules regarding relative cover factor into the intelligent delineation of vegetation polygons.

2.4.2 Mapping Process

Just as the use of biogeographical models by experienced photo interpreters contribute to the production of a high-quality vegetation map, the use of reliable mapping procedures allowed the map to be produced in a highly efficient manner. For example, the study area was divided into three modules. This expedited project workflow by enabling several staff members to work on the mapping effort simultaneously.

Using an on-screen heads-up digitizing method, the photo interpreters had at their disposal a suite of standard and custom ArcMap tools to facilitate the creation of polygons. The photo interpreters generally viewed the imagery at scales ranging from 1:1000 to 1:4000. They used variations in signature on the aerial imagery and the ecological models to draft boundaries separating areas of different vegetation types and/or distinct categories of percent cover of several stature levels. To assist in boundary placement and coding decisions, photo interpreters also referenced supplemental imagery, field data, and other ancillary data. These sources were displayed in the ArcMap session as needed.

Photo interpreters then assigned a map classification code and other attribute values to each polygon in the vegetation database. A custom menu was developed by GIS staff that enabled code values to be assigned to their corresponding spatial extent efficiently and minimizing the possibilities for entry errors. The mapping attribute codes were entered into the database as numeric values, which are easier to input and manipulate than alphanumeric codes or using drop-down menus. Numeric code values also allow for the hierarchical grouping of like or related vegetation communities, assisting the mapper to know at a glance, which alliances are found in a particular hierarchical grouping. Numeric code values were automatically correlated with the actual vegetation type names.

The modules were edge-matched and checked for invalid codes and topology errors. Once finished, they were joined into one seamless geodatabase. The geodatabase was subject to further processing and review by a senior staff member before being delivered to the client. Quality control procedures implemented during the mapping effort and before final delivery of the data improved the consistency and accuracy of the overall geodatabase.

2.4.3 The Update Process

It was assumed that the 2012 mapping and attribution were correct because it had gone through and passed the accuracy assessment process in 2014. In order to update the 2012 vegetation database as completely and efficiently as possible AIS opted to modify the original 2012 database rather than remap the area from scratch using the 2022 imagery. As a result, AIS retained the 2012 delineations and codes in the geodatabase, and added a new set of attribute fields specific to the 2022 mapping. Using this method resulted in coincident polygon boundaries matching in both datasets and not creating unnecessary slivers and noise in the data. If issues were found with the original delineations in the 2012 database the linework was corrected in the new database. The revised 2012 vegetation database was delivered with the 2022 updated database and replaces the original. In general, the update used the following method:

- If a polygon represented a situation of no change, then the polygon was retained and the 2012 attributes copied over to the 2022 attribute fields.
- If a polygon delineation did not change, but some attribute of the polygon did change, e.g., cover density, then all 2012 attributes were copied over to 2022 and the affected attribute(s) modified for 2022.
- If there was a change to a polygon boundary, either partially or in whole, then the polygon extent was modified by adding appropriate linework to represent the change. The previous line work and coding would not be deleted or merged, preserving the 2012 attributes to represent the 2012 condition. All affected polygons representing the change were coded for their corresponding 2022 attributes. Note: In order to make a change the area of change needed to meet the project 1-acre MMU for upland types and .5 acre for wetlands or other special types, and/or a difference of 30 feet for linework to be captured as change.

2.4.3.1 Update Considerations

The following are guidelines for common categorical situations encountered that tended to produce change.

Fire

Two major fires have occurred within the northern portion (Central Subregion) of the study area since the 2012 NAIP base imagery (used for mapping the 2012 vegetation database) was taken. The more recent Silverado fire occurred in October of 2020, burning less than half of the southern part of the Central Subregion. The Canyon II fire occurred in October of 2017, covering less than a quarter of the northern portion of the Central Subregion. The two fires did not overlap one another. Both burned areas were visited, and field observations and criteria assumptions were discussed with the ecologists, Todd Keeler-Wolf and Jennifer Buck-Diaz, while in the field. Guidelines were

developed to aid the mappers in determining how to update the vegetation types within these areas. The assumptions, based on field observations, and discussion follow:

2020 Silverado Fire

Since the Silverado fire occurred 2 years before the 2022 base imagery was flown, there was not enough time for most of the vegetation to recover from the burn for the photo interpreters to determine the vegetation type. In some cases, the original vegetation species may eventually grow back at different rates depending on moisture, the seed bank, or other conditions. In other cases, seral post-fire species may begin to grow right after the fire and remain for a variable number of years.

The following are assumptions formulated based on the field visits:

- Polygons that were intensely burned and obliterated, such that they could not be photo interpreted, were coded as 9460 (Recently Burned Areas – Undetermined Vegetation Type Mapping Unit).
- Polygons that had been singed and not obliterated, tended to be coded as the original type.
- If a polygon looked like it had been burned and was recovering to a limited extent (shrubby on the 2022 imagery) and was flagged for field, and was visited, then the polygon was assigned a code based on the field findings. If field findings could not type the polygon (early seral with mixed species), then the polygon was coded as 9460.
- If the polygon was not burned, with no change in type, it was evaluated for any other kind of changes, such as cover densities. Note that in some cases a change in cover density could change the vegetation type.
- Some stands may burn as such that the tree cover or shrub cover may drop below the 8-10% threshold, indicating a type change. In these cases, the stand was interpreted for a new vegetation type, where possible.
- Chaparral – Intensely burned chaparral types considered the following assumptions:
    - *Adenostoma fasciculatum* resprouts quickly after a burn, so tended to leave as the type, even if badly burned.
    - *Quercus berberidifolia* resprouts quickly after a burn, so tended to leave as the type, even if badly burned.
    - *Ceanothus megacarpus* (a post-fire seeder rather than a resprouter), may not have come in after two years, so coded as 9460. However, if the original database noted, or the old field point indicated, the polygon as having a *Ceanothus megacarpus – Adenostoma fasciculatum* mix, then tended to change the code to *Adenostoma fasciculatum* Alliance since

Ceanothus megacarpus is delayed in seed sprouting compared to *Adenostoma* resprouting right away.

- *Ceanothus crassifolius* (a post-fire seeder rather than a resprouter) may not have come in after two years, so may be better coded as 9460. However, if the original database noted, or the old field point indicated, the polygon as having a *Ceanothus crassifolius – Adenostoma fasciculatum* mix, then tended to change the code to *Adenostoma fasciculatum* Alliance since *Ceanothus crassifolius* is delayed in seed sprouting compared to *Adenostoma* resprouting right away.
- *Adenostoma fasciculatum – Salvia mellifera* may recover to *Adenostoma fasciculatum* or *Adenostoma fasciculatum – Salvia mellifera.* The tendency was to go with *Adenostoma*, as *Salvia mellifera* may delay in sprouting. However, if a polygon was visited in the field and *Salvia mellifera* was encountered, the area was reevaluated as to whether it was better to keep the original *Adenostoma fasciculatum – Salvia mellifera* type.

- Coastal Sage Scrub (CSS) – In CSS areas that were recently burned it is difficult to tell if types are changing from *Artemisia californica – Eriogonum fasciculatum, Artemisia californica – Salvia mellifera, Salvia mellifera*, or *Artemisia californica* to *Malacothamnus fasciculatus*, *Acmispon glaber*, or *Malosma laurina – Acmispon glabe*r, or have enough *Artemisia californica, Salvia mellifera*, and/or *Eriogonum fasciculatum* to remain as the original type, or if both *Malacothamnus fasciculatus* and *Acmispon glaber* are present in significant amounts. The following assumptions were considered:
  - The first 2 years after a fire mainly grasses and forbs tend to come in, and most likely CSS has not yet come in, therefore it was considered to code the polygon as 9460.
  - It was observed in the field that most *Ericameria palmeri* survived or regenerated after the 2017 and 2020 fires. In most cases it was left as no change.
  - *Malosma laurina* and *Rhus integrifolia* will likely recover after a burn, so tended to keep as originally coded as those types as long as their remnants are seen on the 2022 imagery, they remain above the 8-10% cover threshold, and are strongly dominant within the polygon. Otherwise, the polygon was coded as 9460.
- Trees
  - *Quercus agrifolia* tends to survive fires, so tended to keep type as *Quercus agrifolia*.
  - *Platanus racemosa* tends to survive fires, so tended to keep type as *Platanus racemosa*.

    - *Salix* tree types tend to survive fires, but they may change over time from flooding and scouring. Rely on signature, and field verification, where possible, to confirm their occurrence. Polygons with sites visited in the field were evaluated and extrapolated as needed.
- Riparian Shrubs
    - *Lepidospartum squamatum* may survive fires, but the stand may change over time from flooding, scouring, and/or succession. It favors a cobbly, drier environment. Sites are visited in the field, where possible, and evaluated and extrapolated as needed.
    - *Baccharis salicifolia* may survive fires, but may change over time from flooding, scouring, and/or succession, The environment is less cobbly, and more active. Sites are visited in the field, where possible, and evaluated and extrapolated as needed.
    - *Salix lasiolepis* tends to survive fires and not be obliterated, so it tended to remain coded as that type. Sites are visited in the field, where possible, and evaluated and extrapolated as needed.
- Grassland
    - It was observed in the field that *Stipa* tended to survive the fire, so it was left as no change.
    - Grass polygons (other than *Stipa*) that were below the MMU in the 2012 database were subsumed into adjacent polygons in the burned areas.
    - The shrub cover was lowered from code value 1 to 0 if shrubs were not visible on the imagery.

2017 Canyon II Fire

Since the Canyon II fire occurred 5 years before the 2022 base imagery was flown, it was assumed that enough time had passed for the vegetation to sufficiently recover to allow interpretation of a given vegetation type.

The following are assumptions formulated based on the field visits:

- Google Earth imagery taken just after the 2017 fire showed that most stands of shrubs had either been totally obliterated by the fire, or the CSS was obliterated and the tall shrubs had some remaining larger charred branches visible.
- It is assumed that after the first 2 to 3 years there are mainly grasses and forbs in the former CSS polygons, shrubs will probably start to be visible on the imagery in the 3rd year (2020-2021). It is likely that most CSS recovery will be from seeds. Chaparral and tall shrubs, however, tend to recover from resprouting bases and branches.
- Singed stands that had not been obliterated usually maintained their type.
- The 2017 burn was 5 years before the 2022 base imagery was taken and the interim years were, for the most part, below-average to average rainfall years,

considered part of a multi-year extended drought period. The 2 years following the 2022 base imagery were above-average rainfall years, encouraging growth of all types of vegetation, which was witnessed in the 2023 and especially the 2024 field visits. Of note in the field were new or enhanced growth of *Salvia mellifera, Artemisia californica*, and *Ceanothus* spp. which took the form of short plants with very little woody old growth. *Baccharis pilularis* also appeared to increase in size and number. It is also likely that some observed *Salix gooddingii* also increased in stature, with new saplings appearing. There may also have been an increase in exotics species. Mustard was a very common sight.

- If a polygon within the burn perimeter had not burned, then it was left alone, and assumed it had otherwise not changed, especially if the interpreter did not see a difference between the 2012 and the 2022 imagery. It was assumed that any new young *Salvia mellifera* or *Ceanothus* seen in the field for the most part had grown in since 2022 as a result of 2 years of plentiful rainfall.
- Very steep and rocky settings of the Cliff Mapping Unit, *Artemisia californica – Eriogonum fasciculatum*, and *Eriogonum fasciculatum* tended to remain as those types often escaping more intense burning due to their setting, so they were kept as those types.
- *Malacothamnus fasciculatus* and *Acmispon glaber* are seral vegetation types and considered fire followers since they are seed sprouters. The photo interpreter checked for mapped *Malacothamnus fasciculatus* and *Acmispon glaber* polygons and for those species noted in a CSS polygon in the 2012 database. The 2012 imagery was also perused for signatures of *Malacothamnus* and *Acmispon* in the area. It was assumed that if a stand called as or containing *Malacothamnus* and/or *Acmispon* burned in 2017, then it was likely that *Malacothamnus fasciculatus* and/or *Acmispon glaber* would be there in 2022 in significant amounts. If the stand did not burn in 2017, then it was likely that by 2022 most of the *Acmispon glaber* and/or *Malacothamnus fasciculatus* would start to die out or be overtaken by the CSS.
- Polygons that were coded as a grassland in 2012 tended to remain as grass after the 2017 fire, so they were given no change in type in 2022, if signature confirmed that.
- Chaparral
    - Stands mapped as *Adenostoma fasciculatum,* if burned in 2017, tended to remain as that type, since *Adenostoma* resprouts soon after a fire. Therefore, the photo interpreters kept the polygon coded as the *Adenostoma fasciculatum* type.
    - Stands mapped as *Quercus berberidifolia,* if burned in 2017, tended to remain as that type, since *Quercus berberidifolia* resprouts soon after a fire. Therefore, the photo interpreters kept the polygon coded as the *Quercus berberidifolia* type.
    - Some polygons mapped as *Ceanothus megacarpus* may have contained a mix of *Adenostoma fasciculatum* and *Ceanothus megacarpus* based on

field data and notes in the 2012 database. After the 2017 fire enough time has passed that both the *Adenostoma fasciculatum* and *Ceanothus megacarpus* may come back and may be visible on the 2022 imagery. The photo interpreter's tendency was to keep the polygon typed as the *Ceanothus megacarpus* Alliance. Field verification observations confirmed this assumption as a lot of young short *Ceanothus megacarpus* were observed, and it looked as though they had grown in significantly.

- In rocky sparse settings polygons may have originally been coded as *Adenostoma fasciculatum,* but in the field sometimes young short *Ceanothus megacarpus* were observed mixing in the stand. These *Ceanothus megacarpus* may not be visible on the 2022 imagery. It is difficult to determine if *Ceanothus megacarpus* was always present but undetectable, or if they had grown in from the recent wet winters, and whether a change had occurred. In the rockiest areas, mappers tended to keep the polygon typed as *Adenostoma fasciculatum* Alliance. However, in less rocky settings with more soil the mapper assumed that the *Ceanothus megacarpus* was present before 2022 and the stand was *Adenostoma fasciculatum – Ceanothus megacarpus*, which is mapped to the *Ceanothus megacarpus* Alliance, especially if adjacent polygons were also mapped as the *Ceanothus megacarpus* Alliance.
- Stands mapped as *Ceanothus crassifolius,* if burned in 2017, tended to remain as that type, since *Ceanothus crassifolius* sprouts soon after a fire from its seed bank. Therefore, the photo interpreters kept the polygon coded as the *Ceanothus crassifolius* type.
- Polygons originally mapped as *Adenostoma fasciculatum – Salvia mellifera* in 2012 may recover to *Adenostoma fasciculatum* or *Adenostoma fasciculatum – Salvia mellifera* after the fire*.* It is difficult to interpret on the base imagery. Based on field verification many *Adenostoma fasciculatum – Salvia mellifera* polygons did remain as that type, so the photo interpreters would keep the call as *Adenostoma fasciculatum – Salvia mellifera*.

- CSS
  - After the 2023 field reconnaissance it was noted that recovering CSS shrubs could be shorter than the grass and may not be detectable on the imagery.
  - Polygons called as tall shrubs such as *Malosma laurina, Heteromeles arbutifolia*, and *Rhus integrifolia*, tended to remain as those types because they were strongly dominant or occurred over grass with minimal CSS in the polygon. However, where the cover density changed due to the fire, and the post-burn tall shrubs were now below the 10% threshold for mapping as shrub types, the polygon's vegetation type changed to grass.
  - *Salvia apiana* tended to remain as that type, however, where the cover density changed due to the fire, and the *Salvia apiana* fell below the 10%

threshold for mapping as a shrub type, the polygon's vegetation type changed to grass.

- It is difficult to tell on the base imagery if there is enough *Artemisia californica – Eriogonum fasciculatum* remaining or recovering after the 2017 fire. *Artemisia californica – Eriogonum fasciculatum* may stay as that type since *Eriogonum fasciculatum* favors disturbance and *Artemisia californica* sprouts moderately well, and stands are likely to survive and regenerate through root crown sprouting if the burn wasn't too intense. The polygon could go to *Acmispon glaber* if the original vegetation was severely burned. The photo interpreters rely on being able to tell *Acmispon glaber* signature from other signatures. During the field verification effort some *Artemisia californica – Eriogonum fasciculatum* stands were observed to contain some young *Salvia mellifera.* It was deduced that in these cases the *Salvia mellifera* had probably grown in as a result of the last 2 years of above average rainfall. The base imagery was taken in 2022 before the higher rainfall years. So, it is inferred that the *Salvia mellifera* was not detectible on the imagery and therefore the polygon should remain as the *Artemisia californica – Eriogonum fasciculatum* type.
- It is difficult to tell on base imagery if there is enough *Artemisia californica – Salvia mellifera* remaining or recovering after the 2017 fire. Polygons of *Artemisia californica – Salvia mellifera* tended to go to *Malacothamnus fasciculatus*, with or without *Acmispon glaber* if the original vegetation was severely burned; or may have a mix of *Artemisia californica – Salvia mellifera*, *Malacothamnus fasciculatus* and *Acmispon glaber*. The photo interpreters rely on being able to tell *Acmispon glaber* and *Malacothamnus fasciculatus* signatures from other vegetation types. Based on field verification observations many polygons did not have enough *Malacothamnus fasciculatus* or *Acmispon glaber* to warrant calling as those types. *Artemisia californica – Salvia mellifera* tended to remain as the *Artemisia californica – Salvia mellifera* type.
- It is difficult to tell on the base imagery if there is enough *Artemisia californica* remaining or recovering after the 2017 fire. *Artemisia californica* polygons, if severely burned, may convert to *Malacothamnus fasciculatus*, sometimes with an *Acmispon glaber* component. The photo interpreters rely on being able to tell *Acmispon glaber* and *Malacothamnus fasciculatus* signatures from other vegetation types. Based on field verification observations many polygons did not have enough *Malacothamnus fasciculatus* or *Acmispon glaber* to warrant calling as those types. Typically, *Artemisia californica* tended to stay as the *Artemisia californica* type.
- It is difficult to tell on the base imagery if there is enough *Salvia mellifera* remaining or recovering after the 2017 fire. *Salvia mellifera* polygons, if

severely burned, may convert to *Malacothamnus fasciculatus* or *Acmispon glaber*. The photo interpreters rely on being able to tell *Acmispon glaber* and *Malacothamnus fasciculatus* signatures from other signatures. Based on field verification observations many polygons did not have enough *Malacothamnus fasciculatus* or *Acmispon glaber* to warrant calling the polygons those types. *Salvia mellifera* tended to either remain as *Salvia mellifera* or had *Artemisia californica* growing with it. The *Artemisia californica* could be a result of the recent heavy rainfall years, in which case our tendency is to keep the polygon as the original *Salvia mellifera* type.

    - The CSS Group occurring on road cuts and embankments were kept as the CSS Group, unless strongly dominant *Malacothamnus fasciculatus* had grown in, or more recent Google Earth Street View showed that it was the *Artemisia californica – Eriogonum fasciculatum* type.
    - If a polygon was originally typed as *Opuntia littoralis* and burned with few or no survivors, and one could see shrubs on the imagery, then the tendency was to retype the polygon to *Artemisia californica – Eriogonum fasciculatum*. If no or few shrubs are visible on the imagery the polygon was retyped to grassland.
    - From field verification observations, polygons typed as *Ericameria palmeri* tended to recover as that type, with a native understory of grass. Therefore, the tendency was to leave the polygon as *Ericameria palmeri*.
- Grassland
    - From field verification observations, polygons typed as *Stipa* tended to recover as that type, so those polygons were kept as *Stipa.*
    - If a grass polygon was below MMU in 2012 and remained as grass in 2022, then mapper did not delete it or subsume it into an adjacent polygon.
- Trees
    - *Quercus agrifolia* tends to survive fires, so the tendency was to keep polygons of *Quercus agrifolia* as that type.
    - *Platanus racemosa* tends to survive fires, so the tendency was to keep polygons of *Platanus racemosa* as that type.
    - *Salix* tree types tend to survive fires, but they may change over time from flooding and scouring. Therefore, the mapper relied on signature, and field verification, where possible, to confirm their occurrence. Polygons with sites visited in the field were evaluated and extrapolated as needed.
- Riparian Shrubs
    - *Lepidospartum squamatum* may survive fires, but may change over time from flooding, scouring, and/or succession. *Lepidospartum squamatum* is typically found in cobbly, drier stream bed and terrace environments. Polygons with sites visited in the field were evaluated and extrapolated as needed.

- *Baccharis salicifolia* may survive fires, but may change over time from flooding, scouring, and/or succession. The stream environment it is found in is less cobbly and more active. Polygons with sites visited in the field were evaluated and extrapolated as needed.

Unburned Areas (outside of 2017 and 2020 burns)

- It was assumed that the 2012 mapping was correct because it had gone through and passed the AA process in 2014. Therefore, the photo interpreters tended to leave unburned Chaparral and CSS types as they were originally mapped in 2012 for the 2022 database if no change was detected on 2022 base imagery.
- The exception to this was for seral types such as *Acmispon glaber* and *Malacothamnus fasciculatus*. Interpreters reviewed polygons coded as *Acmispon glaber* and *Malacothamnus fasciculatus* to evaluate if a change had occurred. Theoretically, enough time has passed (10 years) for *Acmispon glaber* and *Malacothamnus fasciculatus* to have converted to CSS or Chaparral if not affected by burn or disturbance. However, during field reconnaissance and verification some sites were observed that still had significant amounts of either *Acmispon glaber* or *Malacothamnus fasciculatus* to remain that type. Therefore, the base imagery and/or ancillary imagery were used to evaluate and assign the final code for a given polygon. *Acmispon glaber* or *Malacothamnus fasciculatus* needed to be strongly dominant to keep as those types.
- In the Tecate Cypress area polygons coded as *Adenostoma fasciculatum* Alliance were visited during the field verification effort. Small *Ceanothus* were observed growing with *Adenostoma fasciculatum*. These *Ceanothus* may have grown in within the last 2 years of above average rainfall, in which case the *Ceanothus* may not have been visible on the 2022 imagery, and so the mappers' tendency was to keep the call for the polygon as *Adenostoma fasciculatum* Alliance.
- Within the Tecate Cypress area there were a number of polygons coded as the Xeric Chaparral Group because the area had burned in 2006 or 2007 prior to the 2012 mapping effort, and at the time it was too difficult to determine the specific alliance, even with field observations. During the current mapping effort this area was visited during reconnaissance and verification, and were observed to contain various types including Cypress*, Ceanothus crassifolius, Ceanothus megacarpus*, or *Ceanothus tomentosus* stands.

Restoration

- During the 2012 effort, Milan Mitrovich, the NCC project manager at the time, had requested that restoration sites be captured in the database. During the current effort, the project ecologists Todd Keeler-Wolf and Jennifer Buck-Diaz recommended keeping unnatural looking sites as restoration areas.

- It was assumed that sites identified as restoration areas in the 2012 mapping were based on collateral data.
- Most polygons coded as restoration in 2012 remained as restoration in 2022 because most restoration areas were planted, and as such the species found there may not form distinct alliances and often appear unnatural.
- Some areas that were designated as restoration areas in 2012 have since grown in with a strongly dominant species, and therefore an alliance could be determined using the 2022 imagery. These areas were coded as a vegetation type, especially if they were verified in the field.
- Areas of change since 2012 that show an array of "restoration style" planting pattern on the 2022 imagery were considered as restorations and coded as such in the 2022 mapping. Google Earth imagery viewed on interim years were also used to help determine the coding.
- Polygons of change representing areas that were cleared since the 2012 mapping and have grown in with vegetation but did not show "restoration style" planting pattern were not assumed to be restoration areas and were therefore interpreted as either anthropogenic clearing (Anthropogenic Areas of Little or No Vegetation Mapping Unit, 9330) or as a natural vegetation type.
- For some areas visited in the field there was a suspicion that these areas could be restoration sites, i.e., presence of irrigation, flags, etc., and the field conditions may not have matched what was seen on the 2022 imagery. If vegetation or some disturbance was seen on the imagery, with no strong signature of restoration planting, then a note was put in the corresponding vegetation polygon "Comments" field as "restoration?". The client can look at these polygons in the future and recode as restoration if they have newer collateral information or knowledge of particular locations.
- *Arundo donax* removal since 2012 was not called as restoration unless new restoration style plantings were observed in the polygon.

Herbaceous

- *Stipa* – Most of the *Stipa* stands in the study area were mapped in 2012 with the aid of data from the Irvine Ranch Conservancy. It was observed in the field in 2023 and 2024 that the *Stipa* stands tended not to change, even after fire events. Therefore, *Stipa* stands from the 2012 dataset were kept in the 2022 mapping update.
- Mustard – Mustard is a common tall exotic annual forb on the Orange County landscape. It can vary in extent and location from year to year, and can inundate other native and non-native vegetation types. It is included as part of the upland California Annual & Perennial Grassland Macrogroup (4000) rather than being mapped as a separate type. During the reconnaissance and verification field efforts it was noted that mustard, thistles, and *Centaurea* were very prevalent in the region, probably due to the last two wet winters (2023-2024).

- Native vs Non-native grasses – Grasslands/forblands cannot be photo interpreted to the alliance level unless they have a distinct repeatable signature. Many tall species and some subshrubs are possible to photo interpret with the aid of field data. Annual grasses and forbs tend to vary in type and extent from season to season and from year to year in a given area. Their species composition may also vary. Upland grasslands were originally mapped in the 2012 database as the Mediterranean California Naturalized Annual and Perennial Grassland Group, defined as being strongly dominant by non-native cover. Some non-native annual grass types were also mapped in 2012 from field data provided by the Irvine Ranch Conservancy. However, since that time, the ecologists have determined that most upland herbaceous stands have a significant component of native species in them, and it would be more accurate to call most grasslands as the California Annual & Perennial Grassland Macrogroup. In the 2022 mapping database both the 2012 and 2022 vegetation type for non-native grasslands were recoded to the California Annual & Perennial Grassland Macrogroup. Stands visited in 2012 that were verified as strongly dominant non-native stands were also recoded to the Macrogroup level with the actual alliance name placed in the "Comment" field in the database. Strongly dominant native stands in the 2012 database were left with their original alliance calls.

Riparian *Quercus agrifolia*

Riparian *Quercus agrifolia* was mapped in 2012. During the field reconnaissance of 2023, it was determined that some of the *Quercus agrifolia* Alliance (upland) stands in some of the riparian areas should be mapped as the *Quercus agrifolia* Riparian Mapping Unit. Therefore, during the update mapping process, *Quercus agrifolia* Alliance polygons in proximity to drainages were evaluated for possible recoding to the *Quercus agrifolia* Riparian Mapping Unit. Where these polygons were recoded to the *Quercus agrifolia* Riparian Mapping Unit, the corresponding 2012 database polygon was also recoded to the *Quercus agrifolia* Riparian Mapping Unit.

Tecate Cypress

The Tecate Cypress (*Hesperocyparis forbesii* Alliance*,* 1210) is a unique vegetation type in the Santa Ana Mountains of Orange County that NCC monitors. Prior to the field verification and completion of the 2022 vegetation database NCC needed an update of the extent of Tecate Cypress in their region. AIS agreed to provide an interim subset database for 2022 Tecate Cypress conditions by reviewing and updating the extent of Cypress within the core Tecate Cypress area. The interim dataset of Tecate Cypress for 2022 conditions was delivered as a standalone product. It is important to note that the overall vegetation update was in progress and field reconnaissance/ground truthing had

not occurred yet due to weather constraints. Therefore, the database was subject to change after the field effort was completed.

Method for Interim Dataset for Tecate Cypress

The starting point for updating the Tecate Cypress occurrences was the 2012 vegetation database. A copy of the original database was produced with corresponding 2022 attribute fields added. This resulted in a database containing the original 2012 attributes, as well as the updated 2022 attributes for the vegetation. In addition, a new flag attribute field for Tecate Cypress presence was added to the interim dataset.

Polygons within the newly created Tecate Cypress 2012/2022 database were reviewed if they had the following attributes:

- VegCode as *Hesperocyparis forbesii* Alliance (typically with a conifer cover code >1)
- VegCode as other alliance type, however with a conifer cover of code = 1
- VegCode as other alliance type, however with a conifer cover of code = 1, and with a comment identifying Cypress presence in the polygon
- VegCode as other alliance type, however with conifer cover of code = 0, and with a comment identifying Cypress presence in the polygon

Each 2012 *Hesperocyparis forbesii* Alliance polygon was analyzed through photo interpretation of the 2022 aerial imagery and ancillary information, including older ground data, for change in type or other attributes.

Additionally, polygons within the 1993 vegetation database coded as Southern Interior Cypress Forest were assessed for Cypress update. Within this Tecate Cypress core region the polygons that were coded in 2012 as conifer cover code = 1 (with and without 2012 Cypress comment) were similarly reviewed to determine if there was any change in the vegetation to warrant an update in VegCode or other attributes. If the Cypress present had grown, or Cypress presence had increased significantly, then it was determined whether to update the VegCode to *Hesperocyparis forbesii* Alliance or consider the stand as static with no change in type or cover. If the type remained as a non-Cypress alliance, and Cypress was present, then a comment was added for 2022 indicating the presence of Cypress with a few choice words such as “few”, “some”, “scattered”, “incidental”, etc. suggesting the relative degree of presence within the polygon. An emphasis was made to investigate polygons adjacent to those assigned to the *Hesperocyparis forbesii* Alliance for change.

The polygons that were coded in 2012 as conifer code = 0 and had Cypress mentioned in the Comment field, were also similarly reviewed to determine if there was any change in the vegetation to warrant an update in VegCode or other attributes. Similarly, if the

Cypress present had grown, or Cypress presence had increased significantly, then it was determined whether to update the VegCode to *Hesperocyparis forbesii* Alliance, to consider raising the conifer cover to a higher code value, or to consider the stand as static with no change in type or cover. If the type remained as a non-Cypress alliance, and Cypress was present, then a comment was added for 2022 indicating presence of Cypress. An emphasis was made to investigate polygons adjacent to those assigned to the *Hesperocyparis forbesii* Alliance for change.

The polygons identified as other alliance types in 2012 with no Cypress presence in the Comment field that were adjacent to or in close proximity to the core Cypress polygons that were identified as being a *Hesperocyparis forbesii* Alliance or had presence of Cypress in the Comment Field, were further investigated by photo interpretation to look for any presence of Cypress within the polygon. If Cypress was identified then the polygon was given a Cypress presence comment in the Comment field. Adjustments of attributes were done as needed.

Cypress occurrences were investigated for updates only within the core Tecate Cypress region and in polygons immediately adjacent to the core area. Incidental Tecate Cypress may be present in outlying polygons further away from the core but were not assessed.

There are two attribute fields in the database that indicate the presence of Cypress, the Comment and the Tecate Cypress fields. In the Comment field if a polygon was identified as having Cypress in it, then the polygon was noted with Cypress presence, however, polygons assigned the VegCode of *Hesperocyparis forbesii* Alliance were not given a comment. In the Tecate Cypress attribute field each polygon in the database is coded as either Null, 0, 1, or 2, and are defined as:

- 2 = *Hesperocyparis forbesii* Alliance in 2022
- 1 = Cypress present but coded as another alliance type in 2022 with conifer cover code 0 or 1, and Cypress presence in the Comment field
- 0 = No Cypress present and coded as another alliance type in 2022 with no Cypress presence in the Comment Field
- Null = Not Assessed

One can use the database to display variations of Cypress presence or no presence by creating contrasting color/symbology for the various code values.

Parallax Issue of Major Roads and Highways Seen on the 2012 NAIP Imagery
The 2012 high-resolution (HR-2012) image set that was used as ancillary information during the original project was received on September 15, 2023. The imagery was uploaded and processed to use as ancillary information on the current update project as

well. During this time, the final 2012 vegetation data that was based on the 2012 NAIP imagery was reviewed and compared to the new 2022 NAIP base imagery. Major discrepancies were found in the alignment of the freeways and toll roads in the study area.

Further review of the newer 2022 NAIP imagery to the HR-2012 imagery showed that the 2022 NAIP imagery and the HR-2012 imagery matched well overall. It was concluded that the 2012 NAIP imagery was locally flawed in some areas. Although the delineations of the original data followed the criteria that was set for the project, the information was misaligned with “reality”. It was determined that the discrepancies and mis-registrations should be fixed to better represent the spatial locations of the delineations moving forward.

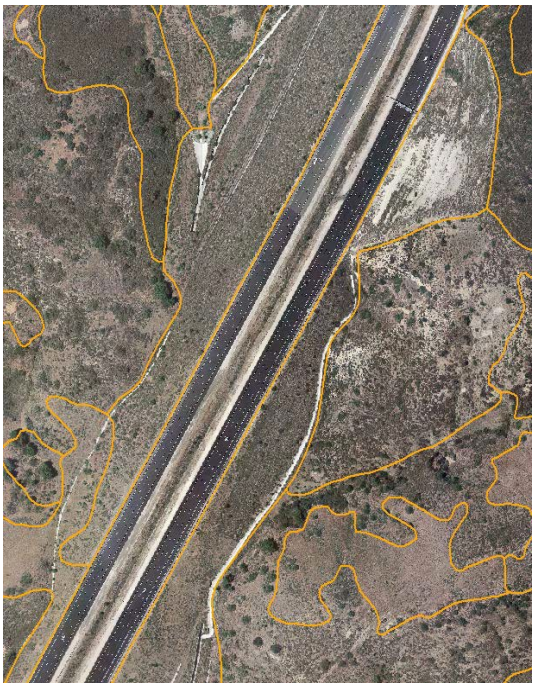
Since the update process created a composite database containing both 2012 and 2022 delineations and attributes, these adjustments were made to both eras of data, thus correcting the mis-registrations while not representing these adjustments as “change”.

The images below show an example of the misregistration and the resulting correction to the data as described above:

2012 data over NAIP-2012

2012 data over NAIP-2022

Adjusted delineation over NAIP-2022



Adjusted delineation over HR-2012

Cliffs/Bluffs

Related to the Parallax Issue of Major Roads and Highways discussed above, some cliff/bluff delineations were modified for 2012 due to mis-registration and distortion of the 2012 NAIP imagery, and adjusted to match the 2022 NAIP image.

Upper Newport Bay and San Joaquin Marsh

During the original mapping effort, the Upper Newport Bay Habitat Map (2012) was provided as collateral information. In mapping the Upper Newport Bay and nearby San Joaquin Marsh, the project MMU was lowered in these areas in order to delineate the intricate patterning and small stands of vegetation that occurred across the landscape in both areas. A 2020 update to the Upper Newport Bay Habitat Map was also provided as ancillary data for the 2022 mapping effort. The MMU rule was also lowered in these areas to accommodate the more detailed linework that was taken from the 2020 Upper Newport Bay Habitat Map.

Changes to 2012 Database VegCode (Retro Coding/Mapping)

Since change detection and trend analysis were major objectives of the update project, it was important to adjust **major** issues in the 2012 base data so that “true” vegetation change was identified and mapped correctly. The 2012 data had passed AA so was assumed to be correct. However, if the photo interpreter/mapper observed a difference between the polygon delineation and/or vegetation type interpretation between 2012 data and the conditions shown on the 2022 imagery, and recognized that the difference was not representative of a change between 2012 to 2022 conditions and was therefore

an error in the 2012 data. If the difference was significant and the mapper was compelled to correct the fault, then retroactive modifications (retro coding/mapping) were made to the database to reflect the correction in the 2012 delineations and/or attributes.

It must be noted that the 2012 and 2022 digital images were of differing pixel resolution and each image set was ortho-rectified using independent sets of ground control points, creating some minor registration issues. The 2012 imagery had a 1-meter pixel resolution, while 2022 imagery had a higher resolution of 2 feet, as well as better clarity than the 2012 base. This resulted in more accurate delineations and classifications of the 2022 era but it also highlighted areas where the 2012 interpretations or polygon boundary placements needed modification. AIS went beyond the scope of the project and performed limited retroactive mapping due to the increased image clarity highlighting major discrepancies.

Because of the modifications made to the 2012 data, any comparisons of 2012 to 2022 must use the new version of the 2012 data that is delivered with the 2022 data.

2.4.4 Mapping Criteria

As discussed above, appropriate tools and reference sources, photo interpretation training, and knowledge of vegetation communities are all essential in creating a quality vegetation map. In order to minimize discrepancies between photo interpreters the establishment and refinement of mapping criteria are crucial to the mapping process. Guidelines and rules such as exceptions, special situations, and minimum feature size are discussed and disseminated to all staff members before and during the mapping effort, which helps to create a clear and consistent product. Establishing criteria also makes the mapping process more efficient, as individual photo interpreters have a clear understanding of how best to capture situations that are encountered. Since the 2022 vegetation database is an update, the same mapping criteria established for the 2012 effort was used for the current project.

The specific criteria for each attribute for the final deliverable vegetation database are discussed below under the appropriate subheadings.

2.4.5 Mapping Attributes

The vegetation database is structured with a schema, or set of mapping attribute fields wherein the photo interpreted map information is encoded to each polygon by the photo interpreter in accordance with the mapping criteria and mapping classification. For the update project two eras of attributes are included in the final “composite” database (2012 and 2022 conditions). The vegetation mapping attributes are listed and described below.

- VegCode
- VegCodeLongName
- ConDensity
- HWDensity
- ShrubDensity
- HerbDensity
- Disturbance
- Exotic
- LandUse
- Comment
- Riparian

2.4.5.1 VegCode and VegCodeLongName

This is the 4-digit numeric code that corresponds to a vegetation type (e.g. mapping unit, alliance, group, or macrogroup) or miscellaneous class (e.g., urban disturbance, water, etc.) in the vegetation mapping classification. The VegCode is assigned to all the vegetation polygons in the geodatabase. The VegCodeLongName attribute field identifies the actual vegetation type names.

Each vegetation type is described in Appendix C; the vegetation mapping classification is presented in Appendix A; and a summary table of vegetation acreage by vegetation type is presented in Appendix B.

Vegetation Mapping Considerations

When the photo interpreter could not confidently classify a polygon at the alliance-level, or the vegetation was a mix that did not fit into an alliance-level or mapping unit, the polygon was assigned a broader group-level code. All classes mapped correlate to a level defined by the MCV2 with the exception of 6001 (Meadow (*Carex* – *Juncus* – *Eleocharis*) Mapping Unit) and 6101 (Fresh Water Marsh (bulrush – cattail) Mapping Unit).

A minimum mapping unit (MMU) size is established to ensure the map contains polygons of a workable, meaningful extent. The choice of an MMU is influenced by the clarity of the imagery, the detail of the mapping classification, the purpose of the data, and time and budget constraints. MMU can vary for different categories of features being mapped. The Statewide mapping criteria has established different MMUs depending on the area being mapped (e.g., Desert mapping MMUs are different from the Sierra Nevada Foothills MMUs). For this project, there were two established MMUs: 1 acre for upland types and .5 acre for special and wetland features. In mapping the Upper Newport Bay and the San Joaquin Marsh, the MMU was lowered in order to delineate the intricate patterning and small stands of vegetation that occurred across

the landscape in both areas, as well as to conform to vegetation stands represented in the updated 2020 Upper Newport Bay Habitat Map.

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 75 feet for the .5-acre MMU, and approximately 100 feet for the 1-acre MMU. The rule of thumb was to make the minimum width roughly half the width of an MMU square. 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. As mentioned above, AIS opted to map below these limitations where structural, floristic, and or ecological characteristics were significantly different from the adjacent vegetation.

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.

Another type of mapping consideration pertains to sparsely vegetated or nonvegetated areas. Polygons assigned to a floristic type in the NVCS often contain small areas of unvegetated surface that is too small to delineate. These sparsely vegetated to nonvegetated areas were not coded in the database unless they met the minimum mapping resolution and could be mapped as separate polygons. The most common examples are small rock outcroppings in shrub dominated communities or small riverine flats and wash channels in riparian settings.

2.4.5.2 Percent Cover

The percent cover attributes include the following:

- Conifer Density (ConDensity)
- Hardwood Density (HW Density)
- Shrub Density (ShrubDensity)
- Herbaceous Density (HerbDensity)

Percent cover, also referred to as density, is a quantitative estimate of the aerial extent of the living plants for each vegetation layer mapped within a stand. Absolute percent cover, based on a birds-eye view (what a photo interpreter can see from the sky looking down), is the primary metric used to quantify the abundance of a life form and/or species within a given polygon. Each polygon in the database was assigned separate percent covers for conifer, hardwood, shrub, and herbaceous components. Density was assessed and then assigned to a percent cover range category (see Appendix A) for each stratum and recorded in the database. A polygon of a single vegetation map unit was divided into smaller polygons based upon a change in cover class, however, the MMU for overstory and understory cover breaks are different that the MMU set for vegetation type. The MMU for overstory cover breaks is typically 3 times larger than the MMU for vegetation type, i.e. 3 acres for a 1-acre vegetation MMU and 1.5 acres for a .5 vegetation MMU. The MMU for understory breaks is typically 5 times larger than the MMU for vegetation type.

Photo interpreters formed separate polygons when there were changes from one cover class to another within a vegetation mapping type. A given vegetation polygon would have been subdivided due to cover differences regardless of which strata the cover difference occurred in. For example, two adjacent polygons in the geodatabase may have had the same shrub vegetation type assigned but different cover categories for conifers (for example, 2-9% versus <2%).

Most standardized vegetation mapping efforts have a set of criteria regarding percent cover. The Orange County mapping effort follows the same criteria as the California Statewide criteria, where a life form generally needs to account for at least 8 to 10 percent cover in order for an alliance of that life form to be mapped.

Percent Cover Mapping Considerations

It is important to note that the photo interpreters could only accurately quantify the vegetation that is visible on the aerial imagery. Therefore, only “bird’s eye” view total cover was mapped. Thus, the cover of understory strata that were obscured by overstory vegetation was not included once the overstory cover exceeded 40 percent cover. For this reason, total cover of understory vegetation may be underestimated, especially 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 overstory cover exceeds 40 percent, such as closed canopy forests, 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.”

The date that the aerial photography was flown influences the percent cover assigned to vegetation types. Subsequent field reconnaissance, field verification, and AA efforts 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 leaf phenology (cold-season deciduous, drought deciduous, facultatively deciduous) can affect plant cover determination. Leaf-on conditions obscure the understory. Imagery of leaf-off conditions would allow photo interpretation 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. This may result in differences of the percent cover assigned to a polygon in the field versus those assigned during photo interpretation.
- 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 photo interpretation is difficult, so field information reflecting the conditions on the ground is used when possible.

2.4.5.3 Disturbance

This field denotes the relative effects on vegetation from removal by scraping or other human-related processes, including road related impact, and cut-and-fill embankments. The intensity is measured as a percent of the polygon affected, and is given general categories of low, medium, and high. Polygons are typically not created or split based on this field. Specific values are noted in Appendix A.

2.4.5.4 Exotics

This field denotes vegetation that has an exotic component in the stand. Exotics may consist of woody or herbaceous vegetation and is measured as a relative component to the total cover. General categories are assigned to low intensity when patches of exotic vegetation are visible but cover is not significant. Moderate to severe cover is assigned to a polygon where cover may exceed dominant vegetation. A severe category is assigned to the polygon when the vegetative type itself is an exotic type (e.g., *Eucalyptus*). Polygons are not created or split based on this field. Specific values are noted in Appendix A.

2.4.5.5 LandUse

Land use is the human use of the land and is embodied through such features as urban centers, towns, mining, or agriculture. This is a dual-use code designed to note areas where land use is 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.

This field offers the user the ability to refine the map based on the hierarchical format of the land use classification. More detailed classes may be added at lower levels of the hierarchy in the future. For example, the Urban (1000) class could be subdivided further into Residential (1100), Commercial (1200), Industrial (1300), Transportation/Communication (1400), and so on.

For this project, a special land use class (1800) was created to denote “Special Linkage Areas.” This is a dual-use code designed to note areas such as regional parks, golf courses, and highway underpasses linking natural areas of vegetation. The VegCode field is assigned to the appropriate floristic type when natural vegetation is present. However, if there is no naturally occurring vegetation present, the area is assigned as Urban/Disturbed Mapping Unit (Code 9300) in the VegCode field. The LandUse code field is assigned to a value of ‘Special Linkage’ (code 1800) when the area is defined as such.

2.4.5.6 Comment

This is a text field to note information regarding a polygon and generally contains “value added” comments that cannot be statistically quantified by the photo interpreter. An example of this “value added” information is the photo interpreter noting predominant species present in the stand other than the vegetation type being mapped. Polygons are not created or split based on this field.

2.4.5.7 Riparian

This attribute is assigned to polygons identified as a riparian type. The field enables users to quickly locate all of the riparian vegetation types mapped in the study area. Polygons assigned the riparian attribute include alliances within the following NVCS hierarchical groups:

- 1600 – Vancouverian Riparian Deciduous Forest
- 1700 – Southwest North American Riparian Woodland
- 1800 – Southwest North American Riparian/Wash Scrub
- 1900 – Southwest North American Introduced Riparian Scrub

The riparian attribute is also assigned to the *Quercus agrifolia* Riparian type (1121).

2.5 Quality Control and Delivery of the Final Product

Quality control steps were used throughout the duration of the project in order to make sure the map followed set guidelines and consistency among the photo interpreters. Once the initial photo interpretation phase was completed, a comprehensive quality control was performed by a different photo interpreter. Checks were conducted to look for invalid vegetation codes, invalid densities for each life form, and topology-related problems.

Quality control checks for illogical coding combinations were also run on polygons. An example of an illogical coding combination is “a dense coast live oak woodland with a high conifer component in the conifer density field.” After the final revisions from the accuracy assessment phase were implemented into the geodatabase, one last round of quality control checks was run on the geodatabase before it was delivered to the client.

2.6 Accuracy Assessment

To validate the vegetation map, an accuracy assessment (AA) effort was conducted using field verification. California Native Plant Society (CNPS) under a separate contract with NCC was tasked to conduct the AA. The methodologies and results of the accuracy assessment are recorded in a separate report by CNPS (Buck-Diaz et al., 2025).

After completion of the AA, CNPS delivered the preliminary results to AIS in an Excel spreadsheet format with comments pertaining to each of the AA points, which were then reviewed by the photo interpreters. The photo interpreters noted for each AA point whether or not they were in agreement with the final call made by the AA reviewing ecologist. If the call was in question or disputed, it was noted in the Excel database along with the reason for its question. The AIS mappers and the CNPS reviewing ecologist and AA field staff met via teleconference to discuss the AA points in question and to resolve any issues. The final results of the AA (with questions or disputes resolved) were then ready for the mappers to apply appropriate revisions to the vegetation database. Photo interpreters used these points to evaluate trends and make any additional corrections to the map.

Significant changes were made to the vegetation map based on the photo interpreters review of the AA points for *Quercus dumosa* stands. It was noted that the 2013 classification report by AECOM (2013) did not account for the *Quercus dumosa* Alliance in the study area. A few AA sites for map units coded as *Quercus dumosa* Alliance were in actuality *Rhus integrifolia* stands, with no evidence of change occurring between the two time-frames. CNPS determined that the *Quercus dumosa* Alliance had perhaps been over-mapped or over-extrapolated in the 2012 mapping effort, and that it should only be mapped from past and/or recent field data. The 2012 and 2022 era vegetation

polygons were reviewed and reassessed against the 2012 and 2022 field data, as well as Cal Flora field data, and appropriate polygons recoded for the vegetation type in both database time-frames.

The Federal Geographic Data Committee standards (FGDC 2008) require that a vegetation map should achieve an overall accuracy of 80%. After final scoring, the updated Orange County vegetation map received an overall accuracy of 85%. The updated fine-scale vegetation map and supporting field survey data coupled with the 2012 vegetation data provide a good basis for trend analyses for long-term land management and conservation within the remaining natural lands of Orange County.

3.0 References

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4.0 Acronyms

AA	Accuracy Assessment
AIS	Aerial Information Systems, Inc
CDFW	California Department of Fish and Wildlife
CNPS	California Native Plant Society
CSS	Coastal Sage Scrub
FGDC	Federal Geographic Data Committee
HCP	Habitat Conservation Plan
IRC	Irvine Ranch Conservancy
MCV	Manual of California Vegetation
MMU	Minimum Mapping Unit
MW	Minimum Width
NAIP	National Aerial Imagery Program
NCC	Natural Communities Coalition
NCCP	Natural Community Conservation Plan
NROC	Nature Reserve of Orange County
NVCS	National Vegetation Classification Standard
PI	Photo Interpretation
USGS	U. S. Geological Survey

APPENDIX A-1: NCC Orange County Vegetation – Mapping Classification-Numeric 03/31/2025

Map Unit (VegCode)

Standard 1acre MMU
Riparian/Special 1/2 acre MMU
Exotic
XXXX code value bold – mapped in 2022 database
XXXX code value not bold – not mapped in 2022 database
(2012) – mapped in 2012 database
(Refer to Buck-Diaz et al., 2025, for the floristic key)

Trees-Upland
1110 = Juglans californica Alliance (2012)
1120 = Quercus agrifolia Alliance (2012)
1130 = Quercus chrysolepis (tree) Alliance
1200 = California Evergreen Coniferous Forest & Woodland Group (2012)
1210 = Hesperocyparis forbesii Alliance (2012) (now Association of the Hesperocyparis forbesii – Hesperocyparis nevadensis Alliance)
1220 = Pinus attenuata Alliance
1230 = Pinus coulteri Alliance
1410 = Pseudotsuga macrocarpa Alliance (2012)
1510 = Eucalyptus (globulus, camaldulensis) Semi-natural Stands; Exotic (2012) (now Semi-Natural Stands Association of the Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-Natural Stands)
1520 = Schinus (molle, terebinthifolius) – Myoporum laetum Semi-natural Stands ; Exotic

Trees-Riparian
1121 = Quercus agrifolia Riparian Mapping Unit; Riparian (2012) (now Quercus agrifolia/Salix lasiolepis Association of the Platanus racemosa – Quercus agrifolia Alliance)
1310 = Acer macrophyllum Alliance; Riparian (now Acer macrophyllum – Acer rubra Alliance)
1610 = Alnus rhombifolia Alliance; Riparian (2012)
1700 = Southwest North American Riparian Woodland Group; Riparian (2012)
1710 = Platanus racemosa Alliance; Riparian (2012) (now Platanus racemosa – Quercus agrifolia Alliance)
1720 = Salix gooddingii Alliance; Riparian (2012) (now Association of the Salix gooddingii – Salix laevigata Alliance)
1730 = Salix laevigata Alliance; Riparian (2012) (now encompassing two associations of the Salix gooddingii – Salix laevigata Alliance)
1740 = Populus fremontii Alliance; Riparian (2012) (now Populus fremontii – Fraxinus velutinus – Salix gooddingii Alliance)

Shrubs-Upland

2000 = California Chaparral Macrogroup (2012)
2100 = California Xeric Chaparral Group (2012)
2110 = Adenostoma fasciculatum Alliance (2012)
2120 = Ceanothus crassifolius Alliance (2012)
2130 = Ceanothus megacarpus Alliance (2012)
2140 = Adenostoma fasciculatum - Salvia mellifera Alliance (2012) (now Adenostoma fasciculatum – Salvia spp. Alliance)
2200 = California Maritime Chaparral Group (2012)
2210 = Malosma laurina Alliance (2012)
2220 = Rhus integrifolia Alliance (2012)
2230 = Quercus dumosa Alliance (2012) (now Association of the Quercus dumosa – Quercus pacifica Alliance)
2300 = California Mesic Chaparral Group (2012)
2310 = Ceanothus tomentosus Alliance (2012) (now Association of the Ceanothus (oliganthus, tomentosus) Alliance)
2320 = Cercocarpus montanus Alliance (2012)
2330 = Heteromeles arbutifolia Alliance (2012) (now Association of Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance)
2340 = Quercus berberidifolia Alliance (2012)
2350 = Quercus berberidifolia - Adenostoma fasciculatum Alliance (2012) (now Association of the Quercus berberidifolia Alliance)
2410 = Arctostaphylos glandulosa Alliance (2012)
2420 = Quercus wislizeni shrub Alliance (now Quercus wislizeni – Quercus chrysolepis (shrub) Alliance)
3100 = Central & South Coastal Californian Coastal Sage Scrub Group (2012)
3110 = Artemisia californica Alliance (2012) (now Artemisia californica Map Unit)
3120 = Artemisia californica - Eriogonum fasciculatum Alliance (2012) (now Artemisia californica – Eriogonum fasciculatum Map Unit)
3130 = Artemisia californica - Salvia mellifera Alliance (2012) (now Association of the Salvia mellifera – (Artemisia californica) Alliance)
3140 = Encelia californica Alliance (2012) (now Encelia californica – Eriogonum cinereum Alliance)
3150 = Eriogonum fasciculatum Alliance (2012)
3160 = Eriogonum fasciculatum – Salvia apiana Alliance (2012)
3170 = Keckiella antirrhinoides Alliance (2012)
3180 = Salvia apiana Alliance (2012)
3190 = Salvia leucophylla Alliance (2012) (now Artemisia californica – (Salvia leucodermis) Alliance)
3210 = Salvia mellifera Alliance (2012) (now Salvia mellifera – (Artemisia californica) Alliance)
3220 = Diplacus aurantiacus Alliance (2012)
3300 = Central & South Coastal Californian Seral Scrub Group (2012)
3310 = Ericameria palmeri Alliance (2012) (now Association of Hazardia squarrosa – Ericameria palmeri Alliance)

3320 = Hazardia squarrosa Alliance (now Hazardia squarrosa/Nassella pulchra – Deinandra fasciculata Association of the Hazardia squarrosa – Ericameria palmeri Alliance)
3330 = Isocoma menziesii Alliance (2012)
3340 = Acmispon glaber Alliance (2012) (now Lotus scoparius Association of the Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance)
3350 = Malacothamnus fasciculatus Alliance (2012) (now Malacothamnus fasciculatus – Malacothamnus spp. Alliance)
3410 = Acacia (cyclops) Semi-natural Stands; Exotic (2012) (now Acacia (cyclops dealbata) Semi Natural Stands Association of the Acacia spp. – Grevillea spp. Leptospermum laevigatum Semi-Natural Stands)
5210 = Toxicodendron diversilobum Alliance (2012)
5310 = Baccharis pilularis Alliance (2012)
8000 = Xeromorphic Scrub & Herb Vegetation Class (2012)
8100 = Coastal Baja California Norte Maritime Succulent Scrub Group (2012)
8110 = Lycium californicum Alliance
8120 = Opuntia littoralis Alliance (2012) (now Opuntia littoralis – Opuntia oricola – Cylindropuntia prolifera Alliance)

Shrubs-Riparian
1800 = Southwest North American Riparian/Wash Scrub Group; Riparian (2012)
1810 = Baccharis salicifolia Alliance; Riparian (2012)
1820 = Salix lasiolepis Alliance; Riparian (2012)
1830 = Sambucus nigra Alliance; Riparian (2012) (now Sambucus nigra Association of the Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance)
7210 = Atriplex lentiformis Alliance; Wetland (2012)
8210 = Lepidospartum squamatum Alliance; Riparian (2012)
8220 = Bebbia juncea Alliance; Riparian (2012) (now Association of the Ambrosia salsola – Bebbia juncea Alliance)

Upland-Herbaceous
4000 = California Annual & Perennial Grassland Macrogroup (2012)
4100 = California Perennial Grassland Group (2012)
4110 = Leymus condensatus Alliance; (2012)
4120 = Stipa lepida Alliance (2012) (now Nassella lepida Association of the Nassella spp. – Mellica spp. Alliance)
4130 = Stipa pulchra Alliance (2012) (now Nassella pulchra Association of the Nassella spp. – Mellica spp. Alliance)
4200 = Mediterranean California Naturalized Annual and Perennial Grassland Group (Weedy); Exotic (now included in the California Annual & Perennial Grasslands Macrogroup 4000)
4210 = Avena (barbata, fatua) Semi-Natural Stands; Exotic (2012) (now included in Avena spp. – Bromus spp. Semi-Natural Stands)
4220 = Brassica nigra and other mustards Semi-Natural Stands; Exotic (now included in Brassica nigra -Centaurea (solstitialis, melitensis) Semi-Natural Stands)

4230 = Bromus (diandrus, hordeaceus) - Brachypodium distachyon Semi-Natural Alliance; Exotic (2012) (now included in Avena spp. – Bromus spp. Semi-Natural Stands)
4240 = Bromus rubens – Schismus (arabicus, barbatus) Semi-Natural Stands; Exotic
4250 = Cynara cardunculus Provisional Semi-Natural Stands; Exotic (now Association of the Avena spp. – Bromus spp. Semi-Natural Stands)
4260 = Cortaderia (jubata, selloana) Semi-Natural Herbaceous Stands; Exotic (2012)
4270 = Foeniculum vulgare Semi-Natural Stands Exotic (now Conium maculatum – Foeniculum vulgare Semi-Natural Stands)
4280 = Lolium perenne Semi-Natural Stands; Exotic (2012)
4290 = Erodium spp. Semi-Natural Stands; Exotic (2012)
5410 = Carpobrotus edulis or Other Ice Plants Semi-Natural Stands; Exotic (2012) (now Mesembryanthemum spp. – Carpobrotus spp. Semi-Natural Stands)

Herbaceous-Riparian/Wetland

1910 = Arundo donax Semi-Natural Stands; Wetland; Exotic (2012) (now Phragmites australis – Arundo donax Semi-Natural Stands)
5110 = Phalaris aquatica Semi-Natural Sands; Wetland; Exotic (now Phalaris aquatica – Phalaris arundinacea Semi-Natural Stands)
6000 = Temperate & Boreal Freshwater Marsh Formation; Wetland (2012)
6001 = Meadow (Carex - Juncus - Eleocharis) Mapping Unit; Wetland (2012)
6100 = Arid West Freshwater Emergent Marsh Group; Wetland (2012)
6101 = Fresh Water Marsh (bulrush - cattail) Mapping Unit; Wetland (2012)
6110 = Schoenoplectus acutus Alliance; Wetland (2012) (now Association of the Schoenoplectus (acutus, californicus) Alliance)
6120 = Typha (angustifolia, domingensis, latifolia) Alliance; Wetland (2012)
6130 = Schoenoplectus californicus Alliance; Wetland (2012) (now Association of the Schoenoplectus (acutus, californicus) Alliance)
6140 = Scirpus robustus Alliance; Wetland (2012) (now Provisional Association of the Bolboschoenus maritimus Alliance)
6210 = Muhlenbergia rigens Alliance
6310 = Lepidium latifolium Semi-Natural Herbaceous Stands; Wetland; Exotic (2012) (now Lepidium latifolium – Lactuca serriola Semi-Natural Stands)
7100 =Temperate Pacific Tidal Salt & Brackish Marsh Group; Wetland (2012)
7110 = Sarcocornia pacifica (Salicornia depressa) Alliance; Wetland (2012)
7120 = Spartina foliosa Alliance; Wetland (2012)
7130 = Bolboschoenus maritimus Alliance; Wetland (2012)
7140 = Distichlis spicata Alliance; Wetland (2012) (now Distichlis spicata – Frankenia salina Coastal Alliance)
7200 = Southwest North American Salt Basin & High Marsh Group; Wetland (2012)

Miscellaneous Classes

9100 = Introduced Trees, Shrubs Mapping Unit (not in hierarchy); Exotic (2012)
9200 = Agriculture Mapping Unit (2012)
9300 = Urban/Disturbed Mapping Unit (2012)
- **9320** = Fuel Mod Zone Mapping Unit (2012)
- **9330** = Anthropogenic Areas of Little or No Vegetation Mapping Unit(2012)
- **9340** = Vegetation Restoration Areas Mapping Unit (2012)

9400 = Sparsely Vegetated to Non-vegetated Mapping Unit; Special (2012)
- 9410 = Shore Mapping Unit
  - **9411** = Rocky Shore Mapping Unit; Special (2012)
  - **9412** = Beach Sand Mapping Unit; Special (2012)
- **9420** = Cliff, Bluffs, Scree, and Rock Outcrop Mapping Unit; Special (2012)
- **9430** = Riverine & Lacustrine Mapping Unit; Special (2012)
  - **9431** = Streambed Mapping Unit; Special (2012)
- **9440** = Tidal Mudflat Mapping Unit; Special (2012)
- **9450** = Salt Panne Mapping Unit; Special (2012)
- **9460 =** Recently Burned Areas - Undetermined Vegetation Type Mapping Unit

9800 = Water Body Mapping Unit; Special (2012)
- **9810** = Perennial Stream Channel Mapping Unit; Special (2012)

9820 = Reservoirs and other Artificial Water Features Mapping Unit; Special (2012)

Other Attributes

Density (Conifer, Hardwood, Shrub)
0 = <2%
1 = 2-9%
2 = 10-24%
3 = 25-39%
4 = 40-59%
5 = >60%
9 = Not applicable/Not assigned

Density Herbaceous
0 = <2%
1 = 2-20%
2 = 20-40%
3=40-60%
9 = Not applicable/Not assigned

Disturbance
0 = No Disturbance Noted
1 = Low: 5% to 25% of the polygon affected
2 = Moderate: 25% to 50% of the polygon affected
3 = High: Over 50% of the polygon affected
9 = Not applicable/Not assigned

Exotic
0 = No exotics detected
1 = Low: <33%
2 = Moderate-High >66%
3 = Reserved primarily for exotic types
9 = Not applicable/Not assigned

Land Use
0 = No land use mapped
1000 = Urban/Built-up
1800 = Special Linkage Areas
2000 = Agriculture
9800 = Water

Comment
Contains text added at discretion of photo interpreter to add extra information about the vegetation polygon as well as the results of the field checks

Riparian
0 = Not defined as a riparian vegetation type
1 = Defined as a riparian vegetation type

APPENDIX A-2: NCC Orange County Vegetation – Mapping Classification-Alphabetic 03/31/2025

Map Unit (VegCode)

Standard 1acre MMU
Riparian/Special 1/2 acre MMU
Exotic
XXXX code value bold – mapped in 2022 database
XXXX code value not bold – not mapped in 2022 database
(2012) – mapped in 2012 database
2025 Key Page Number (Refer to Buck-Diaz et al., 2025, for the floristic key)

Trees-Upland
1200 = California Evergreen Coniferous Forest & Woodland Group (2012)
1510 = Eucalyptus (globulus, camaldulensis) Semi-natural Stands; Exotic (2012) (now Semi-Natural Stands Association of the Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-Natural Stands)
1210 = Hesperocyparis forbesii Alliance (2012) (now Association of the Hesperocyparis forbesii – Hesperocyparis nevadensis Alliance)
1110 = Juglans californica Alliance (2012)
1220 = Pinus attenuata Alliance
1230 = Pinus coulteri Alliance
1410 = Pseudotsuga macrocarpa Alliance (2012)
1120 = Quercus agrifolia Alliance (2012)
1130 = Quercus chrysolepis (tree) Alliance
1520 = Schinus (molle, terebinthifolius) – Myoporum laetum Semi-natural Stands ; Exotic

Trees-Riparian
1310 = Acer macrophyllum Alliance; Riparian (now Acer macrophyllum – Acer rubra Alliance)
1610 = Alnus rhombifolia Alliance; Riparian (2012)
1710 = Platanus racemosa Alliance; Riparian (2012) (now Platanus racemosa -Quercus agrifolia Alliance)
1740 = Populus fremontii Alliance; Riparian (2012) (now Populus fremontii – Fraxinus velutinus – Salix gooddingii Alliance)
1121 = Quercus agrifolia Riparian Mapping Unit; Riparian (2012) (now Quercus agrifolia/Salix lasiolepis Association of the Platanus racemosa – Quercus agrifolia Alliance)
1720 = Salix gooddingii Alliance; Riparian (2012) (now Association of the Salix gooddingii – Salix laevigata Alliance)
1730 = Salix laevigata Alliance; Riparian (2012) (now encompassing two associations of the Salix gooddingii – Salix laevigata Alliance)
1700 = Southwest North American Riparian Woodland Group; Riparian (2012)

Shrubs-Upland

3410 = Acacia (cyclops) Semi-natural Stands; Exotic (2012) (now Acacia (cyclops dealbata) Semi Natural Stands Association of the Acacia spp. – Grevillea spp. Leptospermum laevigatum Semi-Natural Stands)
3340 = Acmispon glaber Alliance (2012) (now Lotus scoparius Association of the Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance)
2110 = Adenostoma fasciculatum Alliance (2012)
2140 = Adenostoma fasciculatum - Salvia mellifera Alliance (2012) (now Adenostoma fasciculatum – Salvia spp. Alliance)
2410 = Arctostaphylos glandulosa Alliance (2012)
3110 = Artemisia californica Alliance (2012) (now Artemisia californica Map Unit)
3120 = Artemisia californica - Eriogonum fasciculatum Alliance (2012) (now Artemisia californica – Eriogonum fasciculatum Map Unit)
3130 = Artemisia californica - Salvia mellifera Alliance (2012) (now Association of the Salvia mellifera – (Artemisia californica) Alliance)
5310 = Baccharis pilularis Alliance (2012)
2000 = California Chaparral Macrogroup (2012)
2200 = California Maritime Chaparral Group (2012)
2300 = California Mesic Chaparral Group (2012)
2100 = California Xeric Chaparral Group (2012)
2120 = Ceanothus crassifolius Alliance (2012)
2130 = Ceanothus megacarpus Alliance (2012)
2310 = Ceanothus tomentosus Alliance (2012) (now Association of the Ceanothus (oliganthus, tomentosus) Alliance)
3100 = Central & South Coastal Californian Coastal Sage Scrub Group (2012)
3300 = Central & South Coastal Californian Seral Scrub Group (2012)
2320 = Cercocarpus montanus Alliance (2012)
8100 = Coastal Baja California Norte Maritime Succulent Scrub Group (2012)
3220 = Diplacus aurantiacus Alliance (2012)
3140 = Encelia californica Alliance (2012) (now Encelia californica – Eriogonum cinereum Alliance)
3310 = Ericameria palmeri Alliance (2012) (now Association of Hazardia squarrosa – Ericameria palmeri Alliance)
3150 = Eriogonum fasciculatum Alliance (2012)
3160 = Eriogonum fasciculatum – Salvia apiana Alliance (2012)
3320 = Hazardia squarrosa Alliance (now Hazardia squarrosa/Nassella pulchra – Deinandra fasciculata Association of the Hazardia squarrosa – Ericameria palmeri Alliance)
2330 = Heteromeles arbutifolia Alliance (2012) (now Association of Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance)
3330 = Isocoma menziesii Alliance (2012)
3170 = Keckiella antirrhinoides Alliance (2012)
8110 = Lycium californicum Alliance
3350 = Malacothamnus fasciculatus Alliance (2012) (now Malacothamnus fasciculatus – Malacothamnus spp. Alliance)
2210 = Malosma laurina Alliance (2012)

8120 = Opuntia littoralis Alliance (2012) (now Opuntia littoralis – Opuntia oricola – Cylindropuntia prolifera Alliance)
2340 = Quercus berberidifolia Alliance (2012)
2350 = Quercus berberidifolia - Adenostoma fasciculatum Alliance (2012) (now Association of the Quercus berberidifolia Alliance)
2230 = Quercus dumosa Alliance (2012) (now Association of the Quercus dumosa – Quercus pacifica Alliance)
2420 = Quercus wislizeni shrub Alliance (now Quercus wislizeni – Quercus chrysolepis (shrub) Alliance)
2220 = Rhus integrifolia Alliance (2012)
3180 = Salvia apiana Alliance (2012)
3190 = Salvia leucophylla Alliance ((2012) (now Artemisia californica – (Salvia leucodermis) Alliance)
3210 = Salvia mellifera Alliance (2012) (now Salvia mellifera – (Artemisia californica) Alliance)
5210 = Toxicodendron diversilobum Alliance (2012)
8000 = Xeromorphic Scrub & Herb Vegetation Class (2012)

Shrubs-Riparian
7210 = Atriplex lentiformis Alliance; Wetland (2012)
1810 = Baccharis salicifolia Alliance; Riparian (2012)
8220 = Bebbia juncea Alliance; Riparian (2012) (now Association of the Ambrosia salsola – Bebbia juncea Alliance)
8210 = Lepidospartum squamatum Alliance; Riparian (2012)
1820 = Salix lasiolepis Alliance; Riparian (2012)
1830 = Sambucus nigra Alliance; Riparian (2012) (now Sambucus nigra Association of the Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance)
1800 = Southwest North American Riparian/Wash Scrub Group; Riparian (2012)

Upland-Herbaceous
4210 = Avena (barbata, fatua) Semi-Natural Stands; Exotic (2012) (now included in Avena spp. – Bromus spp. Semi-Natural Stands)
4220 = Brassica nigra and other mustards Semi-Natural Stands; Exotic (now included in Brassica nigra -Centaurea (solstitialis, melitensis) Semi-Natural Stands)
4230 = Bromus (diandrus, hordeaceus) - Brachypodium distachyon Semi-Natural Alliance; Exotic (2012) (now included in Avena spp. – Bromus spp. Semi-Natural Stands)
4240 = Bromus rubens – Schismus (arabicus, barbatus) Semi-Natural Stands; Exotic
4000 = California Annual & Perennial Grassland Macrogroup (2012)
4100 = California Perennial Grassland Group (2012)
5410 = Carpobrotus edulis or Other Ice Plants Semi-Natural Stands; Exotic (2012) (now Mesembryanthemum spp. – Carpobrotus spp. Semi-Natural Stands)
4250 = Cynara cardunculus Provisional Semi-Natural Stands; Exotic (now Association of the Avena spp. – Bromus spp. Semi-Natural Stands)
4260 = Cortaderia (jubata, selloana) Semi-Natural Herbaceous Stands; Exotic (2012)
4290 = Erodium spp. Semi-Natural Stands; Exotic (2012)

4270 = Foeniculum vulgare Semi-Natural Stands; Exotic (now Conium maculatum – Foeniculum vulgare Semi-Natural Stands)
4110 = Leymus condensatus Alliance; (2012)
4280 = Lolium perenne Semi-Natural Stands; Exotic (2012)
4200 = Mediterranean California Naturalized Annual and Perennial Grassland Group (Weedy); Exotic (now included in the California Annual & Perennial Grasslands Macrogroup 4000)
4120 = Stipa lepida Alliance (2012) (now Nassella lepida Association of the Nassella spp. – Mellica spp. Alliance)
4130 = Stipa pulchra Alliance (2012) (now Nassella pulchra Association of the Nassella spp. – Mellica spp. Alliance)

Herbaceous-Riparian/Wetland
6100 = Arid West Freshwater Emergent Marsh Group; Wetland (2012)
1910 = Arundo donax Semi-Natural Stands; Wetland; Exotic (2012) (now Phragmites australis – Arundo donax Semi-Natural Stands)
7130 = Bolboschoenus maritimus Alliance; Wetland (2012)
7140 = Distichlis spicata Alliance; Wetland (2012) (now Distichlis spicata – Frankenia salina Coastal Alliance)
6101 = Fresh Water Marsh (bulrush - cattail) Mapping Unit; Wetland (2012)
6310 = Lepidium latifolium Semi-Natural Herbaceous Stands; Wetland; Exotic (2012) (now Lepidium latifolium – Lactuca serriola Semi-Natural Stands)
6001 = Meadow (Carex - Juncus - Eleocharis) Mapping Unit; Wetland (2012)
6210 = Muhlenbergia rigens Alliance
5110 = Phalaris aquatica Semi-Natural Sands; Wetland; Exotic (now Phalaris aquatica – Phalaris arundinacea Semi-Natural Stands)
7110 = Sarcocornia pacifica (Salicornia depressa) Alliance; Wetland (2012)
6110 = Schoenoplectus acutus Alliance; Wetland (2012) (now Association of the Schoenoplectus (acutus, californicus) Alliance)
6130 = Schoenoplectus californicus Alliance; Wetland (2012) (now Association of the Schoenoplectus (acutus, californicus) Alliance)
6140 = Scirpus robustus Alliance; Wetland (2012) (now Provisional Association of the Bolboschoenus maritimus Alliance)
7200 = Southwest North American Salt Basin & High Marsh Group; Wetland (2012)
7120 = Spartina foliosa Alliance; Wetland (2012)
6000 = Temperate & Boreal Freshwater Marsh Formation; Wetland (2012)
7100 = Temperate Pacific Tidal Salt & Brackish Marsh Group; Wetland (2012)
6120 = Typha (angustifolia, domingensis, latifolia) Alliance; Wetland (2012)

Miscellaneous Classes

9100 = Introduced Trees, Shrubs Mapping Unit (not in hierarchy); Exotic (2012)
9200 = Agriculture Mapping Unit (2012)
9300 = Urban/Disturbed Mapping Unit (2012)
- **9320** = Fuel Mod Zone Mapping Unit (2012)
- **9330** = Anthropogenic Areas of Little or No Vegetation Mapping Unit(2012)
- **9340** = Vegetation Restoration Areas Mapping Unit (2012)

9400 = Sparsely Vegetated to Non-vegetated Mapping Unit; Special (2012)
- 9410 = Shore Mapping Unit
  - **9411** = Rocky Shore Mapping Unit; Special (2012)
  - **9412** = Beach Sand Mapping Unit; Special (2012)
- **9420** = Cliff, Bluffs, Scree, and Rock Outcrop Mapping Unit; Special (2012)
- **9430** = Riverine & Lacustrine Mapping Unit; Special (2012)
  - **9431** = Streambed Mapping Unit; Special (2012)
- **9440** = Tidal Mudflat Mapping Unit; Special (2012)
- **9450** = Salt Panne Mapping Unit; Special (2012)
- **9460 =** Recently Burned Areas - Undetermined Vegetation Type Mapping Unit

9800 = Water Body Mapping Unit; Special (2012)
- **9810** = Perennial Stream Channel Mapping Unit; Special (2012)
- **9820** = Reservoirs and other Artificial Water Features Mapping Unit; Special (2012)

APPENDIX A-3: NCC Orange County Vegetation – Mapping Hierarchy 03/31/2025

Map Unit (VegCode)

Standard 1acre MMU
Riparian/Special 1/2 acre MMU
Exotic
[XXXX] code value bold – mapped in 2022 database
[XXXX] code value not bold – not mapped in 2022 database
(2012) – mapped in 2012 database

Class
Subclass
Formation
Division
Macrogroup
Group
Alliance

Mesomorphic Tree Vegetation (Forest and Woodland) Class 1
Temperate Forest Subclass 1.C
Warm Temperate Forest Formation 1.C.1
Madrean Forest and Woodland Division 1.C.1.c
California Forest and Woodland Macrogroup M009
Californian broadleaf forest and woodland Group Gp6
Juglans californica Alliance (2012) **[1110]**
Quercus agrifolia Alliance (2012) **[1120]**
Quercus chrysolepis (tree) Alliance [1130]

Californian evergreen coniferous forest and woodland Group Gp21 (2012) **[1200]**
Hesperocyparis forbesii Alliance (now Association of the Hesperocyparis forbesii – Hesperocyparis nevadensis Alliance) (2012) **[1210]**
Pinus attenuata Alliance [1220]
Pinus coulteri Alliance [1230]

Cool Temperate Forest Formation 1C2
Western North American Cool Temperate Forest Division 1C2b *Californian–Vancouverian Montane and Foothill Forest Macrogroup M023 Upland Vancouverian mixed woodland and forest Group Gp49*
Acer macrophyllum Alliance; Riparian (now Acer macrophyllum – Acer rubra Alliance) [1310]

Californian montane conifer forest Group Gp56
Pseudotsuga macrocarpa Alliance (2012) **[1410]**

North American Introduced Evergreen Broadleaf and Conifer Forest Division 1.C.2.x
Introduced North American Mediterranean Woodland and Forest Macrogroup M027
No subdivision at Group level Gp106
Eucalyptus (globulus, camaldulensis) Semi-natural Stands; Exotic (2012) (now Semi-Natural Stands Association of the Eucalyptus spp. – Ailanthus altissima – Robinia pseudoacacia Semi-Natural Stands) (2012) **[1510]**
Schinus (molle, terebinthifolius) – Myoporum laetum Semi-natural Stands Exotic [1520]

Temperate Flooded and Swamp Forest Formation 1.C.3
Western North American Flooded and Swamp Forest Division 1.C.3.b
Western Cordilleran Montane Boreal Riparian Scrub and Forest M034
Vancouverian riparian deciduous forest Group Gp136
Alnus rhombifolia Alliance; Riparian (2012) **[1610]**

Western North American Warm Temperate Flooded and Swamp Forest Division 1.C.3.c
Southwestern North American Riparian, Flooded and Swamp Forest Macrogroup M036
Southwestern North American riparian evergreen and deciduous woodland Group Gp143 Riparian (2012) **[1700]**
Platanus racemosa Alliance; Riparian (now Platanus racemosa -Quercus agrifolia Alliance) (2012) **[1710]**
Salix gooddingii Alliance; Riparian (now Association of the Salix gooddingii – Salix laevigata Alliance) (2012) **[1720]**
Salix laevigata Alliance; Riparian (now encompassing two associations of the Salix gooddingii – Salix laevigata Alliance) (2012) **[1730]**
Populus fremontii Alliance; Riparian (now Populus fremontii – Fraxinus velutinus – Salix gooddingii Alliance) (2012) **[1740]**

Southwestern North American riparian/wash scrub Group Gp151 Riparian (2012) **[1800]**
Baccharis salicifolia Alliance; Riparian (2012) **[1810]**
Salix lasiolepis Alliance; Riparian (2012) **[1820]**
Sambucus nigra Alliance; Riparian (2012) (now Sambucus nigra Association of the Rhus trilobata – Crataegus rivularis – Forestiera pubescens Alliance) (2012) **[1830]**

Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland) Class 2
Mediterranean Scrub and Grassland Subclass 2.B
Mediterranean Scrub Formation 2.B.1
California Scrub Division 2.B.1.a
California Chaparral Macrogroup M043 (2012) **[2000]**
California Xeric Chaparral Group Gp171 (2012) **[2100]**
Adenostoma fasciculatum Alliance (2012) **[2110]**
Ceanothus crassifolius Alliance (2012) **[2120]**
Ceanothus megacarpus Alliance (2012) **[2130]**
Adenostoma fasciculatum - Salvia mellifera Alliance (now Adenostoma fasciculatum – Salvia spp. Alliance) (2012) **[2140]**

California Maritime Chaparral Group Gp184 (2012*)* **[2200]**
Malosma laurina Alliance (2012) **[2210]**
Rhus integrifolia Alliance (2012) **[2220]**
Quercus dumosa Alliance (now Association of the Quercus dumosa – Quercus pacifica Alliance) (2012) **[2230]**

California Mesic Chaparral Group Gp202 (2012) **[2300]**
Ceanothus tomentosus Alliance (now Association of the Ceanothus (oliganthus, tomentosus) Alliance) (2012) **[2310]**
Cercocarpus montanus Alliance (2012) **[2320]**
Heteromeles arbutifolia Alliance (now Association of Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance) (2012) **[2330]**
Quercus berberidifolia Alliance (2012) **[2340]**
Quercus berberidifolia - Adenostoma fasciculatum Alliance (now Association of the Quercus berberidifolia Alliance) (2012) **[2350]**

California Pre-Montane Chaparral Group Gp214
Arctostaphylos glandulosa Alliance (2012) **[2410]**
Quercus wislizeni shrub Alliance (now Quercus wislizeni – Quercus chrysolepis (shrub) Alliance) [2420]

Central & South Coastal Californian Coastal Sage Scrub Group Gp222 (2012) **[3100]**
Artemisia californica Alliance (2012) (now Artemisia californica Map Unit) **[3110]**
Artemisia californica - Eriogonum fasciculatum Alliance (now Artemisia californica – Eriogonum fasciculatum Map Unit) (2012) **[3120]**
Artemisia californica - Salvia mellifera Alliance (now Association of the Salvia mellifera – (Artemisia californica) Alliance) (2012) **[3130]**
Encelia californica Alliance (now Encelia californica – Eriogonum cinereum Alliance) (2012) **[3140]**
Eriogonum fasciculatum Alliance (2012) **[3150]**
Eriogonum fasciculatum – Salvia apiana Alliance (2012) **[3160]**
Keckiella antirrhinoides Alliance (2012) **[3170]**
Salvia apiana Alliance (2012) **[3180]**
Salvia leucophylla Alliance (now Artemisia californica – (Salvia leucodermis) Alliance) (2012) **[3190]**
Salvia mellifera Alliance (now Salvia mellifera – (Artemisia californica) Alliance) (2012) **[3210]**
Diplacus aurantiacus Alliance (2012) **[3220]**

Central & South Coastal Californian Seral Scrub Group Gp238 (2012) **[3300]**
Ericameria palmeri Alliance (now Association of Hazardia squarrosa – Ericameria palmeri Alliance) (2012) **[3310]**
Hazardia squarrosa Alliance (now Hazardia squarrosa/Nassella pulchra – Deinandra fasciculata Association of the Hazardia squarrosa – Ericameria palmeri Alliance) **[3320]**
Isocoma menziesii Alliance (2012) **[3330]**

Acmispon glaber Alliance (now Lotus scoparius Association of the Lotus scoparius – Lupinus albifrons – Eriodictyon spp. Alliance) (2012) **[3340]**
Malacothamnus fasciculatus Alliance (now Malacothamnus fasciculatus – Malacothamnus spp. Alliance) (2012) **[3350]**

Naturalized non-native Mediterranean scrub Group Gp248
Acacia (cyclops) Semi-natural Stands; Exotic (now Acacia (cyclops dealbata) Semi Natural Stands Association of the Acacia spp. – Grevillea spp. Leptospermum laevigatum Semi-Natural Stands) (2012) **[3410]**

Mediterranean Grassland and Forb Meadow Formation 2.B.2
California Grassland and Meadow Division 2.B.2.a
California Annual & Perennial Grassland Macrogroup M045 (2012) **[4000]**
California Perennial Grassland Group Gp261 (2012) **[4100]**
Leymus condensatus Alliance; (2012) **[4110]**
Stipa lepida Alliance (now Nassella lepida Association of the Nassella spp. – Mellica spp. Alliance) (2012) **[4120]**
Stipa pulchra Alliance (now Nassella pulchra Association of the Nassella spp. – Mellica spp. Alliance) (2012) **[4130]**

Mediterranean California Naturalized Annual and Perennial Grassland Group GP267; Exotic (now included in the California Annual & Perennial Grasslands Macrogroup 4000) [4200]
Avena (barbata, fatua) Semi-Natural Stands; Exotic (now included in Avena spp. – Bromus spp. Semi-Natural Stands) (2012) [4210]
Brassica nigra and other mustards Semi-Natural Stands; Exotic (now included in Brassica nigra -Centaurea (solstitialis, melitensis) Semi-Natural Stands) [4220]
Bromus (diandrus, hordeaceus) - Brachypodium distachyon Semi-Natural Alliance; Exotic (2012) (now included in Avena spp. – Bromus spp. Semi-Natural Stands) [4230]
Bromus rubens – Schismus (arabicus, barbatus) Semi-Natural Stands Exotic [4240]
Cynara cardunculus Provisional Semi-Natural Stands; Exotic (now Association of the Avena spp. – Bromus spp. Semi-Natural Stands) [4250]
Cortaderia (jubata, selloana) Semi-Natural Herbaceous Stands; Exotic (2012) **[4260]**
Foeniculum vulgare Semi-Natural Stands Exotic (now Conium maculatum – Foeniculum vulgare Semi-Natural Stands) [4270]
Lolium perenne Semi-Natural Stands; Exotic (2012) [4280]
Erodium spp. Semi-Natural Stands; Exotic (2012) [4290]
Euphorbia terracina Semi-Natural Stands; Exotic

Temperate and Boreal Shrubland and Grassland Subclass 2.C

Temperate and Grassland, Meadow, and Shrubland Formation 2.C.1

Vancouverian and Rocky Mountain Grassland and Shrubland Division 2.C.1.a

Western North American Temperate Grassland and Meadow Macrogroup M048

Vancouverian and Rocky Mountain naturalized perennial grassland Group Gp312

Phalaris aquatica Semi-Natural Sands; Wetland; Exotic (now Phalaris aquatica – Phalaris arundinacea Semi-Natural Stands) [5110]

Vancouverian Lowland Grassland and Shrubland Macrogroup M050

Vancouverian coastal deciduous scrub Group Gp347

Toxicodendron diversilobum Alliance (2012) **[5210]**

Temperate and Boreal Scrub and Herb Coastal Vegetation Formation 2.C.3

Pacific Coast Scrub and Herb Littoral Vegetation Division 2.C.3.b

Vancouverian Coastal Dune and Bluff Macrogroup M058

California Coastal evergreen bluff and dune scrub Group Gp380

Baccharis pilularis Alliance (2012) **[5310]**

California-Vancouverian semi-natural littoral scrub and herb vegetation Group Gp388

Carpobrotus edulis or Other Ice Plants Semi-Natural Stands; Exotic (now Mesembryanthemum spp. – Carpobrotus spp. Semi-Natural Stands) (2012) **[5410]**

Temperate and Boreal Freshwater Marsh Formation 2.C.5

Meadow (Carex - Juncus - Eleocharis) Mapping Unit; Wetland (2012) **[6001]**

Western North American Freshwater Marsh Division 2.C.5.b

Western North American Freshwater Marsh Macrogroup M073

Arid West Freshwater Emergent Marsh Group Gp404; Wetland (2012) **[6100]**

Fresh Water Marsh (bulrush - cattail) Mapping Unit; Wetland (2012) **[6101]**

Schoenoplectus acutus Alliance; Wetland (now Association of the Schoenoplectus (acutus, californicus) Alliance) (2012) **[6110]**

Typha (angustifolia, domingensis, latifolia) Alliance; Wetland (2012) **[6120]**

Schoenoplectus californicus Alliance; Wetland (now Association of the Schoenoplectus (acutus, californicus) Alliance) (2012) **[6130]**

Western North America Wet Meadow and Low Shrub Carr Macrogroup M075

Californian warm temperate marsh/seep Group Gp448

Muhlenbergia rigens Alliance [6210]

Naturalized warm-temperate riparian and wetland Group

Arundo donax Semi-Natural Stands; Wetland; Exotic (now Phragmites australis – Arundo donax Semi-Natural Stands) (2012) **[1910]**

Lepidium latifolium Semi-Natural Herbaceous Stands; Wetland; Exotic (now Lepidium latifolium – Lactuca serriola Semi-Natural Stands) (2012) **[6310]**

Temperate and boreal Salt Marsh Formation 2.C.6
Temperate and Boreal Pacific Coastal Salt Marsh Division 2.C.6.c
North American Pacific Coastal Salt Marsh Macrogroup M081
Temperate Pacific Tidal Salt & Brackish Marsh Group Gp464; Wetland (2012) **[7100]**
Bolboschoenus maritimus Alliance; Wetland (2012) **[7130]**
Scirpus robustus Alliance; Wetland (now Provisional Association of the Bolboschoenus maritimus Alliance) (2012) **[6140]**
Sarcocornia pacifica (Salicornia depressa) Alliance; Wetland (2012) **[7110]**
Spartina foliosa Alliance; Wetland (2012) **[7120]**
Distichlis spicata Alliance; Wetland (now Distichlis spicata – Frankenia salina Coastal Alliance) (2012) **[7140]**

Western North American Interior Alkali-Saline Wetland Division 2.C.6.d
Warm Semi-Desert/Mediterranean Alkali–Saline Wetland Macrogroup M083
Southwest North American Salt Basin & High Marsh Group Gp485; Wetland (2012) [**7200]**
Atriplex lentiformis Alliance; Wetland (2012) **[7210]**

Xeromorphic Scrub and Herb Vegetation (Semi-Desert) Class 3
Warm Semi-Desert Scrub and Grassland Subclass 3.A
Warm Semi-Desert Scrub and Grassland Formation 3.A.1
Sonoran and Chihuahuan Semi-Desert Scrub and Grassland Division 3.A.1.a
Viscaino–Baja California Desert Scrub Macrogroup M089
Coastal Baja California Norte Maritime Succulent Scrub Group Gp522 (2012) **[8100]**
Lycium californicum Alliance [8110]
Opuntia littoralis Alliance (now Opuntia littoralis – Opuntia oricola – Cylindropuntia prolifera Alliance) (2012) **[8120]**

Madrean Warm Semi-Desert Wash Woodland/Scrub Macrogroup M092
Mojavean semi-desert wash scrub Group Gp529
Lepidospartum squamatum Alliance; Riparian (2012) **[8210]**
Bebbia juncea Alliance; Riparian (now Association of the Ambrosia salsola – Bebbia juncea Alliance) (2012) [8220]

APPENDIX B: NCC Orange County Vegetation – Summaries of Acreage 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 NCC vegetation mapping update project, in numerical order by code value (VegCode). The VegCode and Vegetation Name are followed by 3 columns relating to area: the total area covered by the map unit in the study area expressed in acres; total area in hectares; and the percent of the total study area mapped as the given map unit. 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 percent of total area from highest to lowest.

Summary of Acreage By VegCode

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
1110	Juglans californica Alliance	14.7	5.9	0.02%
1120	Quercus agrifolia Alliance	2,323.3	940.2	2.71%
1121	Quercus agrifolia Riparian	1,169.8	473.4	1.36%
1200	Californian Evergreen Coniferous Forest and Woodland Group	0.8	0.3	0.00%
1210	Hesperocyparis forbesii Alliance	136.4	55.2	0.16%
1410	Pseudotsuga macrocarpa Alliance	4.9	2.0	0.01%
1510	Eucalyptus (globulus, camaldulensis) Semi-natural Woodland Stands	166.7	67.5	0.19%
1610	Alnus rhombifolia Alliance	22.1	8.9	0.03%
1700	Southwestern North American Riparian Evergreen and Deciduous Woodland Group	101.5	41.1	0.12%
1710	Platanus racemosa Alliance	474.0	191.8	0.55%
1720	Salix gooddingii Alliance	583.5	236.1	0.68%
1730	Salix laevigata Alliance	115.4	46.7	0.13%
1740	Populus fremontii Alliance	29.0	11.8	0.03%
1800	Southwestern North American Riparian/Wash Scrub Group	20.8	8.4	0.02%
1810	Baccharis salicifolia Alliance	864.1	349.7	1.01%
1820	Salix lasiolepis Alliance	729.4	295.2	0.85%
1830	Sambucus nigra Alliance	460.8	186.5	0.54%
1910	Arundo donax Semi-natural Stands	18.7	7.6	0.02%
2000	California Chaparral Macrogroup	3.8	1.5	0.00%
2100	Californian Xeric Chaparral Group	71.9	29.1	0.08%
2110	Adenostoma fasciculatum Alliance	4,467.8	1,808.1	5.21%
2120	Ceanothus crassifolius Alliance	1,129.1	456.9	1.32%
2130	Ceanothus megacarpus Alliance	1,196.3	484.1	1.40%
2140	Adenostoma fasciculatum - Salvia mellifera Alliance	933.8	377.9	1.09%
2200	Californian Maritime Chaparral Group	43.7	17.7	0.05%
2210	Malosma laurina Alliance	2,859.4	1,157.1	3.34%
2220	Rhus integrifolia Alliance	1,298.1	525.3	1.51%
2230	Quercus dumosa Alliance	23.1	9.3	0.03%
2300	Californian Mesic Chaparral Group	35.0	14.2	0.04%
2310	Ceanothus tomentosus Alliance	111.4	45.1	0.13%
2320	Cercocarpus montanus Alliance	26.0	10.5	0.03%
2330	Heteromeles arbutifolia Alliance	352.6	142.7	0.41%
2340	Quercus berberidifolia Alliance	1,313.2	531.4	1.53%
2350	Quercus berberidifolia - Adenostoma fasciculatum Alliance	165.0	66.8	0.19%
2410	Arctostaphylos glandulosa Alliance	295.7	119.7	0.35%

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
3100	Central and South Coastal Californian Coastal Sage Scrub Group	776.6	314.3	0.91%
3110	Artemisia californica Alliance	4,006.1	1,621.2	4.67%
3120	Artemisia californica - Eriogonum fasciculatum Alliance	6,780.2	2,743.8	7.91%
3130	Artemisia californica - Salvia mellifera Alliance	5,440.7	2,201.8	6.35%
3140	Encelia californica Alliance	241.6	97.8	0.28%
3150	Eriogonum fasciculatum Alliance	945.4	382.6	1.10%
3160	Eriogonum fasciculatum - Salvia apiana Alliance	8.6	3.5	0.01%
3170	Keckiella antirrhinoides Alliance	15.6	6.3	0.02%
3180	Salvia apiana Alliance	177.2	71.7	0.21%
3190	Salvia leucophylla Alliance	349.7	141.5	0.41%
3210	Salvia mellifera Alliance	1,960.6	793.4	2.29%
3220	Diplacus aurantiacus Alliance	93.0	37.6	0.11%
3300	Central and South Coastal California Seral Scrub Group	144.4	58.4	0.17%
3310	Ericameria palmeri Alliance	46.4	18.8	0.05%
3320	Hazardia squarrosa Alliance	1.7	0.7	0.00%
3330	Isocoma menziesii Alliance	31.6	12.8	0.04%
3340	Acmispon glaber Alliance	1,195.6	483.8	1.39%
3350	Malacothamnus fasciculatus Alliance	844.2	341.6	0.99%
3410	Acacia (cyclops) Semi-natural Stands	266.0	107.7	0.31%
4000	California Annual and Perennial Grassland Macrogroup	9,505.6	3,846.8	11.09%
4100	California Perennial Grassland Group	41.6	16.8	0.05%
4110	Leymus condensatus Alliance	3.4	1.4	0.00%
4120	Stipa lepida Alliance	81.0	32.8	0.09%
4130	Stipa pulchra Alliance	587.5	237.7	0.69%
4260	Cortaderia (jubata, selloana) Semi-natural Herbaceous Stands	14.5	5.9	0.02%
5210	Toxicodendron diversilobum Alliance	65.1	26.3	0.08%
5310	Baccharis pilularis Alliance	481.0	194.6	0.56%
5410	Carpobrotus edulis or Other Ice Plants Semi-natural Stands	15.5	6.3	0.02%
6000	Temperate and Boreal Freshwater Marsh Formation	45.0	18.2	0.05%
6001	Meadow (Carex - Juncus - Eleocharis) Mapping Unit	3.2	1.3	0.00%
6100	Arid West Freshwater Emergent Marsh Group	104.2	42.2	0.12%
6101	Fresh Water Marsh (bulrush - cattail) Mapping Unit	13.6	5.5	0.02%

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
6110	Schoenoplectus acutus Alliance	8.2	3.3	0.01%
6120	Typha (angustifolia, domingensis, latifolia) Alliance	13.6	5.5	0.02%
6130	Schoenoplectus californicus Alliance	5.5	2.2	0.01%
6140	Scirpus robustus Alliance	16.5	6.7	0.02%
6310	Lepidium latifolium Semi-natural Herbaceous Stands	8.0	3.2	0.01%
7100	Temperate Pacific Tidal Salt and Brackish Marsh Group	317.0	128.3	0.37%
7110	Sarcocornia pacifica (Salicornia depressa) Alliance	35.8	14.5	0.04%
7120	Spartina foliosa Alliance	89.5	36.2	0.10%
7130	Bolboschoenus maritimus Alliance	0.8	0.3	0.00%
7140	Distichlis spicata Alliance	0.1	0.0	0.00%
7200	Southwestern North American Salt Basin and High Marsh Group	71.5	29.0	0.08%
7210	Atriplex lentiformis Alliance	32.0	13.0	0.04%
8100	Coastal Baja California Norte Maritime Succulent Scrub Group	25.0	10.1	0.03%
8120	Opuntia littoralis Alliance	666.1	269.5	0.78%
8210	Lepidospartum squamatum Alliance	141.0	57.1	0.16%
9100	Introduced Trees, Shrubs (not in hierarchy)	554.8	224.5	0.65%
9200	Agriculture	617.9	250.1	0.72%
9300	Urban/Disturbed	15,677.6	6,344.5	18.29%
9320	Fuel Mod Zone	1,257.2	508.8	1.47%
9330	Anthropogenic Areas of Little or No Vegetation	415.7	168.2	0.49%
9340	Vegetation Restoration Areas	721.6	292.0	0.84%
9400	Sparsely vegetated to non-vegetated	5.8	2.3	0.01%
9411	Rocky shore	36.7	14.9	0.04%
9412	Beach sand	118.6	48.0	0.14%
9420	Cliff, bluffs, scree, and rock outcrop	286.7	116.0	0.33%
9430	Riverine & Lacustrine	3.5	1.4	0.00%
9431	Streambed	139.2	56.3	0.16%
9440	Tidal mudflat	153.4	62.1	0.18%
9450	Salt panne	8.5	3.4	0.01%
9460	Recently Burned Areas – Undetermined Vegetation Type Mapping Unit	6,789.3	2,747.5	7.92%
9800	Water Body	740.8	299.8	0.86%
9810	Perennial Stream Channel	27.6	11.2	0.03%
9820	Reservoirs and other Artificial Water Features	871.6	352.7	1.02%
	Grand Total	**85,705.2**	**34,683.7**	**100.00%**

Summary of Acreage By Vegetation Name Alphabetically

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
3410	Acacia (cyclops) Semi-natural Stands	266.0	107.7	0.31%
3340	Acmispon glaber Alliance	1,195.6	483.8	1.39%
2140	Adenostoma fasciculatum - Salvia mellifera Alliance	933.8	377.9	1.09%
2110	Adenostoma fasciculatum Alliance	4,467.8	1,808.1	5.21%
9200	Agriculture	617.9	250.1	0.72%
1610	Alnus rhombifolia Alliance	22.1	8.9	0.03%
9330	Anthropogenic Areas of Little or No Vegetation	415.7	168.2	0.49%
2410	Arctostaphylos glandulosa Alliance	295.7	119.7	0.35%
6100	Arid West Freshwater Emergent Marsh Group	104.2	42.2	0.12%
3120	Artemisia californica - Eriogonum fasciculatum Alliance	6,780.2	2,743.8	7.91%
3130	Artemisia californica - Salvia mellifera Alliance	5,440.7	2,201.8	6.35%
3110	Artemisia californica Alliance	4,006.1	1,621.2	4.67%
1910	Arundo donax Semi-natural Stands	18.7	7.6	0.02%
7210	Atriplex lentiformis Alliance	32.0	13.0	0.04%
5310	Baccharis pilularis Alliance	481.0	194.6	0.56%
1810	Baccharis salicifolia Alliance	864.1	349.7	1.01%
9412	Beach sand	118.6	48.0	0.14%
7130	Bolboschoenus maritimus Alliance	0.8	0.3	0.00%
4000	California Annual and Perennial Grassland Macrogroup	9,505.6	3,846.8	11.09%
2000	California Chaparral Macrogroup	3.8	1.5	0.00%
4100	California Perennial Grassland Group	41.6	16.8	0.05%
1200	Californian Evergreen Coniferous Forest and Woodland Group	0.8	0.3	0.00%
2200	Californian Maritime Chaparral Group	43.7	17.7	0.05%
2300	Californian Mesic Chaparral Group	35.0	14.2	0.04%
2100	Californian Xeric Chaparral Group	71.9	29.1	0.08%
5410	Carpobrotus edulis or Other Ice Plants Semi-natural Stands	15.5	6.3	0.02%
2120	Ceanothus crassifolius Alliance	1,129.1	456.9	1.32%
2130	Ceanothus megacarpus Alliance	1,196.3	484.1	1.40%
2310	Ceanothus tomentosus Alliance	111.4	45.1	0.13%
3300	Central and South Coastal California Seral Scrub Group	144.4	58.4	0.17%
3100	Central and South Coastal Californian Coastal Sage Scrub Group	776.6	314.3	0.91%
2320	Cercocarpus montanus Alliance	26.0	10.5	0.03%
9420	Cliff, bluffs, scree, and rock outcrop	286.7	116.0	0.33%

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
8100	Coastal Baja California Norte Maritime Succulent Scrub Group	25.0	10.1	0.03%
4260	Cortaderia (jubata, selloana) Semi-natural Herbaceous Stands	14.5	5.9	0.02%
3220	Diplacus aurantiacus Alliance	93.0	37.6	0.11%
7140	Distichlis spicata Alliance	0.1	0.0	0.00%
3140	Encelia californica Alliance	241.6	97.8	0.28%
3310	Ericameria palmeri Alliance	46.4	18.8	0.05%
3160	Eriogonum fasciculatum - Salvia apiana Alliance	8.6	3.5	0.01%
3150	Eriogonum fasciculatum Alliance	945.4	382.6	1.10%
1510	Eucalyptus (globulus, camaldulensis) Semi-natural Woodland Stands	166.7	67.5	0.19%
6101	Fresh Water Marsh (bulrush - cattail) Mapping Unit	13.6	5.5	0.02%
9320	Fuel Mod Zone	1,257.2	508.8	1.47%
3320	Hazardia squarrosa Alliance	1.7	0.7	0.00%
1210	Hesperocyparis forbesii Alliance	136.4	55.2	0.16%
2330	Heteromeles arbutifolia Alliance	352.6	142.7	0.41%
9100	Introduced Trees, Shrubs (not in hierarchy)	554.8	224.5	0.65%
3330	Isocoma menziesii Alliance	31.6	12.8	0.04%
1110	Juglans californica Alliance	14.7	5.9	0.02%
3170	Keckiella antirrhinoides Alliance	15.6	6.3	0.02%
6310	Lepidium latifolium Semi-natural Herbaceous Stands	8.0	3.2	0.01%
8210	Lepidospartum squamatum Alliance	141.0	57.1	0.16%
4110	Leymus condensatus Alliance	3.4	1.4	0.00%
3350	Malacothamnus fasciculatus Alliance	844.2	341.6	0.99%
2210	Malosma laurina Alliance	2,859.4	1,157.1	3.34%
6001	Meadow (Carex - Juncus - Eleocharis) Mapping Unit	3.2	1.3	0.00%
8120	Opuntia littoralis Alliance	666.1	269.5	0.78%
9810	Perennial Stream Channel	27.6	11.2	0.03%
1710	Platanus racemosa Alliance	474.0	191.8	0.55%
1740	Populus fremontii Alliance	29.0	11.8	0.03%
1410	Pseudotsuga macrocarpa Alliance	4.9	2.0	0.01%
1120	Quercus agrifolia Alliance	2,323.3	940.2	2.71%
1121	Quercus agrifolia Riparian	1,169.8	473.4	1.36%
2350	Quercus berberidifolia - Adenostoma fasciculatum Alliance	165.0	66.8	0.19%
2340	Quercus berberidifolia Alliance	1,313.2	531.4	1.53%
2230	Quercus dumosa Alliance	23.1	9.3	0.03%

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
9460	Recently Burned Areas – Undetermined Vegetation Type Mapping Unit	6,789.3	2,747.5	7.92%
9820	Reservoirs and other Artificial Water Features	871.6	352.7	1.02%
2220	Rhus integrifolia Alliance	1,298.1	525.3	1.51%
9430	Riverine & Lacustrine	3.5	1.4	0.00%
9411	Rocky shore	36.7	14.9	0.04%
1720	Salix gooddingii Alliance	583.5	236.1	0.68%
1730	Salix laevigata Alliance	115.4	46.7	0.13%
1820	Salix lasiolepis Alliance	729.4	295.2	0.85%
9450	Salt panne	8.5	3.4	0.01%
3180	Salvia apiana Alliance	177.2	71.7	0.21%
3190	Salvia leucophylla Alliance	349.7	141.5	0.41%
3210	Salvia mellifera Alliance	1,960.6	793.4	2.29%
1830	Sambucus nigra Alliance	460.8	186.5	0.54%
7110	Sarcocornia pacifica (Salicornia depressa) Alliance	35.8	14.5	0.04%
6110	Schoenoplectus acutus Alliance	8.2	3.3	0.01%
6130	Schoenoplectus californicus Alliance	5.5	2.2	0.01%
6140	Scirpus robustus Alliance	16.5	6.7	0.02%
1700	Southwestern North American Riparian Evergreen and Deciduous Woodland Group	101.5	41.1	0.12%
1800	Southwestern North American Riparian/Wash Scrub Group	20.8	8.4	0.02%
7200	Southwestern North American Salt Basin and High Marsh Group	71.5	29.0	0.08%
9400	Sparsely vegetated to non-vegetated	5.8	2.3	0.01%
7120	Spartina foliosa Alliance	89.5	36.2	0.10%
4120	Stipa lepida Alliance	81.0	32.8	0.09%
4130	Stipa pulchra Alliance	587.5	237.7	0.69%
9431	Streambed	139.2	56.3	0.16%
6000	Temperate and Boreal Freshwater Marsh Formation	45.0	18.2	0.05%
7100	Temperate Pacific Tidal Salt and Brackish Marsh Group	317.0	128.3	0.37%
9440	Tidal mudflat	153.4	62.1	0.18%
5210	Toxicodendron diversilobum Alliance	65.1	26.3	0.08%
6120	Typha (angustifolia, domingensis, latifolia) Alliance	13.6	5.5	0.02%
9300	Urban/Disturbed	15,677.6	6,344.5	18.29%
9340	Vegetation Restoration Areas	721.6	292.0	0.84%
9800	Water Body	740.8	299.8	0.86%
	Grand Total	**85,705.2**	**34,683.7**	**100.00%**

Summary of Acreage By Percent of Total Area

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
9300	Urban/Disturbed	15,677.6	6,344.5	18.29%
4000	California Annual and Perennial Grassland Macrogroup	9,505.6	3,846.8	11.09%
9460	Recently Burned Areas – Undetermined Vegetation Type Mapping Unit	6,789.3	2,747.5	7.92%
3120	Artemisia californica - Eriogonum fasciculatum Alliance	6,780.2	2,743.8	7.91%
3130	Artemisia californica - Salvia mellifera Alliance	5,440.7	2,201.8	6.35%
2110	Adenostoma fasciculatum Alliance	4,467.8	1,808.1	5.21%
3110	Artemisia californica Alliance	4,006.1	1,621.2	4.67%
2210	Malosma laurina Alliance	2,859.4	1,157.1	3.34%
1120	Quercus agrifolia Alliance	2,323.3	940.2	2.71%
3210	Salvia mellifera Alliance	1,960.6	793.4	2.29%
2340	Quercus berberidifolia Alliance	1,313.2	531.4	1.53%
2220	Rhus integrifolia Alliance	1,298.1	525.3	1.51%
9320	Fuel Mod Zone	1,257.2	508.8	1.47%
2130	Ceanothus megacarpus Alliance	1,196.3	484.1	1.40%
3340	Acmispon glaber Alliance	1,195.6	483.8	1.39%
1121	Quercus agrifolia Riparian	1,169.8	473.4	1.36%
2120	Ceanothus crassifolius Alliance	1,129.1	456.9	1.32%
3150	Eriogonum fasciculatum Alliance	945.4	382.6	1.10%
2140	Adenostoma fasciculatum - Salvia mellifera Alliance	933.8	377.9	1.09%
9820	Reservoirs and other Artificial Water Features	871.6	352.7	1.02%
1810	Baccharis salicifolia Alliance	864.1	349.7	1.01%
3350	Malacothamnus fasciculatus Alliance	844.2	341.6	0.99%
3100	Central and South Coastal Californian Coastal Sage Scrub Group	776.6	314.3	0.91%
9800	Water Body	740.8	299.8	0.86%
1820	Salix lasiolepis Alliance	729.4	295.2	0.85%
9340	Vegetation Restoration Areas	721.6	292.0	0.84%
8120	Opuntia littoralis Alliance	666.1	269.5	0.78%
9200	Agriculture	617.9	250.1	0.72%
4130	Stipa pulchra Alliance	587.5	237.7	0.69%
1720	Salix gooddingii Alliance	583.5	236.1	0.68%
9100	Introduced Trees, Shrubs (not in hierarchy)	554.8	224.5	0.65%
5310	Baccharis pilularis Alliance	481.0	194.6	0.56%
1710	Platanus racemosa Alliance	474.0	191.8	0.55%
1830	Sambucus nigra Alliance	460.8	186.5	0.54%
9330	Anthropogenic Areas of Little or No Vegetation	415.7	168.2	0.49%

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
2330	Heteromeles arbutifolia Alliance	352.6	142.7	0.41%
3190	Salvia leucophylla Alliance	349.7	141.5	0.41%
7100	Temperate Pacific Tidal Salt and Brackish Marsh Group	317.0	128.3	0.37%
2410	Arctostaphylos glandulosa Alliance	295.7	119.7	0.35%
9420	Cliff, bluffs, scree, and rock outcrop	286.7	116.0	0.33%
3410	Acacia (cyclops) Semi-natural Stands	266.0	107.7	0.31%
3140	Encelia californica Alliance	241.6	97.8	0.28%
3180	Salvia apiana Alliance	177.2	71.7	0.21%
1510	Eucalyptus (globulus, camaldulensis) Semi-natural Woodland Stands	166.7	67.5	0.19%
2350	Quercus berberidifolia - Adenostoma fasciculatum Alliance	165.0	66.8	0.19%
9440	Tidal mudflat	153.4	62.1	0.18%
3300	Central and South Coastal California Seral Scrub Group	144.4	58.4	0.17%
8210	Lepidospartum squamatum Alliance	141.0	57.1	0.16%
9431	Streambed	139.2	56.3	0.16%
1210	Hesperocyparis forbesii Alliance	136.4	55.2	0.16%
9412	Beach sand	118.6	48.0	0.14%
1730	Salix laevigata Alliance	115.4	46.7	0.13%
2310	Ceanothus tomentosus Alliance	111.4	45.1	0.13%
6100	Arid West Freshwater Emergent Marsh Group	104.2	42.2	0.12%
1700	Southwestern North American Riparian Evergreen and Deciduous Woodland Group	101.5	41.1	0.12%
3220	Diplacus aurantiacus Alliance	93.0	37.6	0.11%
7120	Spartina foliosa Alliance	89.5	36.2	0.10%
4120	Stipa lepida Alliance	81.0	32.8	0.09%
2100	Californian Xeric Chaparral Group	71.9	29.1	0.08%
7200	Southwestern North American Salt Basin and High Marsh Group	71.5	29.0	0.08%
5210	Toxicodendron diversilobum Alliance	65.1	26.3	0.08%
3310	Ericameria palmeri Alliance	46.4	18.8	0.05%
6000	Temperate and Boreal Freshwater Marsh Formation	45.0	18.2	0.05%
2200	Californian Maritime Chaparral Group	43.7	17.7	0.05%
4100	California Perennial Grassland Group	41.6	16.8	0.05%
9411	Rocky shore	36.7	14.9	0.04%
7110	Sarcocornia pacifica (Salicornia depressa) Alliance	35.8	14.5	0.04%
2300	Californian Mesic Chaparral Group	35.0	14.2	0.04%
7210	Atriplex lentiformis Alliance	32.0	13.0	0.04%

Veg Code	Vegetation Name	Area (acres)	Area (hectares)	% of Total Area
3330	Isocoma menziesii Alliance	31.6	12.8	0.04%
1740	Populus fremontii Alliance	29.0	11.8	0.03%
9810	Perennial Stream Channel	27.6	11.2	0.03%
2320	Cercocarpus montanus Alliance	26.0	10.5	0.03%
8100	Coastal Baja California Norte Maritime Succulent Scrub Group	25.0	10.1	0.03%
2230	Quercus dumosa Alliance	23.1	9.3	0.03%
1610	Alnus rhombifolia Alliance	22.1	8.9	0.03%
1800	Southwestern North American Rriparian/Wash Scrub Group	20.8	8.4	0.02%
1910	Arundo donax Semi-natural Stands	18.7	7.6	0.02%
6140	Scirpus robustus Alliance	16.5	6.7	0.02%
3170	Keckiella antirrhinoides Alliance	15.6	6.3	0.02%
5410	Carpobrotus edulis or Other Ice Plants Semi-natural Stands	15.5	6.3	0.02%
1110	Juglans californica Alliance	14.7	5.9	0.02%
4260	Cortaderia (jubata, selloana) Semi-natural Herbaceous Stands	14.5	5.9	0.02%
6120	Typha (angustifolia, domingensis, latifolia) Alliance	13.6	5.5	0.02%
6101	Fresh Water Marsh (bulrush - cattail) Mapping Unit	13.6	5.5	0.02%
3160	Eriogonum fasciculatum - Salvia apiana Alliance	8.6	3.5	0.01%
9450	Salt panne	8.5	3.4	0.01%
6110	Schoenoplectus acutus Alliance	8.2	3.3	0.01%
6310	Lepidium latifolium Semi-natural Herbaceous Stands	8.0	3.2	0.01%
9400	Sparsely vegetated to non-vegetated	5.8	2.3	0.01%
6130	Schoenoplectus californicus Alliance	5.5	2.2	0.01%
1410	Pseudotsuga macrocarpa Alliance	4.9	2.0	0.01%
2000	California Chaparral Macrogroup	3.8	1.5	0.00%
9430	Riverine & Lacustrine	3.5	1.4	0.00%
4110	Leymus condensatus Alliance	3.4	1.4	0.00%
6001	Meadow (Carex - Juncus - Eleocharis) Mapping Unit	3.2	1.3	0.00%
3320	Hazardia squarrosa Alliance	1.7	0.7	0.00%
1200	Californian Evergreen Coniferous Forest and Woodland Group	0.8	0.3	0.00%
7130	Bolboschoenus maritimus Alliance	0.8	0.3	0.00%
7140	Distichlis spicata Alliance	0.1	0.0	0.00%
	Grand Total	**85,705.2**	**34,683.7**	**100.00%**

APPENDIX C: NCC Orange County Vegetation – Mapping Descriptions

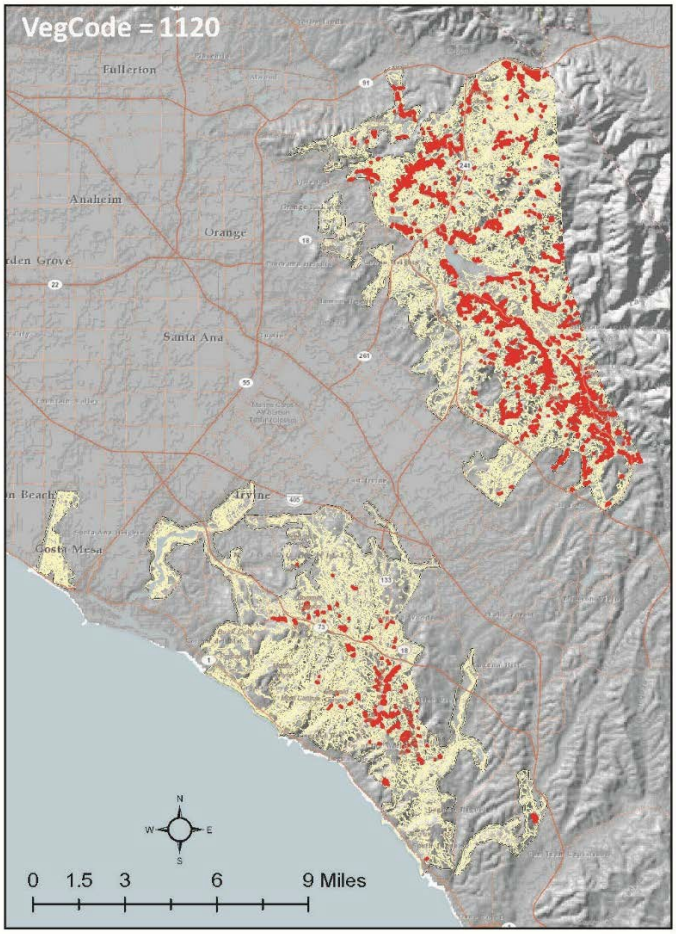
This section of the report contains descriptions for each of the vegetation types (Alliances & Map Units) represented in the final geodatabase for this project. Most vegetation types have a detailed written description containing the following components:

- **Aerial View:** These are digital images showing aerial views of the vegetation stands. The images give the reader a sense of the overall photo signature. Most examples represent only a portion of the stand mapped depicting pieces of the delineated polygon (in red). When the stand occupies only a portion of the imagery, an arrow denotes its proper location.
- **Ground photos:** These are digital pictures taken during a field effort. They are a snapshot in time showing the plants in their landscape, and usually represent only a portion of the actual mapped stand.
- **Descriptions:** The descriptions discuss the expected locations, cover characteristics, species composition, and other pertinent information. Species cover characteristics and relative abundance conforms to those presented in the second edition of *The Manual of California Vegetation* (MCV2), but is specifically tailored to the Orange County Study. For example, where *Quercus berberidifolia* is described in the MCV as occurring primarily on steep north-facing slopes, the descriptions in this document are more restrictive because within the mapping area, they are more likely to be found on protected lower slopes of variable steepness, often adjacent to small bands of riparian vegetation. Specific rules regarding definitive cover and floristic characteristics of the stand are derived from the MCV2 floristic descriptions and plot data and analysis. Descriptions in this section refer to common and/or likely settings within the Orange County mapping area.
- **Photo Interpretation Signature:** These descriptions of color, tone, and texture, as well as other contextual information, e.g., ecological settings, patterning, etc., assist in identifying the vegetation from an aerial perspective.
- **Distribution Maps:** The distribution maps show the mapped polygons of the vegetation types within the study area and give the user an overall range of the species distribution in the study.

Some vegetation types have a very limited presence in the study area at sizes above the MMU. For these types, it was not possible to formulate the standard in-depth descriptions. Instead, they are represented only with a short description of their location within the study area. These will be noted at the end of the descriptions within this Appendix.

1120 *Quercus agrifolia* Alliance (Coast Live Oak)

The above example depicts a low to mid-slope setting near the junction of state highway 133 and El Toro Road. The elevation here is approximately 250'. The stand contains an emergent *Quercus agrifolia* canopy over a mixed maritime chaparral community of *Heteromeles arbutifolia* and *Rhus integrifolia.*



1120 *Quercus agrifolia* Alliance (Coast Live Oak)

DESCRIPTION:

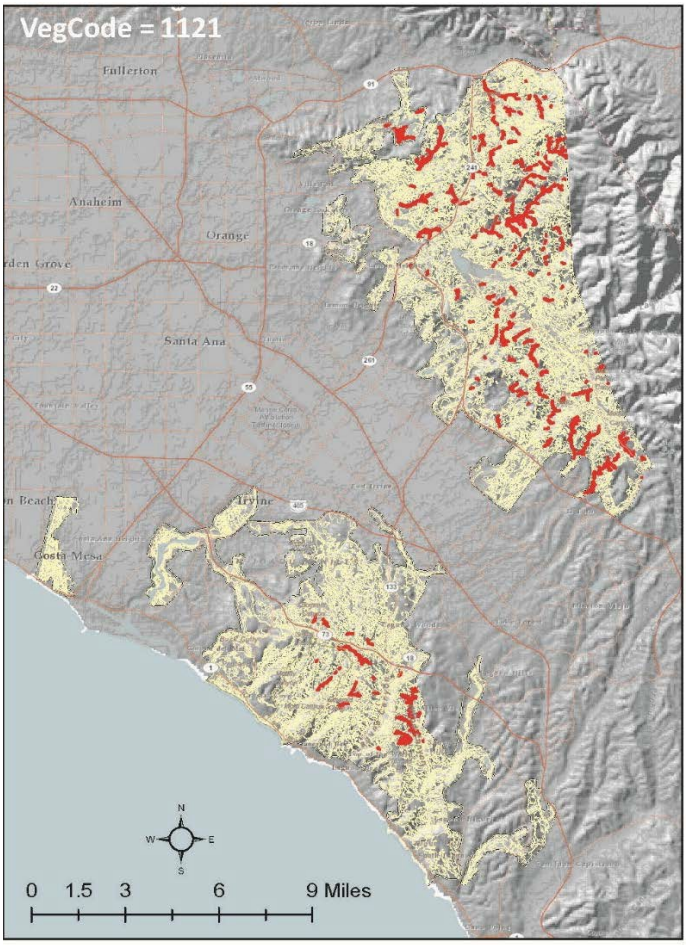
The *Quercus agrifolia* Alliance occurs in widely distributed areas throughout all but the near coastal regions of the mapping area. Stands are specifically mapped in non-riparian settings (see type 1121 below for riparian stands) in sparse to dense woodland settings, with a grassy or shrubby understory. Stands with a shrub understory are dominated by either drought-deciduous or sclerophyllous shrubs. Stands vary considerably in size and occupy low, middle. and occasionally upper slopes.

PHOTO INTERPRETATION SIGNATURE:

Quercus agrifolia forms a fairly uniform signature across the mapping area. In all but the densest woodland settings, crowns are generally rounded and form multiple sub-crowning, especially in mature trees. Crown edges form distinct margins. Signature color ranges from medium to dark tones of green depending mainly on the leaf age and health.

1121 *Quercus agrifolia* Riparian Mapping Unit (Coast Live Oak Riparian)

Above example depicts a riparian setting with a small component of *Platanus racemosa* with dense *Quercus agrifolia,* in the uppermost reaches of Fremont Canyon. The elevation here is approximately 1900'.



1121 *Quercus agrifolia* Riparian Mapping Unit (Coast Live Oak Riparian)

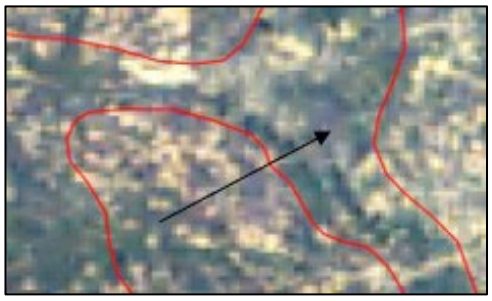
DESCRIPTION:

The *Quercus agrifolia* Riparian Mapping Unit occurs in widely distributed areas throughout all but the near coastal regions of the mapping area. Stands occur in narrow canyons that are temporarily, intermittently or seasonally flooded. Stands vary considerably in size but are generally narrow, occupying lower to occasionally lower-middle slope positions. The Mapping Unit is mapped primarily where *Quercus agrifolia* dominates the canopy, occasionally with small amounts of *Platanus racemosa* in larger seasonally flooded stands. Canopy cover is generally over 40%; sparser canopies have a visible shrub understory containing riparian species such as *Baccharis salicifolia* and/or *Salix lasiolepis.* Riparian presence is diagnostic but may be absent. In stands where riparian species are not present, other cold-season deciduous species are present in the understory.

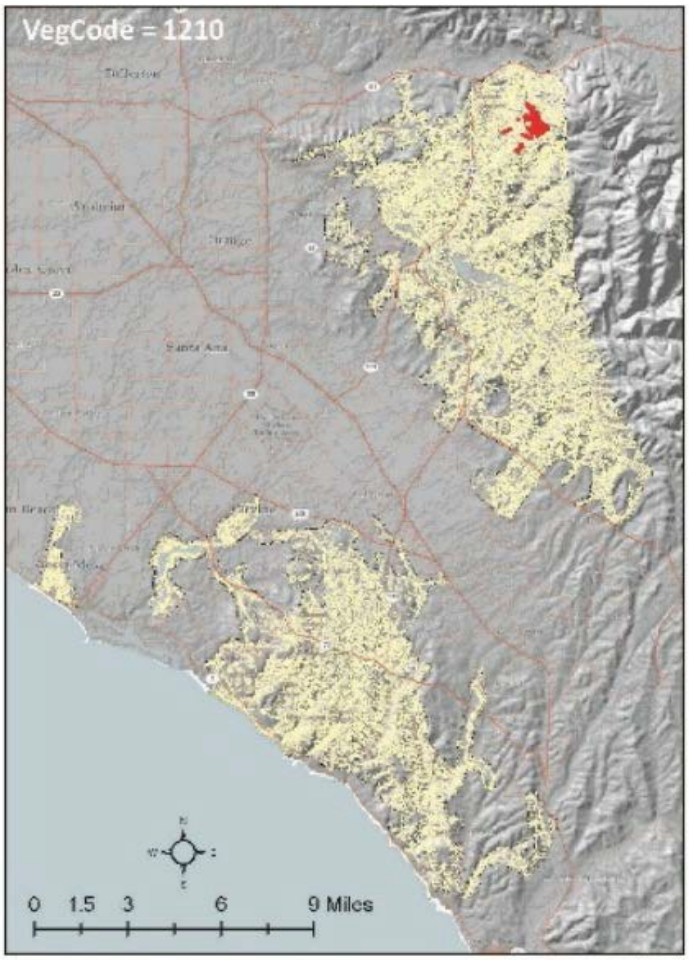
PHOTO INTERPRETATION SIGNATURE:

Similar to the more xeric *Quercus agrifolia* Alliance, but often with higher canopy cover. Mapped polygons are generally narrow and linear, and stands are limited in their upslope extent. Mesic chaparral or coastal scrub may be a component along the drier margins of the stand.

1210 *Hesperocyparis forbesii* Alliance (Tecate Cypress)



The above example depicts several small individuals occurring with mixed chaparral in an area that burned in 2006. The stand is located near the Claymont Clay Mine at the 1350' elevation level just south of Coal Canyon in the Santa Ana Mountains. Note the presence of *Hesperocyparis forbesii* in the imagery as a small linear dark band as depicted by the arrow at left. The stand here contains about 5% conifer cover in the same stature as the adjacent chaparral. Individuals are scattered throughout the stand beyond the core area denoted by the arrow at left.



1210 *Hesperocyparis forbesii* Alliance (Tecate Cypress)

DESCRIPTION:

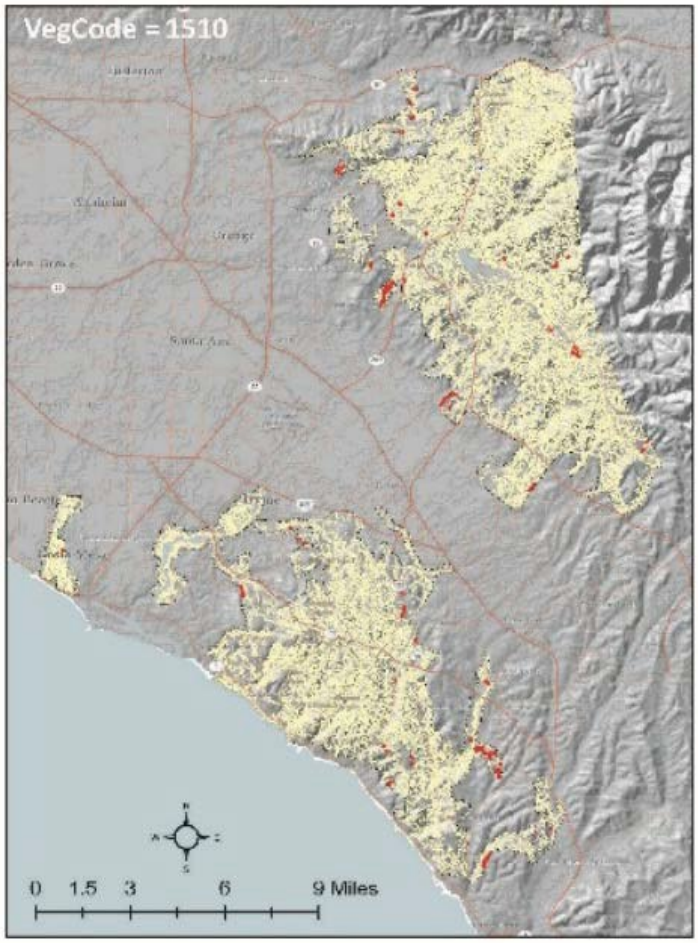
The *Hesperocyparis forbesii* Alliance is restricted to the northwestern most portion of the mapping area in the middle elevations of the Santa Ana Mountains. Stands have undergone multiple burns and occur in settings where dense stands of chaparral dominate and sometimes strongly dominate the stand. Stands are very small and generally occupy lower to middle side-slope positions in the upper reaches of small draws. The alliance is mapped where *H. forbesii* generally occurs in the same canopy layer as the adjacent chaparral, only on occasion seen forming a minor emergent stature. It should be noted that several polygons coded as other vegetation types contain a component of this conifer as denoted in the conifer cover field and the Comment attribute field note.

PHOTO INTERPRETATION SIGNATURE:

Hesperocyparis forbesii is difficult to see on the imagery because it is usually a minor component and is similar in height to the adjacent chaparral. Crowns are narrow and conical, even in young recovering post burn settings. Where more than about 10-15 individuals occur in close proximity to one another, they generally appear significantly darker than the adjacent chaparral.

1510 *Eucalyptus (globulus, camaldulensis)* Semi-Natural Stands (Eucalyptus)

The above example depicts a small stand of *Eucalyptus* invading riparian vegetation at the 1000' level in Black Star Canyon. The stand has a minor component of *Quercus agrifolia* and *Platanus racemosa.*



1510 *Eucalyptus (globulus, camaldulensis)* Semi-Natural Stands (Eucalyptus)

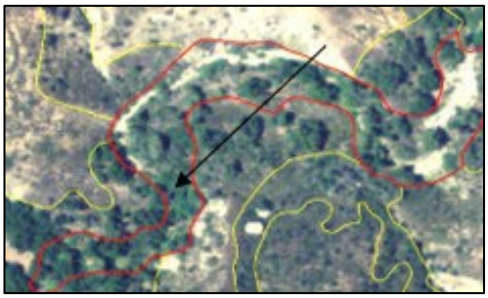
DESCRIPTION:

Eucalyptus (globulus, camaldulensis) Semi-Natural Stands occur in scattered areas inconsistently throughout the mapping area; most often as linear polygons along urban thoroughfares, city parks and other developed areas. Naturalized stands are rare in the mapping area. The alliance is mapped where *Eucalyptus* spp. dominates or co-dominates the stand when occurring with other exotic trees in the canopy. In uncommon circumstances where it mixes with native vegetation, (especially riparian woodlands) *Eucalyptus* spp. must strongly dominate the stand. Stand cover ranges from well-spaced to a dense cover that can exceed 60%.

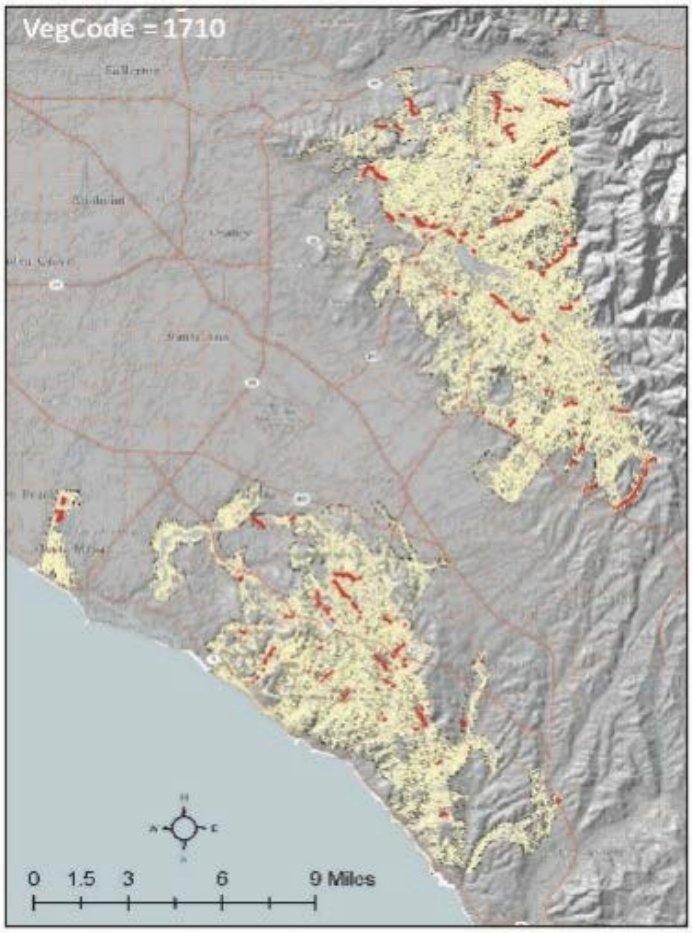
PHOTO INTERPRETATION SIGNATURE:

Eucalyptus has a distinct signature (especially *E. globulus*) in both color and crown shape and texture. Mature trees exhibit an open irregularly shaped crown with indistinct margins. Colors tend to be brown with dark orange hues. Crown texture tends to be feathery.

1710 *Platanus racemosa* Alliance (California Sycamore)



The above example depicts *Platanus. racemosa* in an open stand that burned in 2006. *Quercus agrifolia* forms the outer margins of the stand and is denoted by polygons adjacent to the one highlighted. The area is located in the middle to upper reaches of Fremont Canyon just below 1300' elevation.



1710 *Platanus racemosa* Alliance (California Sycamore)

DESCRIPTION:

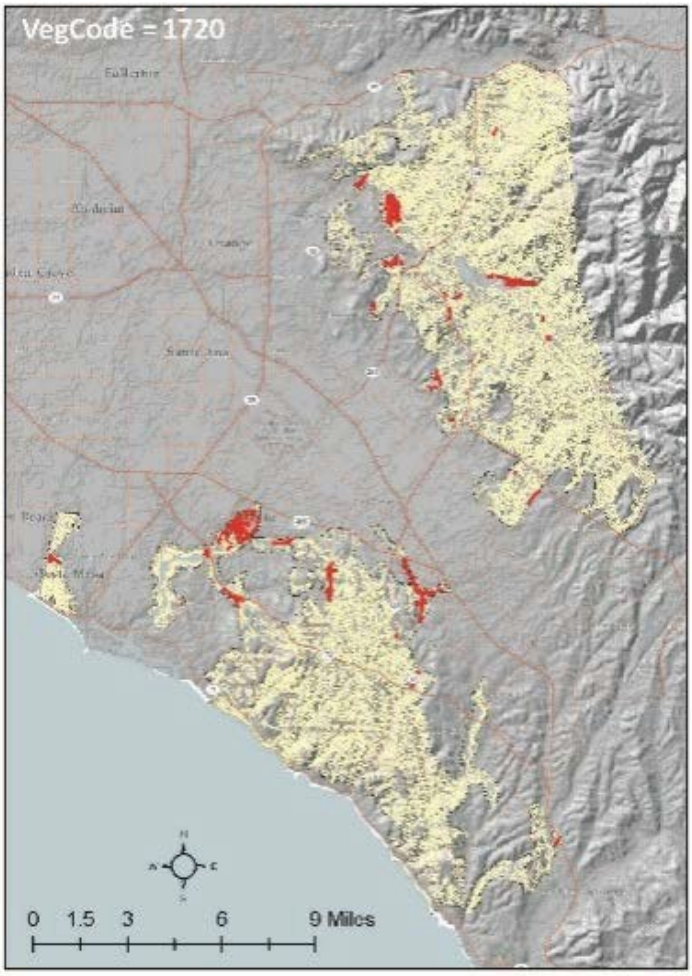
The *Platanus racemosa* Alliance occurs in widely scattered locations throughout all but the near coastal regions of the mapping area. Stands occur almost exclusively in riparian zones generally adjacent to larger seasonally or semi-permanently flooded watercourses. Smaller stands may originate from small canyons below seeps in rock outcroppings. The alliance is mapped in rather open to dense settings where *Platanus racemosa* dominates the canopy or occasionally shares dominance with *Quercus agrifolia. Q. agrifolia* often forms stands along the margins of this type in larger canyons.

PHOTO INTERPRETATION SIGNATURE:

Platanus racemosa yields a consistent signature across the mapping area but can be difficult to discern from younger individuals of *Quercus agrifolia* where they share dominance. They frequently form only a sub-dominant canopy component to riparian stands of *Q. agrifolia. P. racemosa* has a smaller, more irregularly shaped, and less well-defined crown than *Q. agrifolia.* Signature color ranges only slightly, usually a light to medium tone of yellow-green.

1720 *Salix gooddingii* Alliance (Black Willow)

The above example depicts *S. gooddingii* in moderately dense cover showing multiple age statures in the canopy. The stand continues to the east and is located just upstream from the Santiago Reservoir.

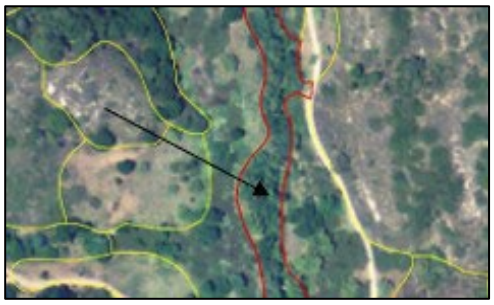


1720 *Salix gooddingii* Alliance (Black Willow)

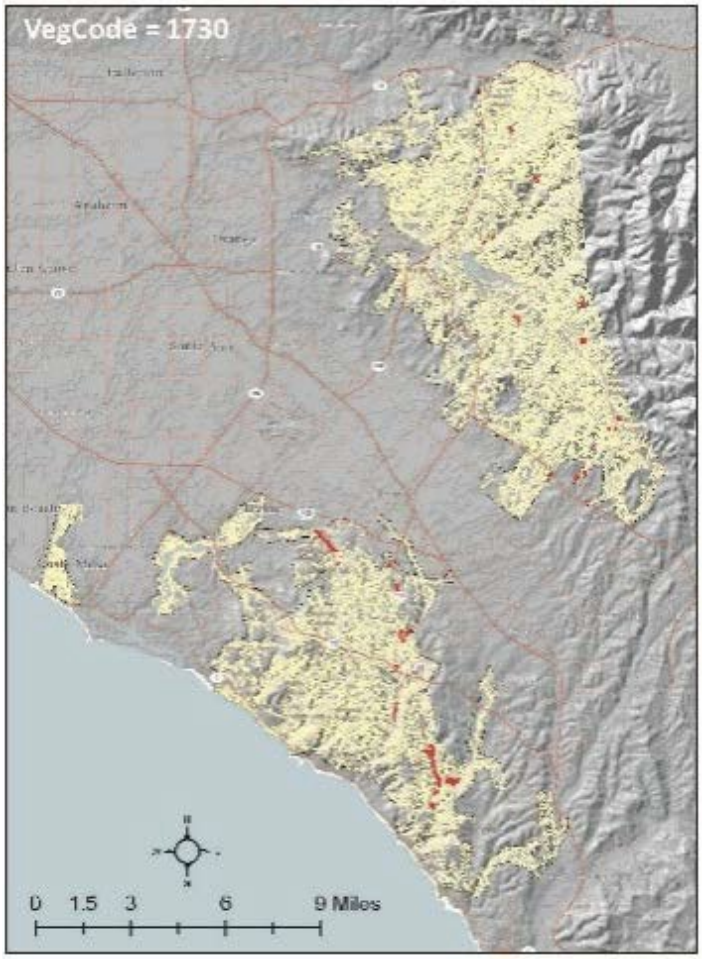
DESCRIPTION:
The *Salix gooddingii* Alliance is restricted to the lower portions of semi-permanently to perennially flooded lower stream courses; often in artificially restricted flooding regimes or above major reservoirs. Stands often form canopies containing multiple stature individuals. *Salix gooddingii* dominates or co-dominates the stand with *S. laevigata* or in some cases, such as along the Santiago Creek, with *Alnus rhombifolia.*

PHOTO INTERPRETATION SIGNATURE:
Salix gooddingii is difficult to distinguish from other tree willow species; within the mapping area, as its signature and bio-geographical setting overlaps considerably with *S. laevigata.* Generally, *S. gooddingii* has a slightly lighter green signature than other willow species, especially *S. lasiolepis.* Modeling stands in close proximity to reservoirs is approximate at best. As with all riparian vegetation, younger stands in their sapling stage are indistinguishable at the alliance level.

1730 *Salix laevigata* Alliance (Red Willow)



The above example depicts *Salix laevigata* in a dense cover mixing with *S. lasiolepis.* The area is located along Wood Canyon west of the Sheep Hills.



1730 *Salix laevigata* Alliance (Red Willow)

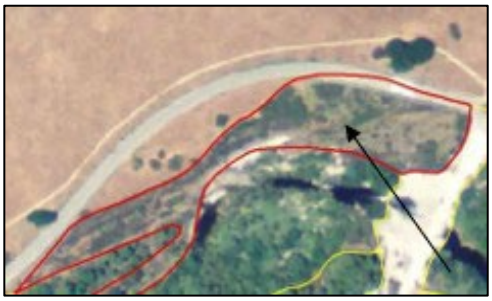
DESCRIPTION:

The *Salix laevigata* Alliance is found in semi-permanently to perennially flooded stream courses in narrow to fairly broad canyons. It is common along Aliso and Laguna Creeks, and elsewhere it is scattered in small patches. Stands often form canopies containing multiple stature individuals with other willow species, especially *S. lasiolepis*. *Salix laevigata* dominates or co-dominates the stand in mixed settings with *S. lasiolepis.* In lower slope settings, both *S. laevigata* and *S. gooddingii* co-occur.

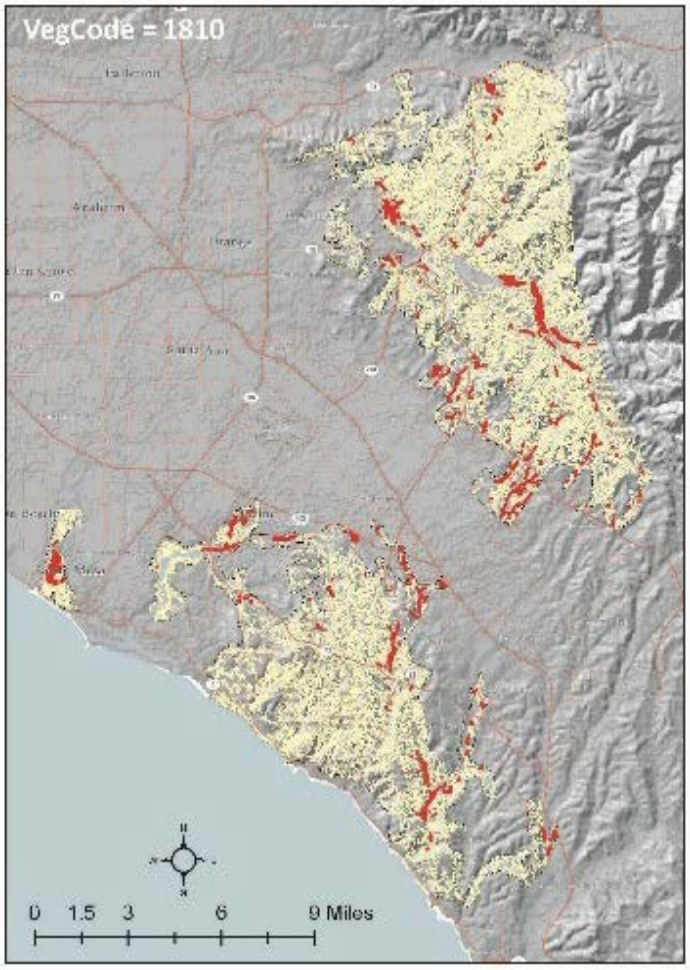
PHOTO INTERPRETATION SIGNATURE:

Salix laevigata is difficult to distinguish from other tree willow species; within the mapping area, as its signature and bio-geographical setting overlaps considerably with *S. gooddingii.* Stands are generally more species diverse than those dominated by *S. gooddingii* and therefore yield a more variable photo signature across the mapped polygon. As with all riparian vegetation, younger stands in their sapling stage are indistinguishable at the alliance level.

1810 *Baccharis salicifolia* Alliance (Mulefat)



The picture depicts *Baccharis salicifolia* in a variable setting along the drier margins of Aliso Creek just below a small dam. Willow is scattered in the stand and dominates areas to the south as depicted by the greener signature.



1810 *Baccharis salicifolia* Alliance (Mulefat)

DESCRIPTION:

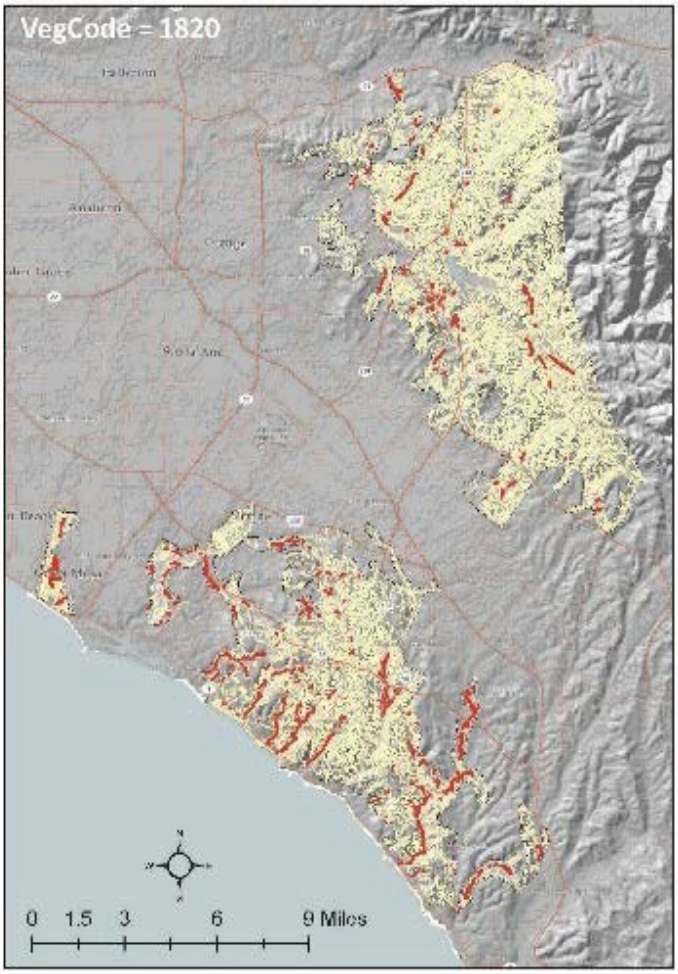
The *Baccharis salicifolia* Alliance is found in temporarily flooded to perennially flooded stream courses in narrow to fairly broad canyons. Stands vary in cover and occasionally mix with some willow in wetter settings and with *B*. *pilularis* in drier more open grassy areas. *Baccharis salicifolia* generally dominates the stand. It is common throughout much of the region, especially in Aliso, Laguna, and Santiago Creeks.

PHOTO INTERPRETATION SIGNATURE:

Baccharis salicifolia has a highly variable signature depending primarily on the cover characteristics of the stand. Denser stands are generally dark brown with a greenish tint and have a smooth to slightly stippled texture. Sparser stands tend to form a more mottled texture and can appear patchy. Background setting can vary based on the density of the herbaceous understory. In frequently flooded settings where herbaceous cover is low, sparse shrub cover is distinct against the white background. In drier settings, herbaceous cover is often high and contrasts less with the shrub overstory.

1820 *Salix lasiolepis* Alliance (Arroyo Willow)

In this example, *Salix lasiolepis* forms a dense shrub cover along a narrow canyon just above Abalone Point. This is a common setting in many of the canyons less than a mile from the coast.

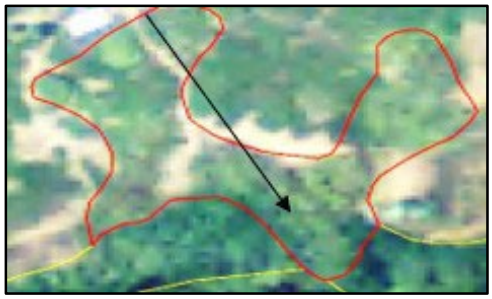


1820 *Salix lasiolepis* Alliance (Arroyo Willow)

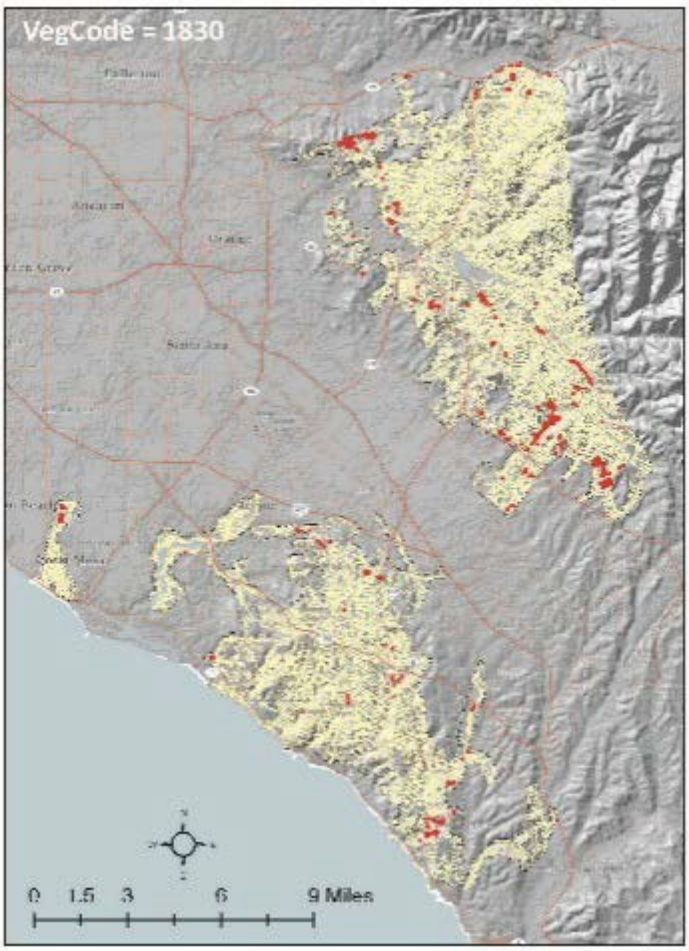
DESCRIPTION:
The *Salix lasiolepis* Alliance is found in seasonally flooded to perennially flooded stream courses as a sole dominant in narrow canyons and along the drier margins of mixed willow stands in larger watersheds. Inland stands frequently mix with a small component of *S. laevigata*; closer to the coast, *S. lasiolepis* often strongly dominates.

PHOTO INTERPRETATION SIGNATURE:
Salix lasiolepis can best be identified by its setting where it prefers steeper canyons close to the coast. In these settings, it is often the sole dominant and has a fairly uniform dark green color with a relatively smooth texture with minimal structural variability. Inland, it is extremely difficult to separate out from adjacent tree willow species but at times can be noted along the drier margins of the riparian corridor.

1830 *Sambucus nigra* Alliance (Black Elderberry)



Sambucus nigra is depicted above in a dense cover south of Awma Road upslope from Aliso Creek. The above example is a less common setting than its typical presence as an overstory to coastal scrub or as a sparse emergent to annual grasslands.



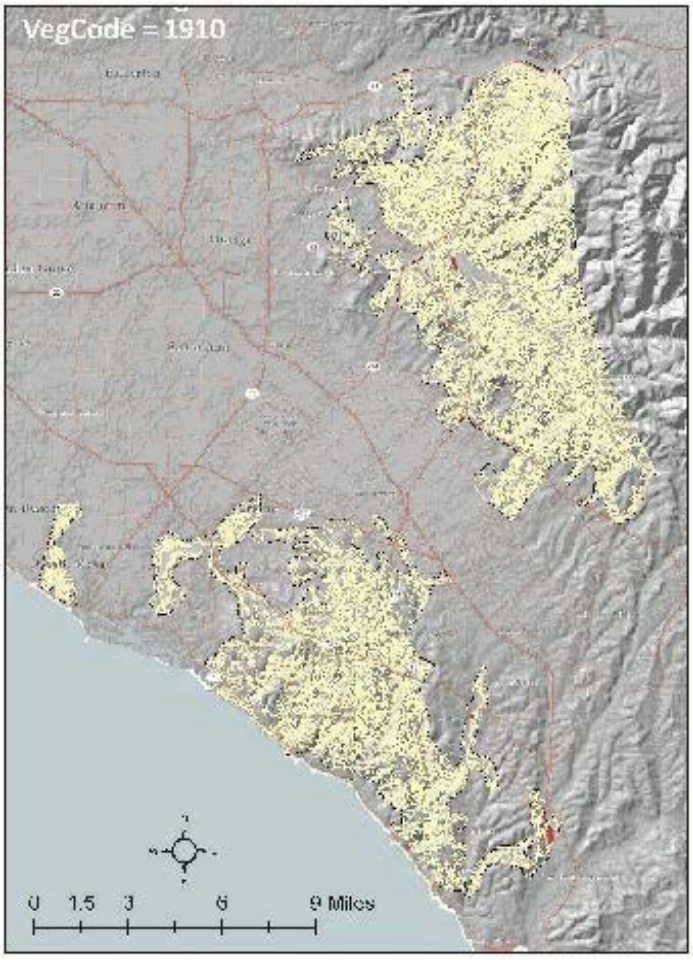
1830 *Sambucus nigra* Alliance (Black Elderberry)

DESCRIPTION:
The *Sambucus nigra* Alliance is found in fairly mesic settings either as an emergent to coastal scrub (especially dense stands of *Artemisia californica*) or as a sparse emergent tall shrub over annual grasses and forbs. In steeper settings where it is associated with coastal scrub, *S. nigra* is generally mapped to the scrub type since the smaller stature scrubs usually strongly dominate. In herbaceous settings, it is mapped with as little as 5% cover; stands within the mapping area typically between 5 and 15% cover. Within the mapping area, it is noted in small to very small stands, especially on mesic slopes near Niguel Hill and in the inland southern portions of the mapping area in the Limestone Canyon management area and the Irvine Open Space Preserve.

PHOTO INTERPRETATION SIGNATURE:
In all settings, *Sambucus nigra* is distinct from its associated understory but more so when the species is emergent to herbaceous vegetation. Individuals appear more like small trees with rounded crowns with a green to yellow-green color.

1910 *Arundo donax* Semi-Natural Stands (Giant Reed)

In this example, *Arundo donax* forms dense patches along a creek. Willow species are mapped adjacent along the northwest margins of the *Arundo* and appear darker green.



1910 *Arundo donax* Semi-Natural Stands (Giant Reed)

DESCRIPTION:

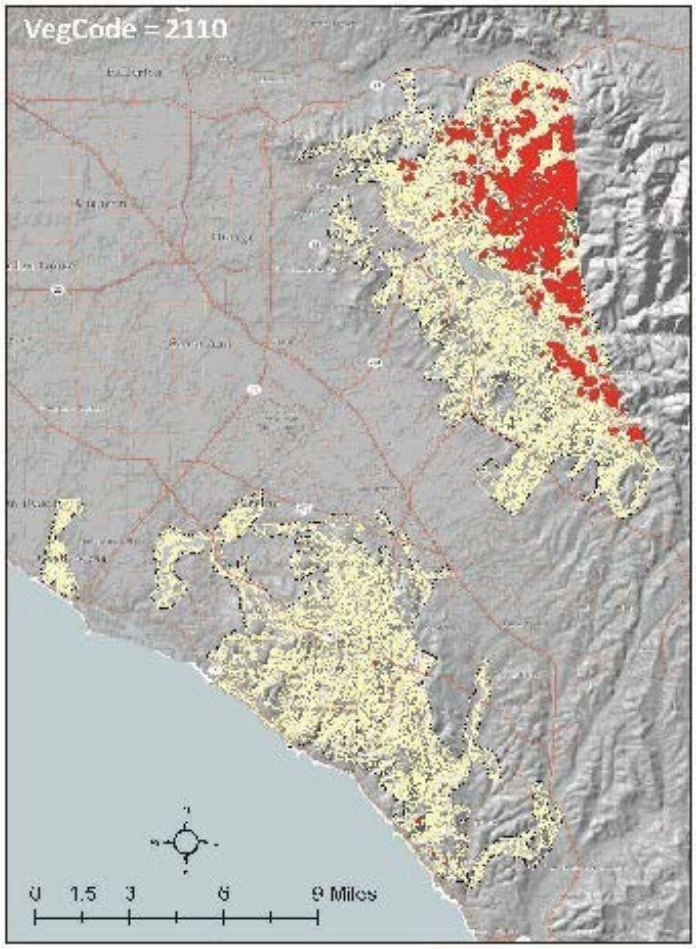
Arundo donax occurs primarily in the southeastern portion of the mapping area. Other occurrences are at lower Aliso Creek, along the southern part of Santiago Reservoir, and at Talbert Park. Stands form dense uniform cover and strongly dominate the tall herbaceous layer in similar statures to the adjacent willow. Stands appear to occupy both the near margins of the active stream channel and the outer margins of the riparian fringe. Stands of *Arundo* are in the process of being removed.

PHOTO INTERPRETATION SIGNATURE:

Arundo donax has a distinct signature when found in dense stands, which is the most frequent setting in the mapping area. Adjacent riparian vegetation appears much darker green and texture less uniform. Texture within the *A. donax* vegetation is consistent and stipple-like. Smaller patches significantly below the MMU form mottled textures with the adjacent willow.

2110 *Adenostoma fasciculatum* Alliance (Chamise)

In the above example, *Adenostoma. fasciculatum* occurs in multiple cover settings and is separated out (note red line) based on cover density classes. This stand occurs at the 1850' level just above Fremont Canyon. The region was burned in both 2002 and 2006.



2110 *Adenostoma fasciculatum* Alliance (Chamise)

DESCRIPTION:

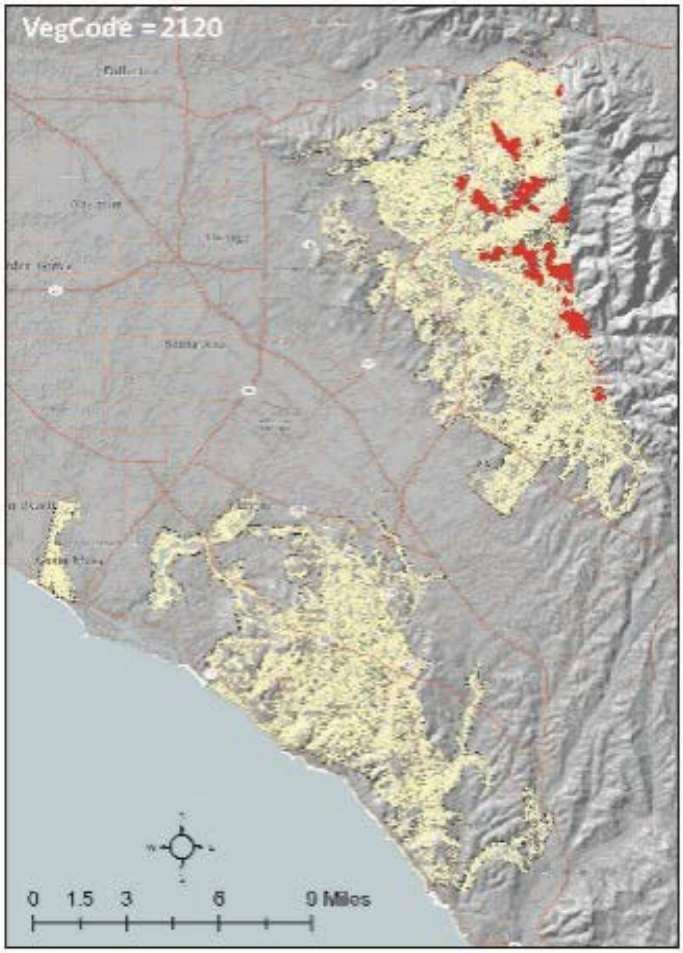
Although stands of *Adenostoma fasciculatum* occur almost exclusively in the northern section of the mapping area, it is still the most commonly occurring chaparral type. The alliance is mapped in chaparral settings where *A. fasciculatum* generally dominates the stand or in mixed settings with coastal scrub where it can co-dominate with various drought deciduous shrub types. Stands vary considerably in cover from open to very dense depending primarily on fire history. Stands generally occur on xeric sites on lower, mid, to upper slopes. Stand distribution is more restricted on north-trending slopes.

PHOTO INTERPRETATION SIGNATURE:

Adenostoma fasciculatum yields a highly variable signature but has a fairly consistent defined mode that remains true across its extensive range in California. Signature variability is determined primarily by three aspects of the vegetation: 1) the cover density, 2) the relative cover of other shrub species and 3) the associated understory components whether vegetative or not. In the mapping area, pure stands appear stippled in texture; in mixed chaparral, the texture is more hummocky. Modal color is a medium to dark brown with a slightly greenish hue.

2120 *Ceanothus crassifolius* Alliance (Hoary Leaf Ceanothus)

In the above example, *Ceanothus crassifolius* dominates the stand. The area is located on a lower slope just above the Santiago Reservoir.



2120 *Ceanothus crassifolius* Alliance (Hoary Leaf Ceanothus)

DESCRIPTION:

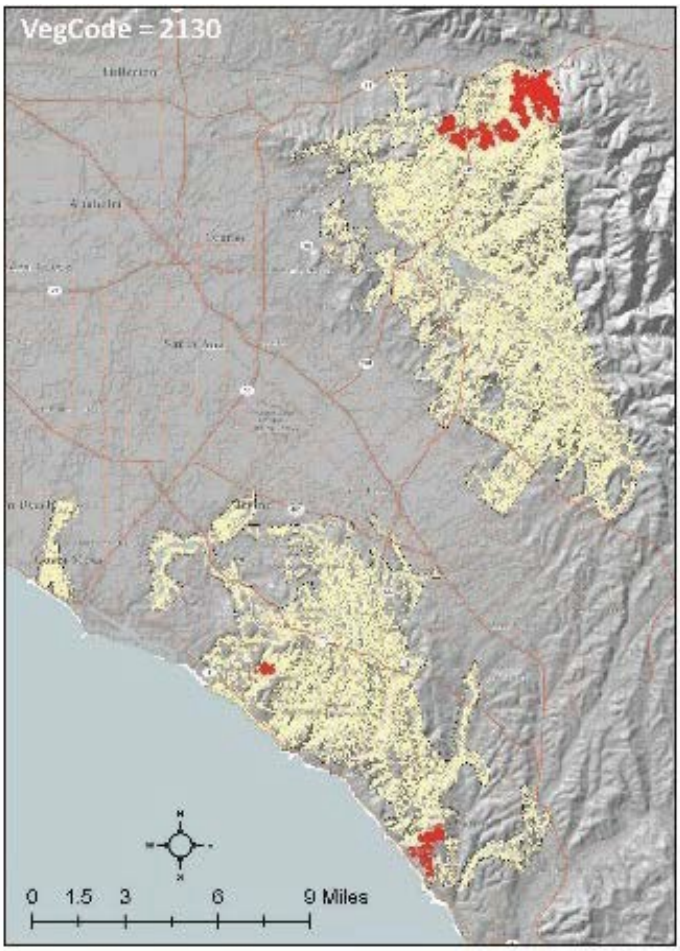
The *Ceanothus crassifolius* Alliance is found exclusively in the northern mapping area in a similar but more limited range than *Adenostoma fasciculatum.* In the mapping area, *C. crassifolius* usually shares dominance with *A. fasciculatum* in variable cover depending primarily on fire history. Stands generally occur on xeric sites on gently to moderately sloping lower-mid to upper slopes. It is mapped where *C. crassifolius* dominates or co-dominates the stand with other chaparral species. Unlike *A. fasciculatum,* there is minimal mixing of this type with coastal scrub types.

PHOTO INTERPRETATION SIGNATURE:

Like *Adenostoma fasciculatum,* this alliance has a variable signature, which is determined primarily in the mapping region by fire history. Recent post burn stands are difficult to distinguish from *A. fasciculatum,* especially where cover falls below 20-30%. Dense mature stands trend medium tones of gray with a tint of blue-green. Texture is hummocky (crown margins are partially discernable even in closed cover) rather than stippled.

2130 *Ceanothus megacarpus* Alliance (Bigpod Ceanothus)

In the above example, *Ceanothus megacarpus* dominates the stand with a small component of *Rhus ovata*. The stand is located just upslope from the lower portions of Coal Canyon just south of the Santa Ana River.



2130 *Ceanothus megacarpus* Alliance (Bigpod Ceanothus)

DESCRIPTION:

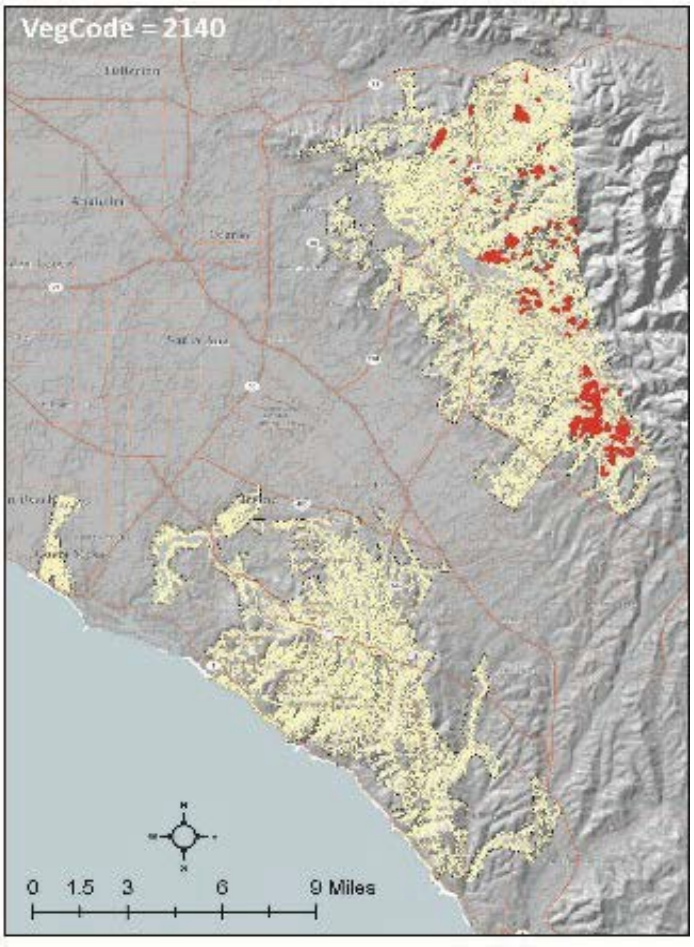
The *Ceanothus megacarpus* Alliance is found in two settings; one in a maritime chaparral zone on the hills above South Laguna and Los Trancos Canyon, and a more interior location on the lower slopes of the northern edge of the Santa Ana Mountains. Maritime stands have not recently burned; portions of stands in the north burned in 2006 and 2017. Stands generally occur on xeric sites on gently to moderately sloping lower mid-to-upper slopes. It is mapped where *C. megacarpus* generally dominates the stand. Several stands along the eastern edge of the mapping area near the county line occasionally co-dominate with *Rhus ovata*. Cover varies considerably; inland stands often have a dense herbaceous understory of annual grasses.

PHOTO INTERPRETATION SIGNATURE:

Ceanothus megacarpus in most circumstances has a hummocky texture since it rarely co-dominates with other chaparral species in the mapping area (southern coastal maritime stands less so due to some mixing). Signature color is similar to *C. crassifolius*. Overlap between the two species is minimal; where the two species are mapped in close proximity to one another, differentiation is extremely difficult.

2140 *Adenostoma fasciculatum – Salvia mellifera* Alliance (Chamis – Black Sage)

In this example, *Adenostoma fasciculatum* shares dominance with *Salvia mellifera* in an open stand burned in 2007 and 2020 (Photos are from 2012 project). The stand is located in the upper portions of Borrego Canyon in the Santa Ana Mountains.



2140 *Adenostoma fasciculatum – Salvia mellifera* Alliance (Chamis – Black Sage)

DESCRIPTION:

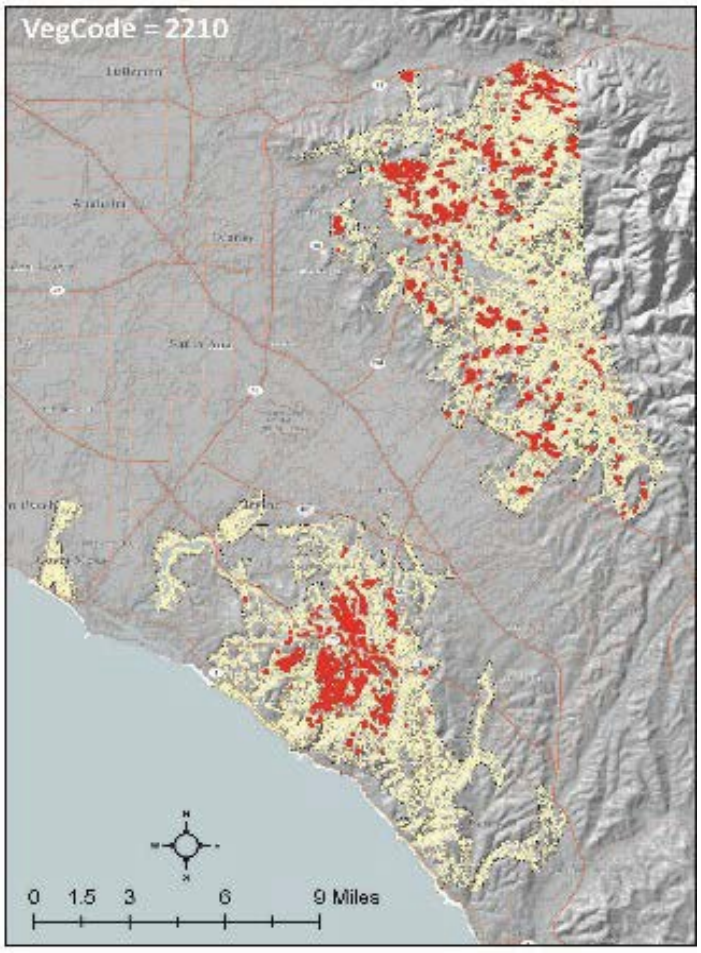
The *Adenostoma fasciculatum – Salvia mellifera* Alliance occurs exclusively in the northern portion of the mapping area in post burn settings. Stands generally occur on xeric sites, that are on gently to moderately sloping lower mid-to-upper slopes, closer to the margins of the coastal scrub. It is mapped where *A. fasciculatum* and *S. mellifera* co-dominate the shrub layer in widely varying cover.

PHOTO INTERPRETATION SIGNATURE:

Differentiating this alliance from the *Adenostoma fasciculatum* Alliance proved difficult with confusion between the two. Post burn chaparral can be difficult to classify to alliance levels in the classification. In ideal settings, *Salvia mellifera* yields a typical light green to yellow to darker brown signature depending on the phenology of the leaf. Early summer NAIP imagery reveals all phenological possibilities in these settings. *A. fasciculatum* maintains a modal dark to light brown (cover dependent) stipple-like texture. The mixed alliance was mapped when both signatures were present in the stand.

2210 *Malosma laurina* Alliance (Laurel Sumac)

In this example, *Malosma laurina* strongly dominates the shrub layer in varying degrees of drought and/or freeze related stress. The stand occurs on a northeast-trending slope above Shady Canyon in the San Joaquin Hills.



2210 *Malosma laurina* Alliance (Laurel Sumac)

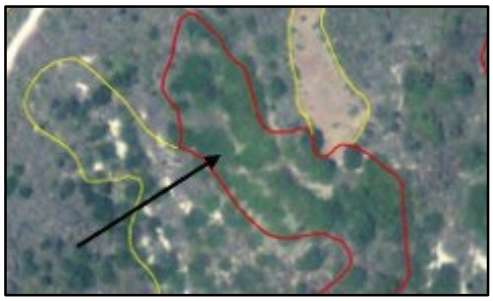
DESCRIPTION:

The *Malosma laurina* Alliance is widespread in both the northern and southern portions of the mapping area on a wide variety of slope configurations. It is mapped where maritime chaparral (*M. laurina)* dominates or strongly dominates in areas where a coastal scrub species is present. Cover in these setting is generally over 60%. In grassy settings, *M. laurina* strongly dominates the shrub canopy with cover generally under 30%. Stands where it co-dominates with xeric chaparral alliances are generally mapped to the xeric chaparral type.

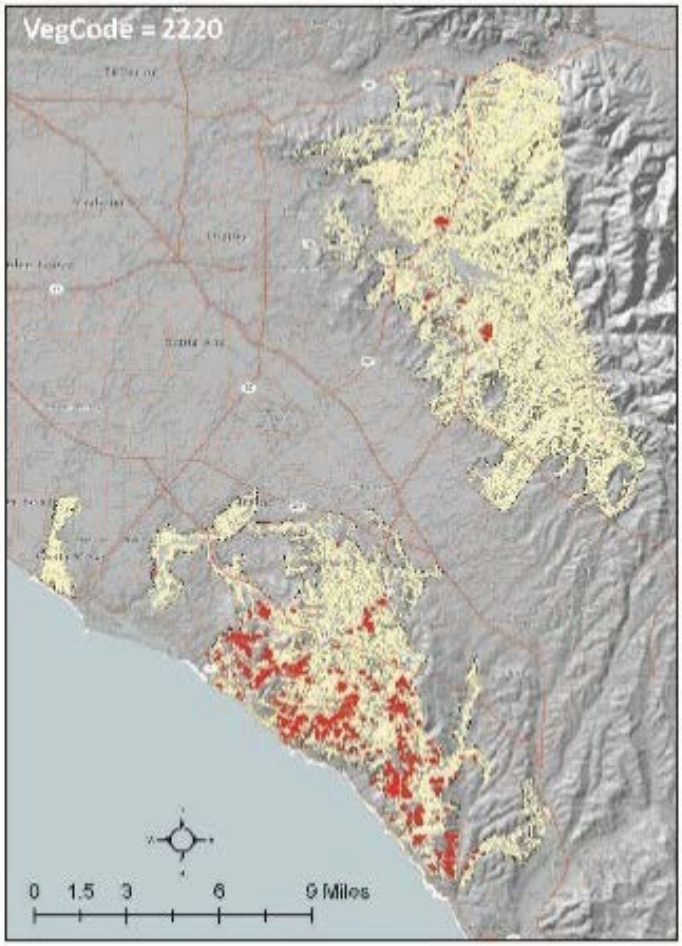
PHOTO INTERPRETATION SIGNATURE:

The key in separating out this maritime chaparral type is the strong presence of *Malosma laurina.* In areas of dense cover, there is often a wide variability in signature color due to phenological stress. Healthier portions of the stand trend a medium to light green with a billowy texture. Stressed stands yield a mottled pattern with increasing dark to medium gray colors.

2220 *Rhus integrifolia* Alliance (Lemonadeberry)



In this example, *Rhus integrifolia* strongly dominates the stand. Adjacent stands contain a component of *R. integrifolia* but are mapped to a coastal scrub type. This stand is located above Wood Canyon in the San Joaquin Hills.



2220 *Rhus integrifolia* Alliance (Lemonadeberry)

DESCRIPTION:

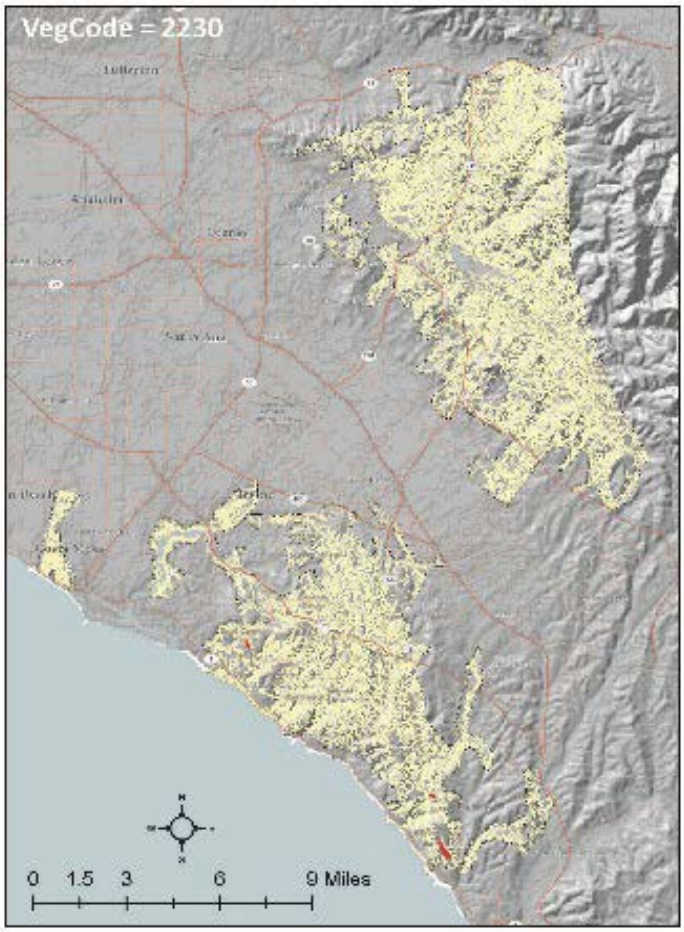
The *Rhus integrifolia* Alliance is mapped primarily in the southern portion of the study area, and individuals were noted throughout the mapping area as a component to other types. It is mapped where maritime chaparral (*R. integrifolia)* dominates or strongly dominates in areas where a coastal scrub species is present. Cover in these setting is generally over 60%. Stands where *R. integrifolia* co-dominates with coastal scrub types are generally assigned one of the alliances containing varying components of *Artemisia californica, Salvia mellifera* or *Eriogonum fasciculatum*. When *R. integrifolia* co-dominates with *Quercus dumosa* or other maritime chaparral types, in most cases it is assigned to that particular alliance.

PHOTO INTERPRETATION SIGNATURE:

The key to separating out this maritime chaparral type is the strong presence of *R. integrifolia*. It is difficult to distinguish between the *R. integrifolia* and *Malosma laurina* maritime types; stands containing the latter tend to exhibit a higher component of stressed and dead vegetation. There is a general trend for *R. integrifolia* forming stands occurring closer to the coast, and overall signature color of the same tends to yield a darker green color. *R. integrifolia* also tends to have a broader less rounded crown and somewhat lower stature. In addition, adjacent coastal scrub vegetation is often somewhat more mesic, often dominated by *Artemisia* with some *Diplacus aurantiacus.*

2230 *Quercus dumosa* Alliance (Coastal Sage Scrub Oak)

In this example, *Quercus dumosa* dominates a dense shrub layer with components of *Rhus integrifolia* and *Heteromeles arbutifolia.* The stand is located along Pacific Island Drive about one mile from the coast.



2230 *Quercus dumosa* Alliance (Coastal Sage Scrub Oak)

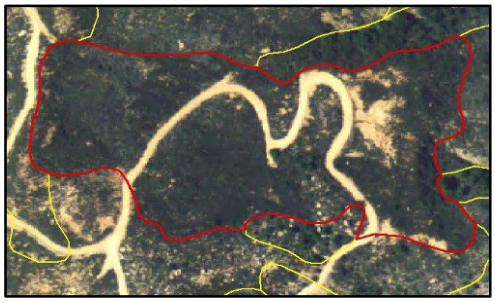
DESCRIPTION:

The *Quercus dumosa* Alliance is restricted to small stands mostly under 10 acres, generally within 1-2 miles from the coast. It is mapped where maritime chaparral (*Q. dumosa)* dominates or co-dominates the shrub layer, and is based on ancillary field data. Mapped stands were noted where *Q. dumosa* was a sole dominant or with components of other maritime chaparral species. Cover in these setting is commonly over 60%.

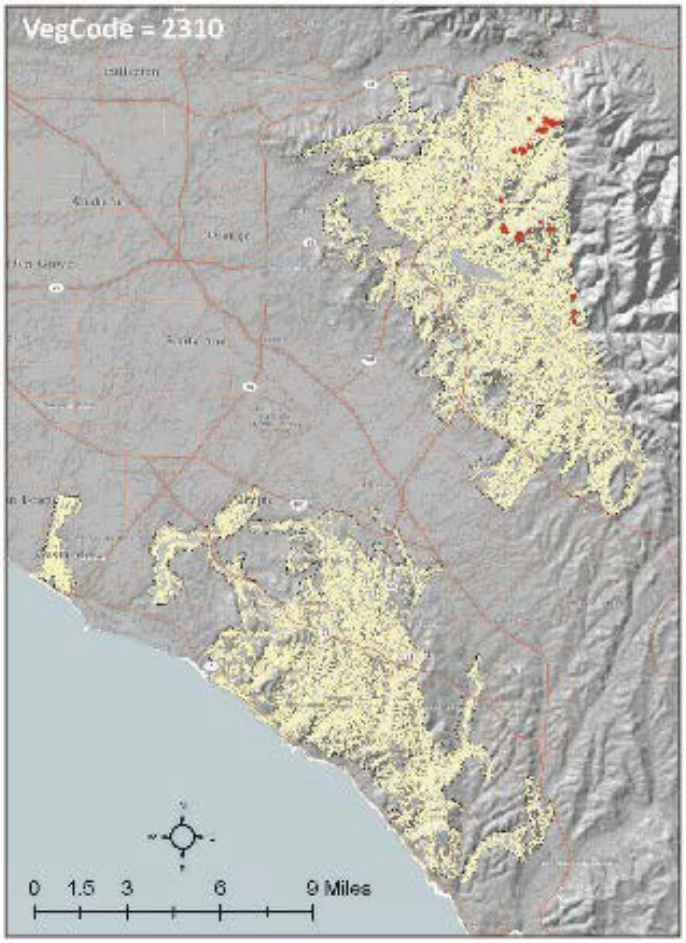
PHOTO INTERPRETATION SIGNATURE:

Separating out the *Quercus dumosa* and *Q. berberidifolia* scrub oak alliances in the mapping area is not possible on signature characteristics alone. Photo interpreters used ancillary field data, and then modeled stands using adjacent vegetation (in this alliance adjacent stands of *Rhus integrifolia, Diplacus aurantiacus,* and other mesic coastal scrub types) and proximity to the coast.

2310 *Ceanothus tomentosus* Alliance (Woolly Leaf Ceanothus)



In this example, *Ceanothus tomentosus* co-dominates with *Adenostoma fasciculatum* in a dense cover over 60%. The stand is located on gently sloping terrain at the 2000' elevation above Black Star Canyon in the Santa Ana Mountains.



2310 *Ceanothus tomentosus* Alliance (Woolly Leaf Ceanothus)

DESCRIPTION:

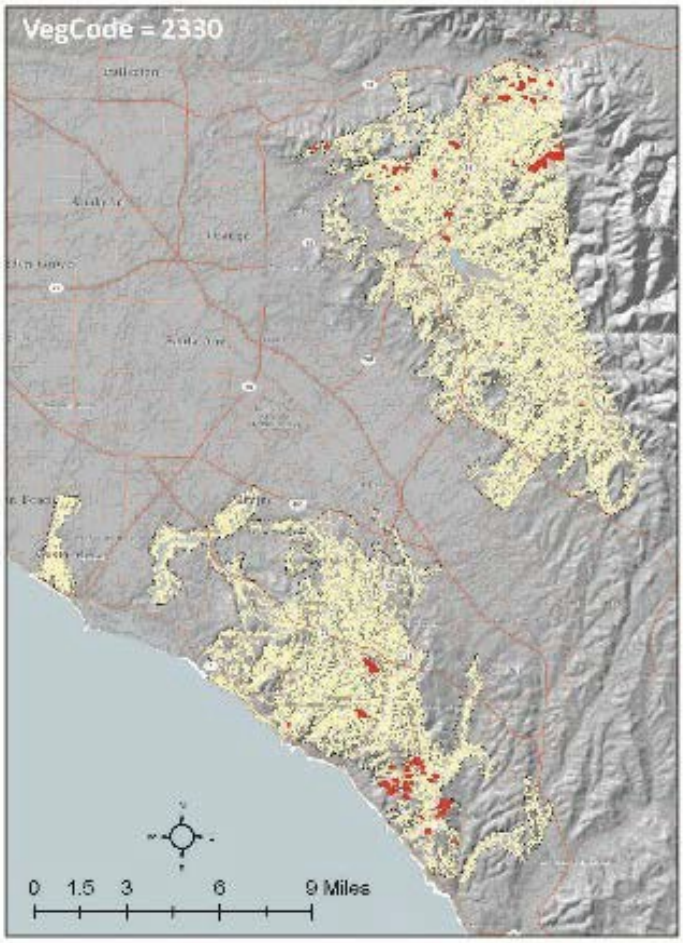
The *Ceanothus tomentosus* Alliance is a mesic chaparral found on gentle to moderate slopes at higher elevations within the mapping area. The alliance is mapped where *Ceanothus tomentosus* co-dominates the stand, in most cases with *Adenostoma fasciculatum.* Nearly all mapped stands contain greater than 60% cover.

PHOTO INTERPRETATION SIGNATURE:

Ceanothus tomentosus is a difficult type to identify. Stands of mesic chaparral often contain a component of this species along with other species of *Ceanothus,* in addition to *Heteromeles arbutifolia* and *Quercus berberidifolia*, making it difficult to photo interpret. In these settings, signature colors overlap considerably between the abovementioned species. It is noted more frequently than other mesic types on gentler slopes and often with the more xeric trending chamise. Modal signature color trends very dark brown with green tints; texture is smooth with some mottling.

2330 *Heteromeles arbutifolia* Alliance (Toyon)

In this example, *Heteromeles arbutifolia* occurs on a steep slope co-dominating with *Fraxinus dipetala.* This is a mesic chaparral example located just above Fremont Canyon at the 1300' level in the Santa Ana Mountains.



2330 *Heteromeles arbutifolia* Alliance (Toyon)

DESCRIPTION:

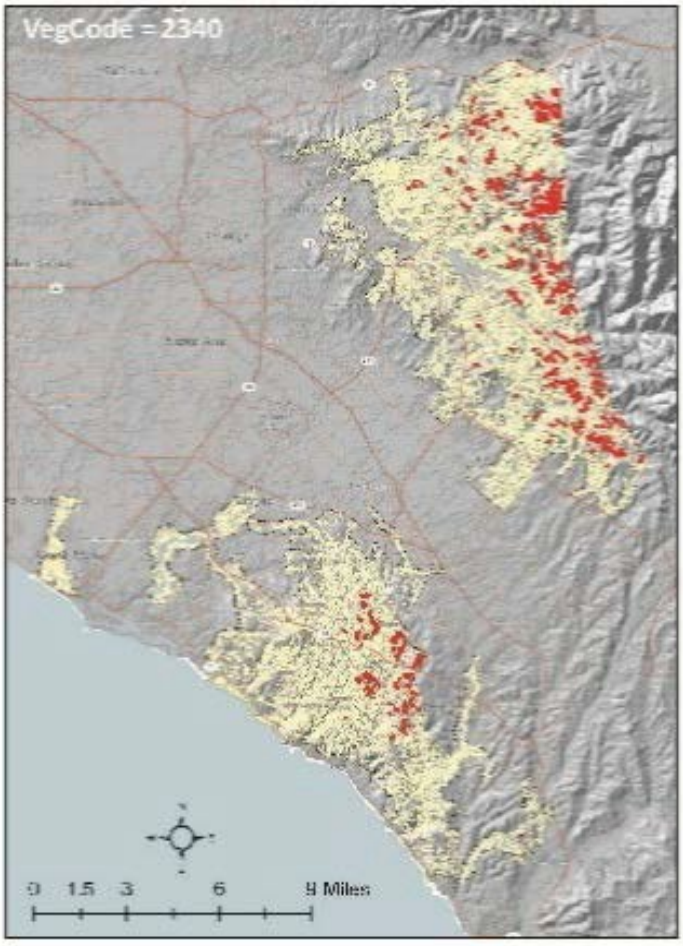
The *Heteromeles arbutifolia* Alliance is a mesic chaparral type occurring on steep north trending slopes in two distinct regions of the mapping area: a northern study type where it occurs with other mesic chaparral species; and a coastal type where it shares dominance with maritime chaparral. The alliance is mapped where *Heteromeles* dominates or at times co-dominates the stand with *Rhus integrifolia* in maritime settings, or with *Fraxinus dipetala* in mesic chaparral settings. Stands usually contain greater than 60% cover except in post burn areas in the north.

PHOTO INTERPRETATION SIGNATURE:

This alliance is difficult to identify in most settings. In coastal maritime settings, *Heteromeles arbutifolia* has a similar stature and growth form to both *Rhus integrifolia* and *Malosma laurina.* Northern inland stands often mix with other mesic species making relative cover estimates difficult. *H. arbutifolia* has rounded well-defined crowns trending light to medium-dark green. Inland stands tend to occur with mesic chaparral in dense cover; similar stature *M. laurina* tends to grow in more open xeric conditions.

2340 *Quercus berberidifolia* Alliance (Scrub Oak)

In the above example, *Q. berberidifolia* co-dominates with *Heteromeles arbutifolia* in a dense setting recovering from a burn in 2007. Post burn recovering mesic chaparral typically has a uniform texture as noted in the imagery above; leaf phenology is young with minimal sclerophyllous characteristics. The stand is located on steep terrain above Modjeska Road.



2340 *Quercus berberidifolia* Alliance (Scrub Oak)

DESCRIPTION:

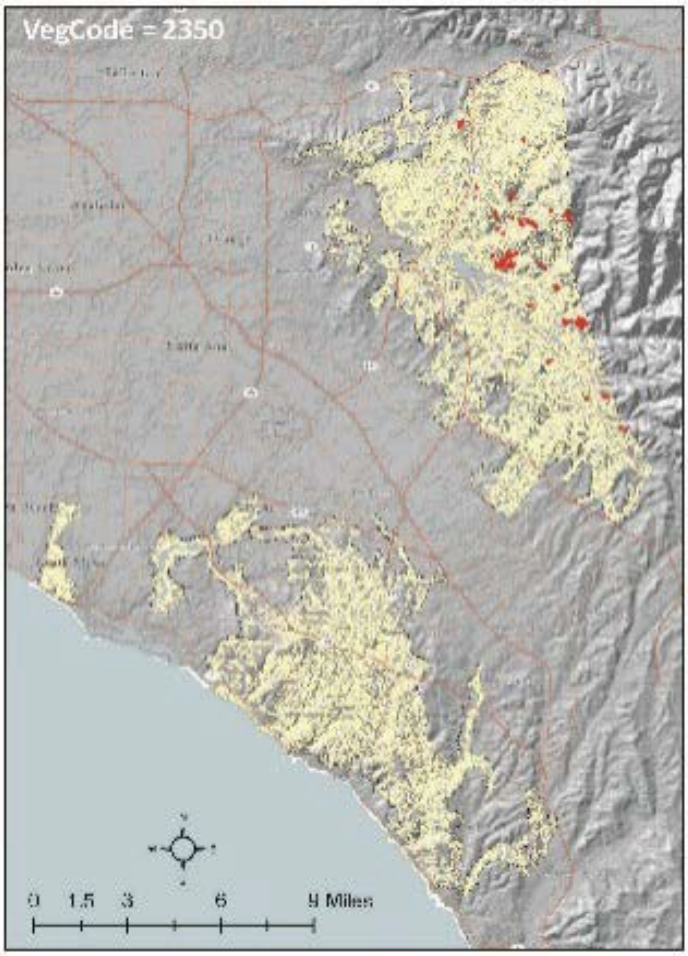
Quercus berberidifolia is a frequently occurring alliance throughout the Santa Ana Mountains in the northern portion of the mapping area and in interior mesic slopes in the San Joaquin Hills closer to the coast. It is mapped where *Q. berberidifolia* dominates or co-dominates the stand with other mesic chaparral (or at times in the south with maritime chaparral) species, usually in cover greater than 60%. Stands are mapped on gently to moderately steep slopes, especially in low to mid positions trending northerly.

PHOTO INTERPRETATION SIGNATURE:

Quercus berberidifolia has a wide variation of textural qualities, but more often than not trends toward a hummocky texture in a closed crown setting where crown margins are somewhat discernable. In post burn settings, the recovering stand yields a smooth texture. Mature stands trend toward darker greens with a slightly blue tint. In stands that mix with other mesic chaparral, shrub crowning is less distinct yielding a smoother texture.

2350 *Quercus berberidifolia – Adenostoma fasciculatum* Alliance (Scrub Oak – Chamise)

In the above example, *Quercus berberidifolia* and *Adenostoma fasciculatum* co-dominate the shrub layer. This stand is located downslope from the *A. fasciculatum* Alliance where the latter follows the top of the ridgeline. The stand is found just west of the upper reaches of Limestone Canyon at 1200’ elevation.



2350 *Quercus berberidifolia – Adenostoma fasciculatum* Alliance (Scrub Oak – Chamise)

DESCRIPTION:

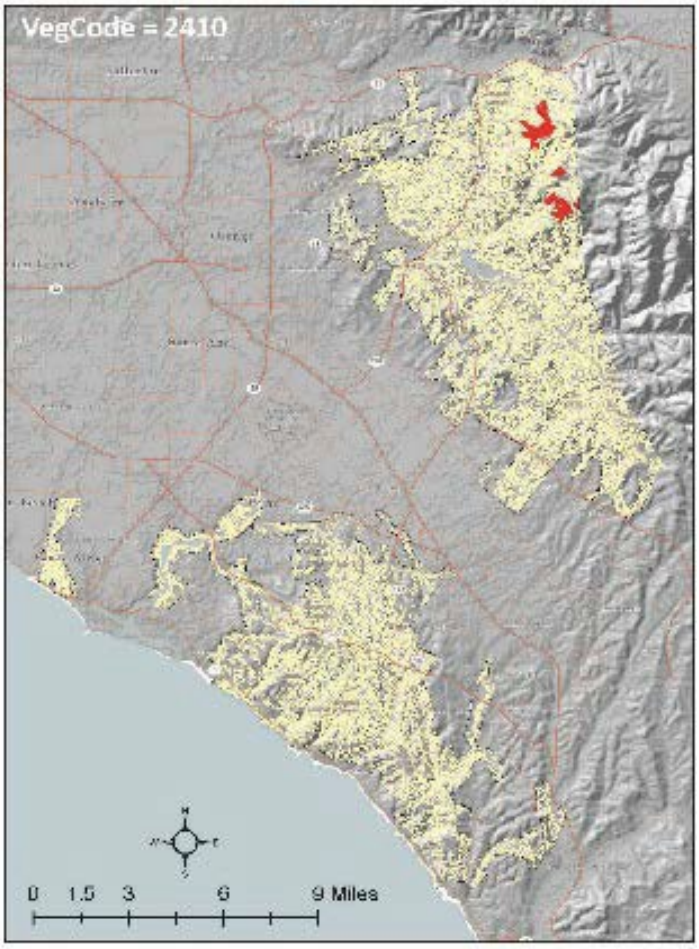
The *Quercus berberidifolia – Adenostoma fasciculatum* Alliance is mapped where both species co-dominate the stand, generally in dense cover. The alliance is an intermediate type to the two single alliance types in almost all regards, including slope characteristics, moisture requirements and species composition. This type, with its component of *A. fasciculatum,* is mapped exclusively in the northern portion of the study at mid to higher elevations in the Santa Ana Mountains.

PHOTO INTERPRETATION SIGNATURE:

This alliance shares signature characteristic of both of the single-species types. Mixing can be gradational with more scrub oak toward the lower slopes and chamise higher up; many stands have more random mixing of the two species. Defining the precise margins of the stand is often problematic due to difficulties in estimating relative cover of the two species.

2410 *Arctostaphylos glandulosa* Alliance (Eastwood Manzanita)

In the above example, *Arctostaphylos glandulosa* and *Adenostoma fasciculatum* co-dominate in a region that burned in both 2002 & 2006. The area shown above represents only a small portion of an extensive stand (over 140 acres) and is located on a major ridgeline at the 2400' elevation level above the upper reaches of Fremont Canyon.



2410 *Arctostaphylos glandulosa* Alliance (Eastwood Manzanita)

DESCRIPTION:

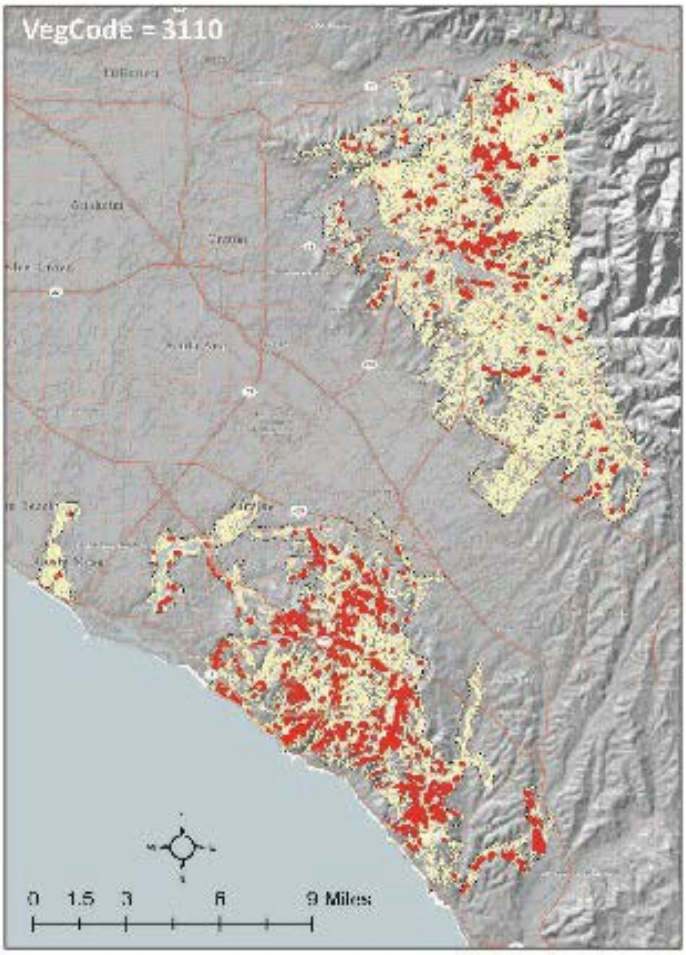
Within the mapping area, the *Arctostaphylos glandulosa* Alliance usually co-dominates with *Adenostoma fasciculatum;* most of which has been burned at least once since 2000. Stand cover averages between 10-25%; mapped polygons include complex matrixes where significant areas fall below 10%. Most stands were mapped on upper slopes, small spur lines and major ridges. This is one of the highest elevation types in the mapping area.

PHOTO INTERPRETATION SIGNATURE:

Sparsely covered portions of the stand show a high degree of bedrock substrate following the Silverado Formation, which yield a yellow to yellow-brown signature color. Where shrub cover increases, signatures trend medium green with a smooth to slightly hummocky signature characteristic of many species of *Arctostaphylos.* The key to mapping to this alliance is the topographical setting and substrate characteristics.

3110 *Artemisia californica* Alliance (California Sagebrush)

The above example depicts a small stand of dense *Artemisia californica* with a few emergent tall *Sambucus nigra* shrubs. There is a small component of *Diplacus aurantiacus*. The stand is located on a steep north-facing slope above Aliso Creek.



3110 *Artemisia californica* Alliance (California Sagebrush)

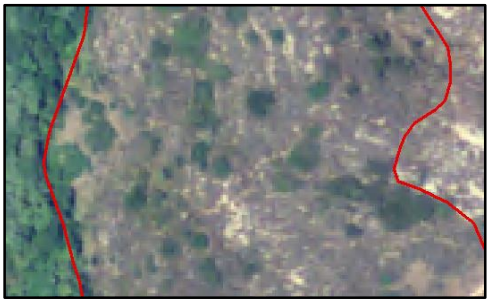
DESCRIPTION:

The *Artemisia californica* Alliance was mapped where *A. californica* strongly dominates or dominates the shrub layer in varying cover when present with other drought deciduous species. Most stands mapped are on north-trending low to upper mesic slopes with greater than 40% cover. When other coastal scrub species (generally *Salvia mellifera* or *Eriogonum fasciculatum)* were consistently visible on the imagery, the stand was mapped to one of the mixed coastal scrub alliances containing both species. In all settings, the lower cover sage scrub species has to be consistently present throughout the polygon before mapping to a mixed *A. californica* – coastal scrub type. The *A. californica* Alliance was also mapped as a co-dominant or at times sub-dominant when present with *Rhus integrifolia, Malosma laurina,* or *Diplacus aurantiacus.*

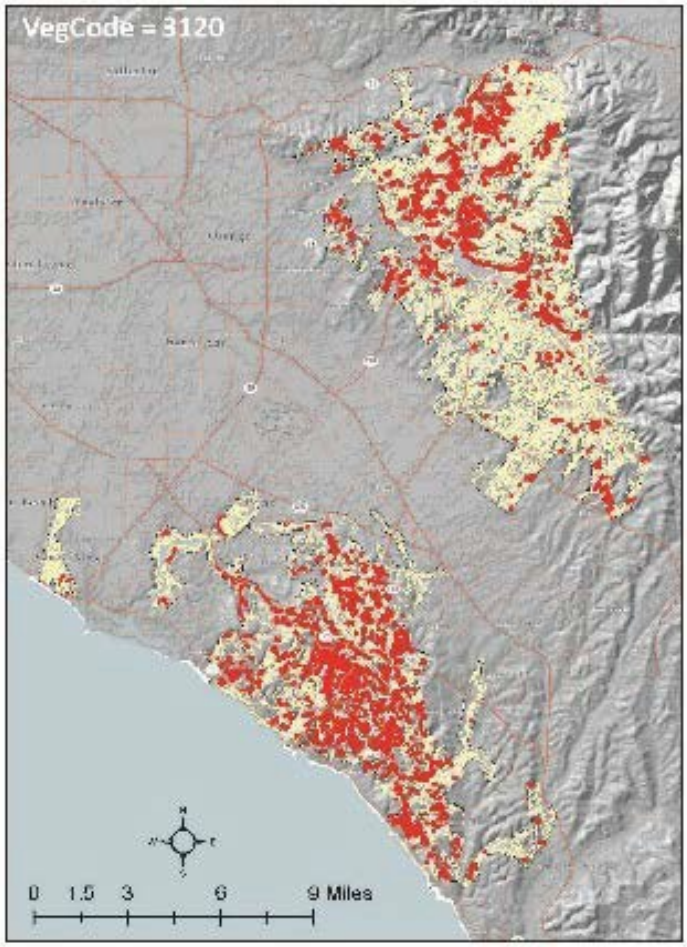
PHOTO INTERPRETATION SIGNATURE:

The signature for *Artemisia californica* is fairly consistent in all settings and cover with a light to medium-dark gray color of slight to moderately hummocky texture. Stand color varies depending on species composition; stands co-dominating with *Diplacus* have a yellow component.

3120 *Artemisia californica* – *Eriogonum fasciculatum* Alliance (California Sagebrush – California Buckwheat)



The above example co-dominates with the two species and may contain a minor component of *Opuntia* spp. Note the openings in the canopy; in these areas, *Eriogonum fasciculatum* dominates.



3120 *Artemisia californica* – *Eriogonum fasciculatum* Alliance (California Sagebrush – California Buckwheat)

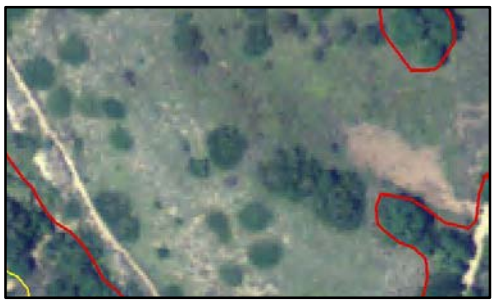
DESCRIPTION:

The *Artemisia californica* – *Eriogonum fasciculatum* Alliance covers greater than 10% of the entire mapping area and is widespread in all regions. The alliance is mapped where both species co-dominate; in certain situations when an *Opuntia* species is scattered in the stand, *E. fasciculatum* can occur as a consistently scattered sub-dominant species. Cover is generally lower than areas mapped to the *A. californica* Alliance.

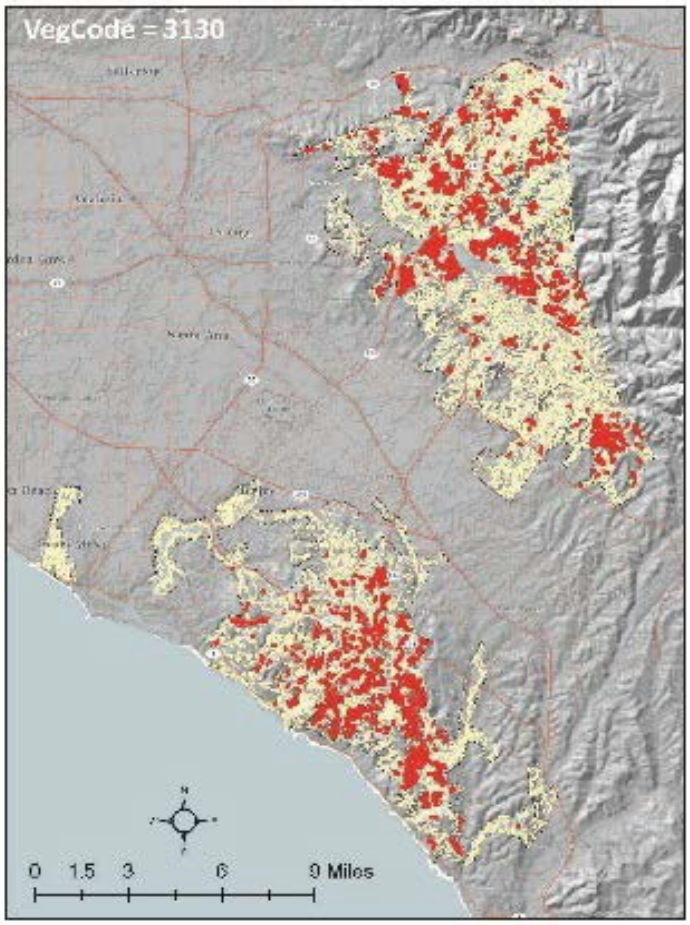
PHOTO INTERPRETATION SIGNATURE:

This mixed alliance characteristically contains areas of sparser cover and small openings in the canopy where *Eriogonum fasciculatum* locally concentrates; in these areas, the substrate color is a bright white color contrasting with the deep browns of the *Eriogonum.* Where cover increases and exposed substrate is not visible, *Artemisia* locally dominates and the signature yields a gray color. This patterning is generally consistent across much of the stand.

3130 *Artemisia californica* – *Salvia mellifera* Alliance (California Sagebrush – Black Sage)



In the above example, *Salvia mellifera* and *Artemisia californica* co-dominate the stand with dense cover. Small amounts of *Rhus integrifolia* and *Eriogonum fasciculatum* are also present in the stand. This stand is located on Moulton Hill east of Laguna Canyon.



3130 *Artemisia californica – Salvia mellifera* Alliance (California Sagebrush – Black Sage)

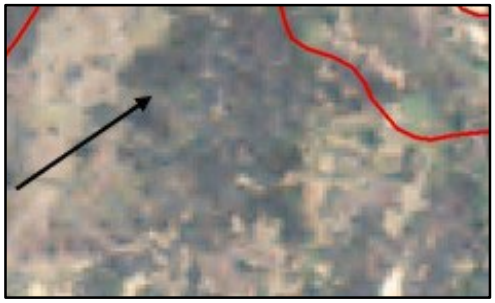
DESCRIPTION:

The *Artemisia californica – Salvia mellifera* Alliance is widespread throughout the mapping area. The alliance is mapped where both species co-dominate, generally in cover greater than 40%. Drier stands will often contain a component of *Eriogonum fasciculatum;* stands near the coast generally contain small amounts of *Rhus integrifolia.* When all three major coastal scrub species share dominance in the stand (*A. californica, S. mellifera,* and *E. fasciculatum),* photo interpreters look for the presence of succulent species (this may incline the call toward the *A. californica – E. fasciculatum* Alliance) and the overall setting to determine which mixed alliance type is more diagnostic.

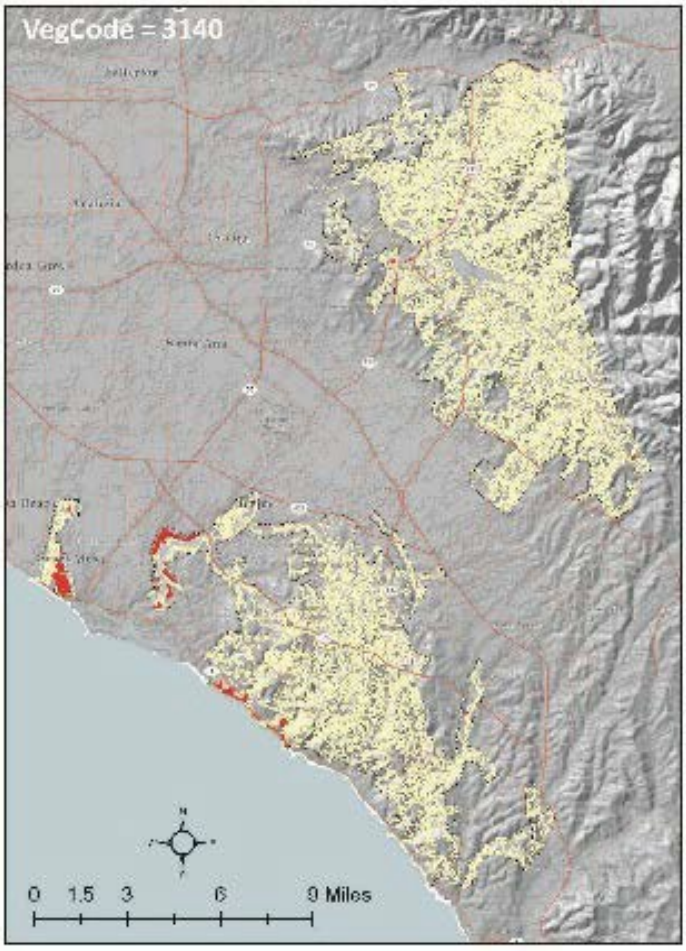
PHOTO INTERPRETATION SIGNATURE:

This mixed alliance contains on average a slightly higher cover than the *Artemisia californica – Eriogonum fasciculatum* Alliance and usually does not contain the scattered openings in shrub canopy. Overall signature is a mix of green and grey hues creating a mottled patchy appearance. The gradient between the two colors in this alliance is less distinct than that of the *A. californica – E. fasciculatum* alliance.

3140 *Encelia californica* Alliance (California Brittle Bush)



In the above example, *Encelia californica* dominates the stand with a small component of *Eriogonum. fasciculatum* and *Artemisia californica.* The stand is located above a coastal bluff off Pelican Point.



3140 *Encelia californica* Alliance (California Brittle Bush)

DESCRIPTION:

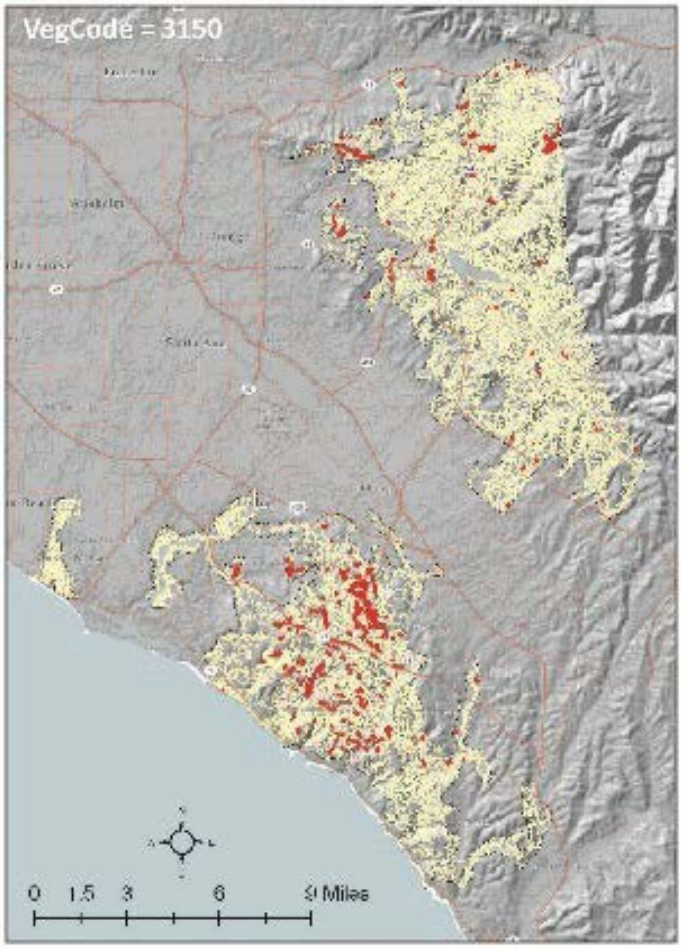
The *Encelia californica* Alliance for the most part is limited to the coastal fringe, located on steep bluffs and the adjacent terraces. However, small stands of this alliance were mapped on bluffs adjacent to Upper Newport Bay and along the bluffs at the southwest margins of Costa Mesa to the west. The alliance was mapped where *Encelia californica* dominates the stand. Other coastal strand species were present in all stands mapped including one or more of the following: *Artemisia californica, Eriogonum farinosa, Salvia mellifera, Rhus integrifolia* and *Lycium californicum.*

PHOTO INTERPRETATION SIGNATURE:

The signature color of *Encelia californica* varies considerably during its seasonal phenological change from young growth in early spring to complete senescence in late summer. NAIP imagery yields a signature that is in its early deciduous phase where the leaf die-off is nearly complete but sill remaining on the plant. This phase typically yields a very dark signature in relation to other coastal scrub types adjacent.

3150 *Eriogonum fasciculatum* Alliance (California Buckwheat)

In the above example, *Eriogonum fasciculatum* dominates on a steep south trending slope with characteristic openings in the canopy yielding a light-colored substrate. *Malosma laurina* is a component to this stand located west of Laguna Canyon Road.



3150 *Eriogonum fasciculatum* Alliance (California Buckwheat)

DESCRIPTION:

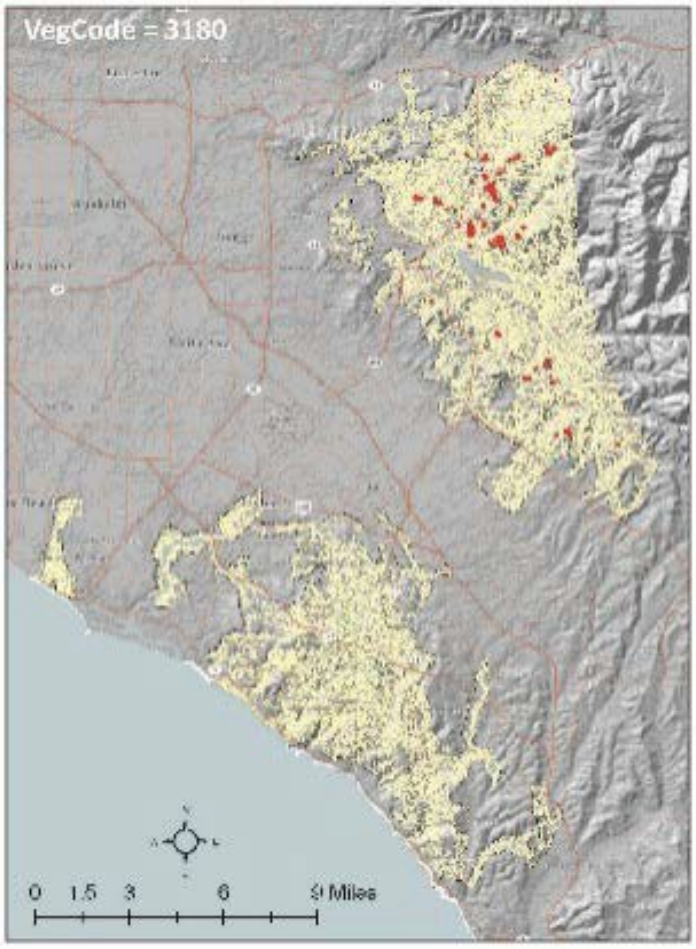
The *Eriogonum fasciculatum* Alliance is widespread throughout the mapping area; however, it is much more abundant in the San Joaquin Hills to the south. This Alliance was mapped where *E. fasciculatum* dominates the stand when other coastal scrub species were noted such as *Artemisia californica,* and *Salvia mellifera.* In inland stands where *Malosma laurina* or *Acmispon glaber* were noted, *E. fasciculatum* was mapped when it was a co-dominant and at times even a sub-dominant shrub. Cover averages the lowest of the three extensively mapped species, the other two being *A. californica* and *S. mellifera.*

PHOTO INTERPRETATION SIGNATURE:

The signature color of *Eriogonum fasciculatum* is fairly consistent throughout the mapping area and maintains a dark brown to dark gray-brown signature on all topographical settings. In most stands, substrate color is white to light gray.

3180 *Salvia apiana* Alliance (White Sage)

In the above example, *Salvia apiana* dominates the stand in sparse cover over a dense annual grass understory on an upper slope and ridge. The stand is a typical setting for this alliance, and is located about a half mile east of the Route 241 Toll Road.



3180 *Salvia apiana* Alliance (White Sage)

DESCRIPTION:

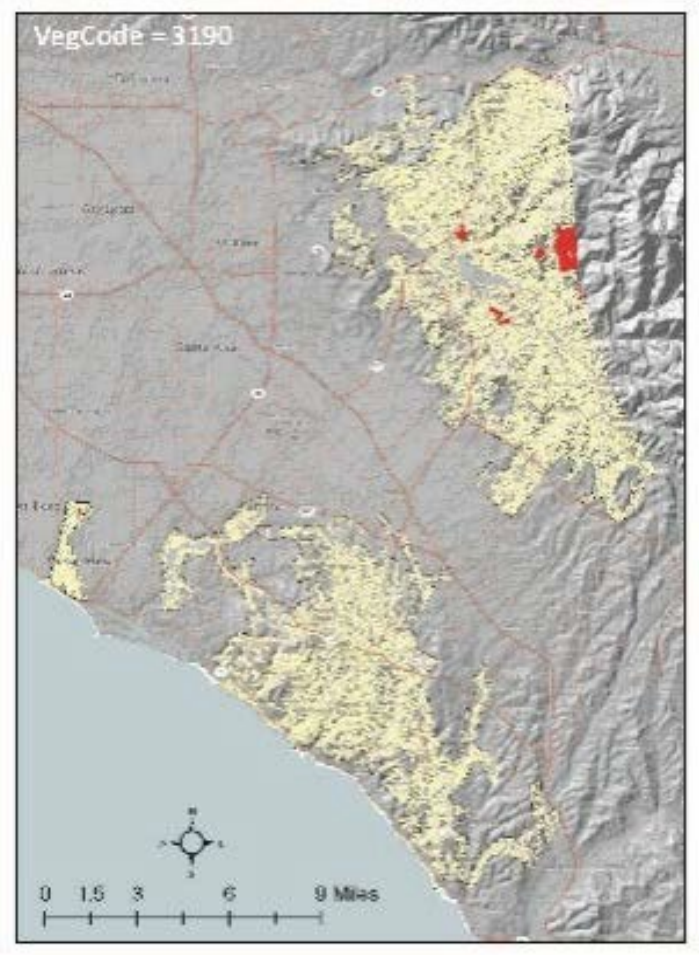
The *Salvia apiana* Alliance is restricted to the northern portion of the mapping area, frequently occurring on grassy upper slopes and ridgelines. This alliance was mapped where *Salvia apiana* dominates or co-dominates the stand, most frequently with *Artemisia californica* or *Eriogonum fasciculatum.* In most stands, *S. apiana* was the sole dominant with a sparse cover, generally under 25%.

PHOTO INTERPRETATION SIGNATURE:

The signature color of *Salvia apiana* is distinct and can be confused only with one other shrub, *Salvia leucophylla.* Existing higher resolution imagery (3” resolution HR-2012) was necessary in initially mapping this type due to its extremely sparse cover. In most settings, the taller stature of this species helps to differentiated from *S. leucophylla* on the high-resolution imagery.

3190 *Salvia leucophylla* Alliance (Purple Sage)

In the above example, *Salvia leucophylla* co-dominates with *Artemisia californica* in a dense cover. This stand is located on an extensive slope above Black Star Canyon ranging from 1000’ to 1700’ elevation.



3190 *Salvia leucophylla* Alliance (Purple Sage)

DESCRIPTION:

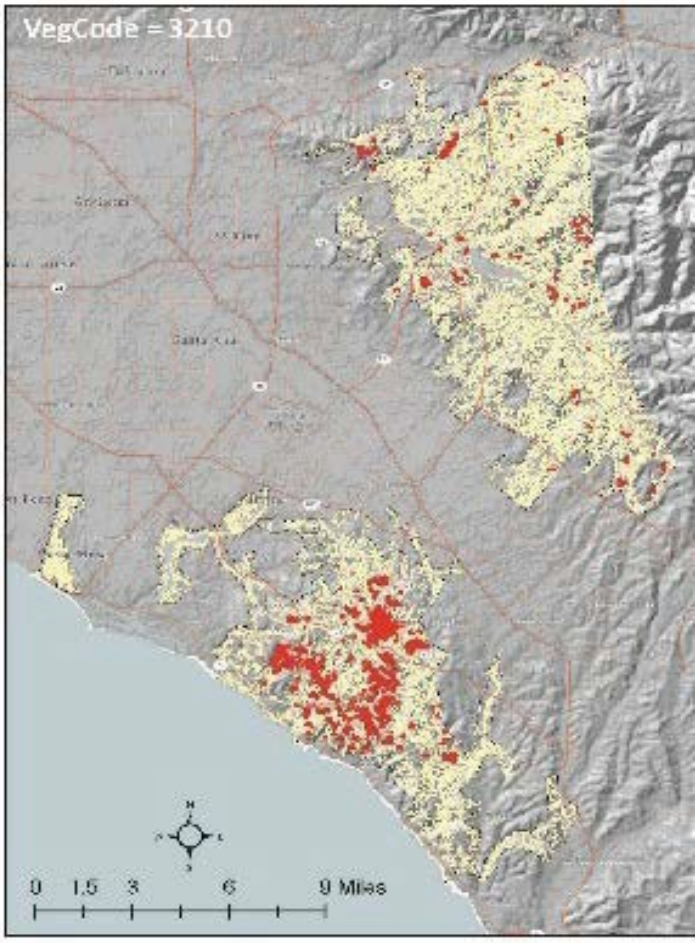
The *Salvia leucophylla* Alliance is restricted to three core regions in the northern portion of the mapping area all within a few miles of the Santiago Reservoir. Stands were mapped where *Salvia leucophylla* dominated or co-dominated the shrub layer. *Artemisia californica* is a commonly occurring co-dominant in mapped stands. Most stands mapped were assigned cover values greater than 40%.

PHOTO INTERPRETATION SIGNATURE:

The signature color of *Salvia leucophylla* is somewhat similar to *Artemisia californica* but tends to have more of a bluish-green as opposed to a bluish-gray color. Unlike the latter alliance, this type's signature tends to remain consistent across varying topographical features. Portions of the stand on protected settings are similar in signature than stands occupying more xeric sites. Stands average much higher in cover than *S. apiana,* which has a similar signature.

3210 *Salvia mellifera* Alliance (Black Sage)

In the above example, *Salvia mellifera* dominates the stand. Note signature color variability in both the image and ground photo based on leaf phenology. The stand is located on the southern slopes of the Sheep Hills above Aliso Creek.



3210 *Salvia mellifera* Alliance (Black Sage)

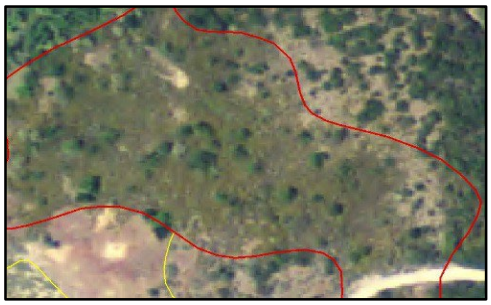
DESCRIPTION:

The *Salvia mellifera* Alliance is widespread in most regions of the mapping area. However, stands are somewhat more localized in the southern portion of the San Joaquin Hills west of Laguna Canyon. This alliance was mapped in moderately dense to dense cover where *Salvia mellifera* dominated or co-dominated the stand. Numerous stands were mapped where the plant co-dominates with *Eriogonum fasciculatum.* In these settings, cover tends to be somewhat lower.

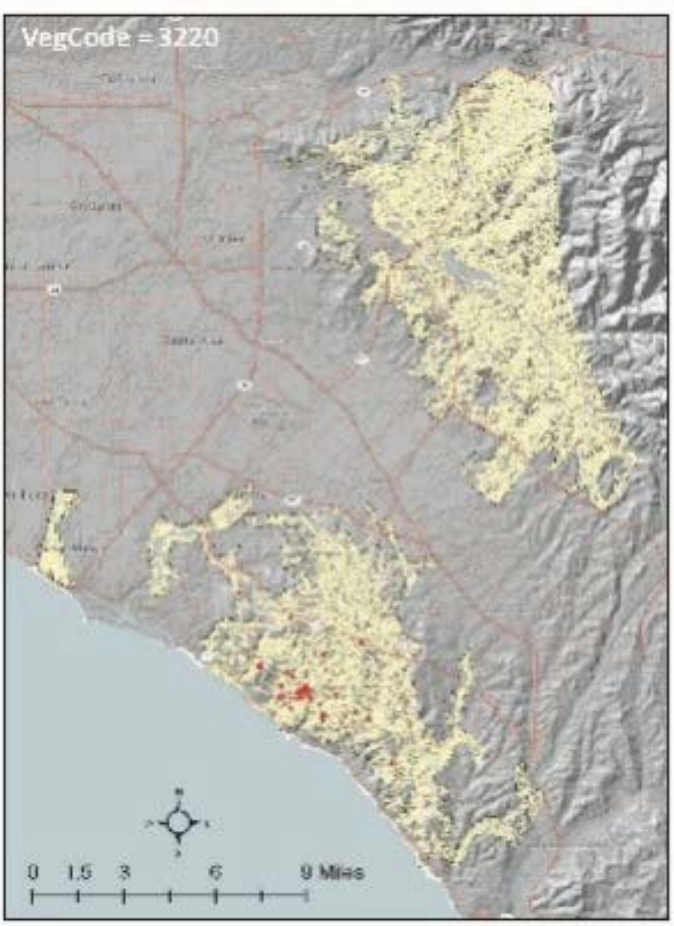
PHOTO INTERPRETATION SIGNATURE:

Salvia mellifera photo signature characteristics are highly variable depending on the phenology of the plant during its growing season. NAIP imagery depicts the plant in transitional phenology corresponding with the early onset of the dry season. Plants in more protected settings are yellow-green; those on more exposed slopes trend towards a light brown signature color. Confusion exists where small amounts of *Artemisia californica* consistently occurring in the stand may be classified to the mixed species alliance. It can be difficult to determine relative cover of the two species across the stand.

3220 *Diplacus aurantiacus* Alliance (Bush Monkeyflower)



This example depicts a steep protected slope where *Diplacus aurantiacus* strongly dominates the shrub layer with a small and inconsistent component of *Artemisia californica.* The stand is located upslope from Moro Canyon.



3220 *Diplacus aurantiacus* Alliance (Bush Monkeyflower)

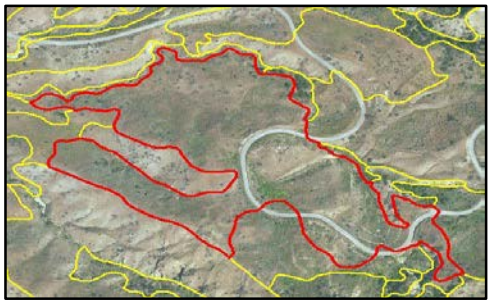
DESCRIPTION:

The *Diplacus aurantiacus* Alliance is restricted to isolated stands on very mesic protected slopes within several miles of the coast. Elsewhere, *D. aurantiacus* is a fairly common component to mesic stands of *Artemisia californica.* This alliance was mapped in dense cover settings where *D. aurantiacus* strongly dominates the shrub layer. *Toxicodendron diversilobum* and *A. californica* are often scattered in the stand.

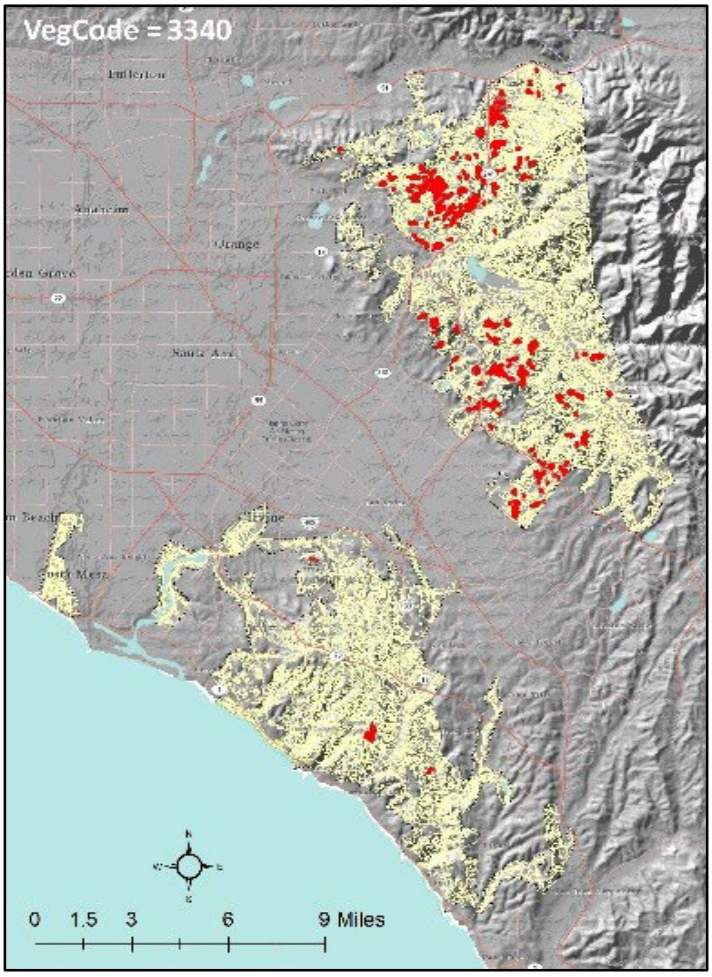
PHOTO INTERPRETATION SIGNATURE:

Diplacus aurantiacus has a fairly easily identifiable signature on the NAIP imagery that portrays dense cover stands as medium green with areas of yellow scattered throughout. Texture is smooth to slightly hummocky. Scattered presence of *Artemisia californica* adds variability to the texture.

3340 *Acmispon glaber* Alliance (Deerweed)



This example depicts a post burn area strongly dominated by *Acmispon glaber.* Note the high cover of yellow-flowering *A. glaber* in the ground photo.



3340 *Acmispon glaber* Alliance (Deerweed)

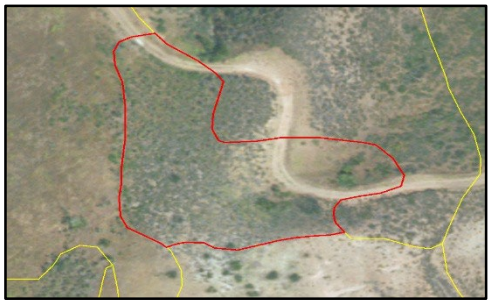
DESCRIPTION:

The *Acmispon glaber* Alliance is concentrated almost entirely in the lower foothills of the Santa Ana Mountains near the urban fringe that was burned in 2017 or 2020, with previous burns in 2006 or 2007. Stands may be maturing back to coastal scrub and chaparral types since the 2017 fire. This alliance was mapped in areas where *A. glaber* dominated or strongly dominated the shrub layer, generally in partially senesced phenology. Numerous stands of vegetation in the northern portion of the mapping area were assigned to coastal scrub or chaparral types even though they had a high component of *A. glaber.* However, these stands did have a consistent presence (generally locally co-dominating) of pre-burn coastal scrub or chaparral throughout the mapped polygon.

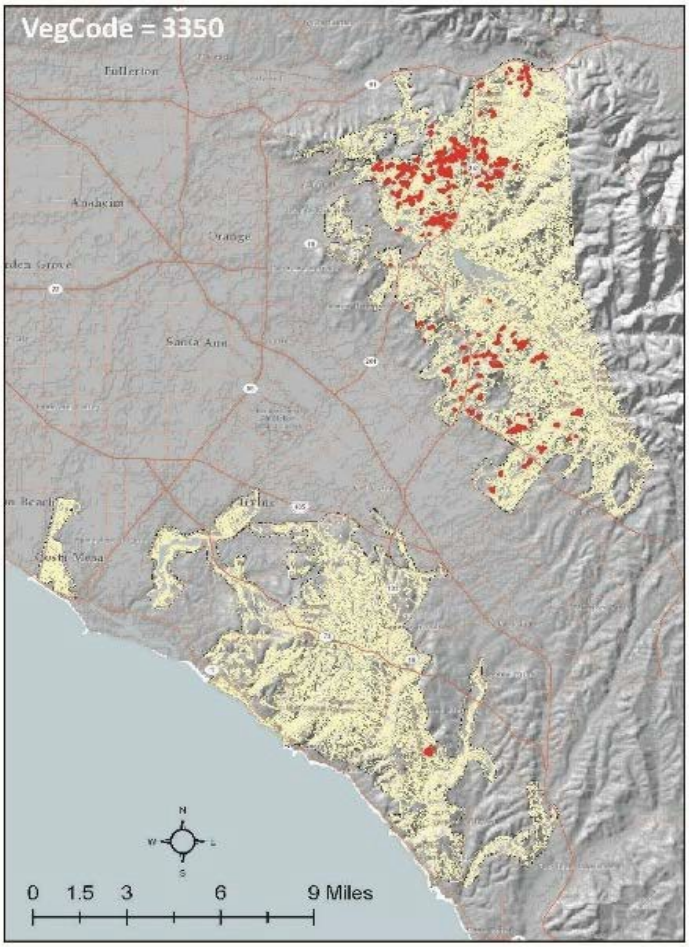
PHOTO INTERPRETATION SIGNATURE:

Acmispon glaber yields a brown signature color with a slight reddish tint. Texture is stipple-like with high variability across the stand. This signature reflects this species phenology 4-5 years after a burn.

3350 *Malacothamnus fasciculatus* Alliance (Bush Mallow)



This example depicts a small but dense stand of *Malacothamnus fasciculatus*.



3350 *Malacothamnus fasciculatus* Alliance (Bush Mallow)

DESCRIPTION:

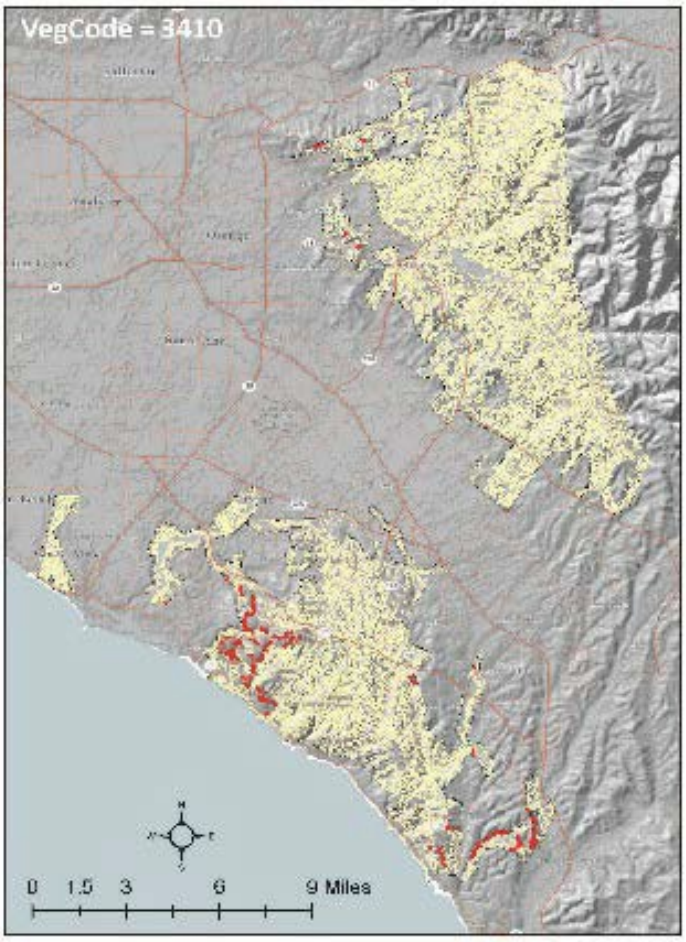
The *Malacothamnus fasciculatus* Alliance is concentrated primarily in two post burn areas of the Santa Ana Mountains, one to the south that burned in 2017 and one in the north where it burned in 2020. Unlike the *Acmispon glaber* Alliance, this type appears to consist of uniform monotypic stands. This alliance was mapped in widely varying cover in areas where *M. fasciculatus* dominates or strongly dominates the shrub layer. The alliance was more often seen in higher chaparral settings than the *A. glaber* Alliance where it was noted adjacent to coastal scrub types and chamise coastal scrub mixes.

PHOTO INTERPRETATION SIGNATURE:

This alliance has a stipple-like texture that accounts for its sparse and feathery crown shape. Signature variability is high, reflecting the broad cover range in which it was mapped. Signature color varied from gray to dull green.

3410 Acacia (cyclops) Semi-natural Stands (Australian Wattle)

This example depicts a narrow band of roadside *Acacia* spp. located above Newport Coast Drive.



3410 Acacia (cyclops) Semi-natural Stands (Australian Wattle)

DESCRIPTION:

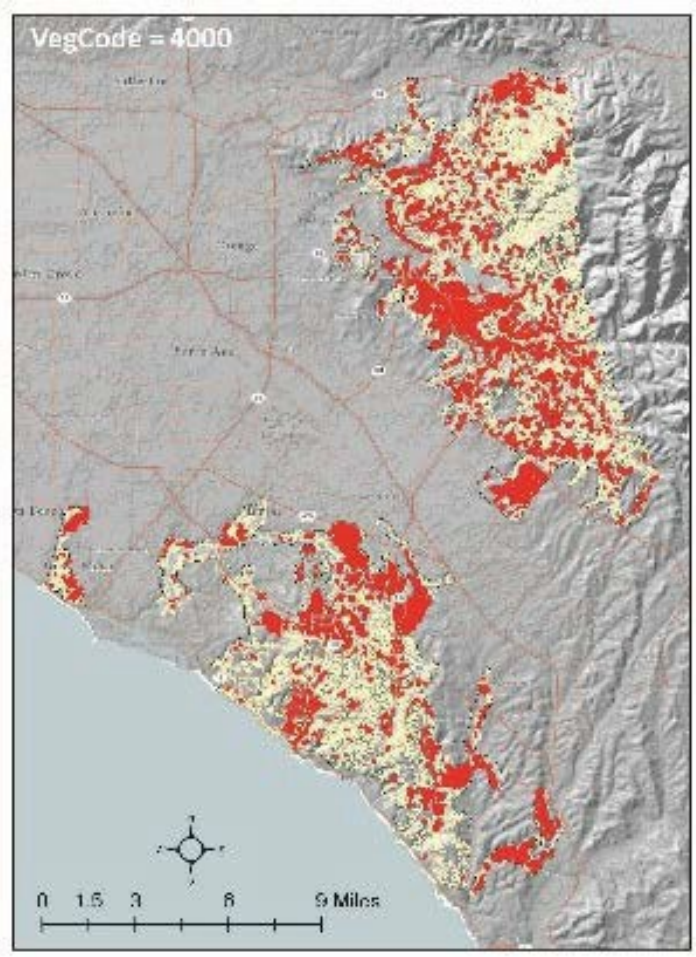
The *Acacia (cyclops)* Semi-natural Stands occurs almost exclusively along roadside thoroughfares and along the margins of newer urban developments. Stands are generally long and narrow and are frequently a sole dominant. Naturalized stands are rare in the mapping area; however, reconnaissance trips noted *Acacia* in some native coastal scrub vegetation. The category is mapped where *Acacia* spp. strongly dominates the shrub layer. Exotic trees (pines, *Eucalyptus,* and others) may be an emergent component to the shrub layer in cover up to 10%. Stands consistently form a dense cover. This category mapped only along the fringes of urban development; linear bands of *Acacia* are not mapped when they continue into the urban development, in which case they are included in the Urban (9300) polygon.

PHOTO INTERPRETATION SIGNATURE:

Acacia has a monotypic signature in nearly all settings. The nearly always-dense cover exhibits a uniformly smooth texture across the stand. Colors range from a grayish brown to grayish blue, which tends to vary within the mapped polygon. Patterns are linear and follow roads and the urban fringe.

4000 – California Annual & Perennial Grasslands Macrogroup

Stand of mixed native and non-native herbs and grasses composed primarily of native *Croton setigerus* and non-native *Avena* spp. and *Bromus* spp. Stand is located in Limestone Canyon.



4000 – California Annual & Perennial Grasslands Macrogroup

DESCRIPTION:

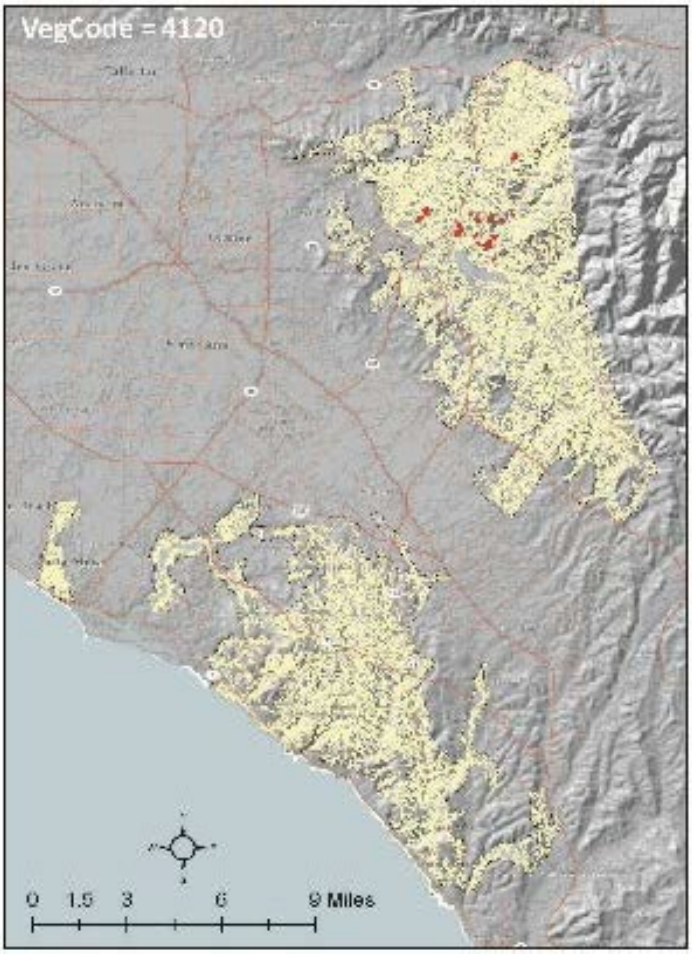
This class represents mixed stands of native and non-native forbs and grasses. Annual grasses and forbs tend to vary in type and extent from season to season and from year to year in a given area. Their species composition may also vary. Upland grasslands were originally mapped in the 2012 database as the Mediterranean California Naturalized Annual and Perennial Grassland Group, defined as being strongly dominant by non-native cover. However, since that time, the ecologists have determined that most upland herbaceous stands have a significant component of native species in them, and it would be more accurate to call most grasslands as the California Annual & Perennial Grassland Macrogroup. In the 2022 mapping database both the 2012 and 2022 vegetation type for non-native grasslands were recoded to the California Annual & Perennial Grassland Macrogroup. The 2012 verified strongly dominant non-native stands were also recoded to the Macrogroup level with the actual alliance name placed in the “Comment” field in the database. Strongly dominant native stands in the 2012 database were left with their original alliance call.

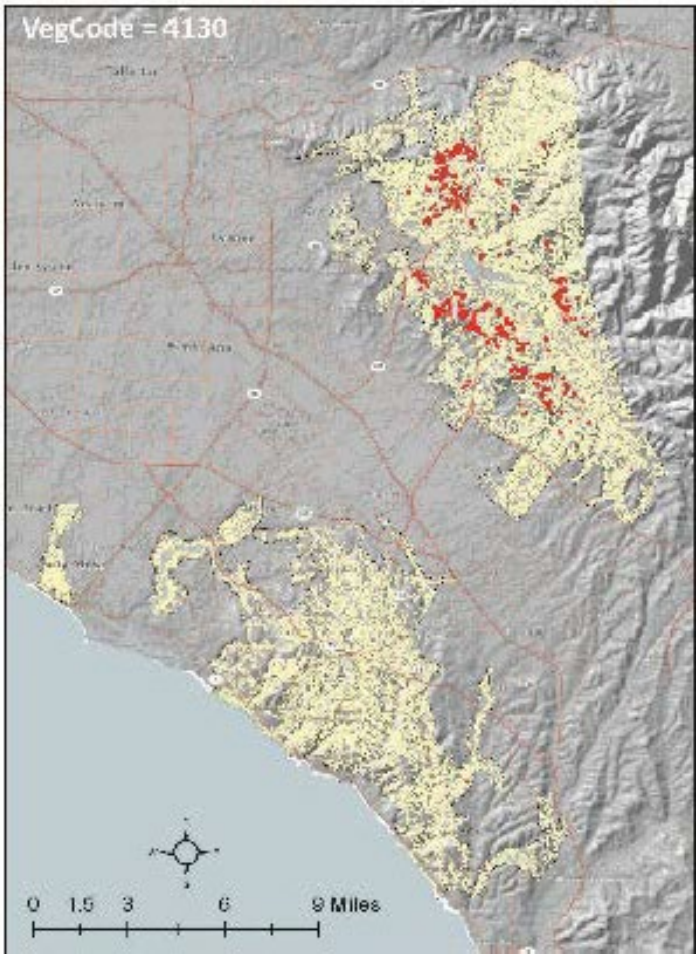
PHOTO INTERPRETATION SIGNATURE:

Grasslands/forblands cannot be photo interpreted to the alliance level unless they have a distinct repeatable signature. Many tall species and some subshrubs are possible to photo interpret with the aid of field data. Signature color varies considerably depending on the species composition (especially with the amount of weedy forbs mixing with annual grasses), and phenology of the plant at the time the imagery was flown. Texture likewise is variable and can be highly mottled based on the presence of weedy forbs. Texture variability is a reflection of species composition, not differing vegetative stature.

4120 & 4130 – *Stipa (Nassella) lepida & Stipa (Nassella) pulchra* Alliances (Foothill Needlegrass & Purple Needlegrass)

This example depicts a small patch of *Stipa pulchra* with a scattering of *Ericameria palmeri* adjacent to a coast live oak woodland. The stand contains a high component of non-native annual grasses.





4120 & 4130 – *Stipa (Nassella) lepida & Stipa (Nassella) pulchra* Alliances (Foothill Needlegrass & Purple Needlegrass)

DESCRIPTION:

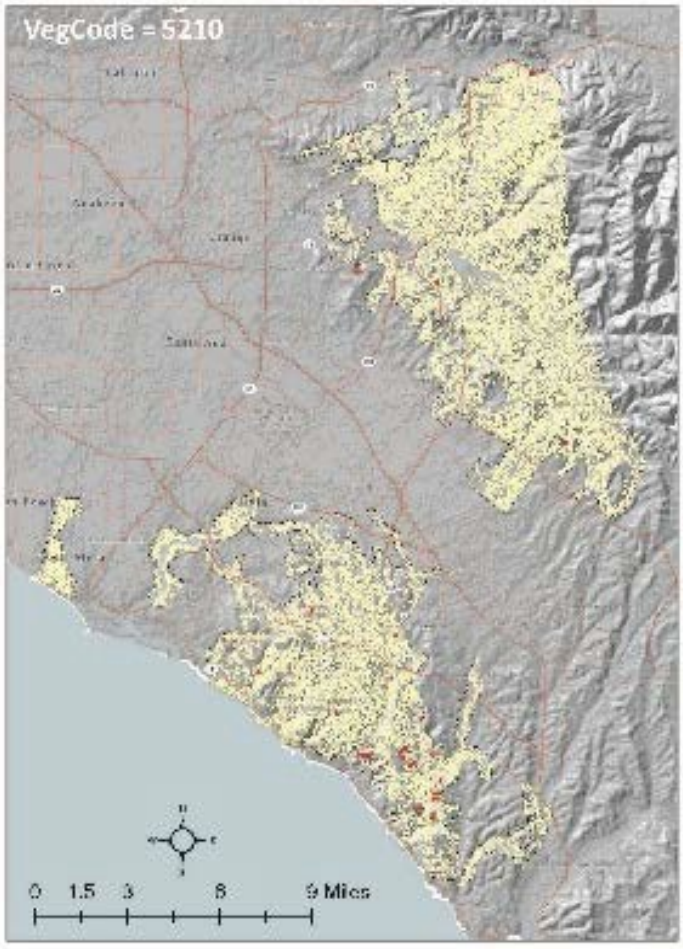
The two perennial *Stipa* bunch grasses (*Stipa lepida* and *Stipa pulchra*) occur throughout the mapping area. These two alliances were not easily discernable from the non-native annual grasses that were often a high component to the stands. In the 2012 mapping effort photo interpreters used polygon data from the Irvine Ranch Conservancy and integrated the data into the vegetation map. Stands had been modified where shrub cover may have increased since the time of the sampling. During the current mapping effort, it was noted that the *Stipa* stands had not changed, having recovered after the 2017 and 2020 fires, and were therefore mapped as such in the 2022 project.

PHOTO INTERPRETATION SIGNATURE:

These two native grass types were not separable using existing imagery and therefore were not mapped using photo interpretive techniques.

5210 *Toxicodendron diversilobum* Alliance (Poison Oak)

This example depicts a very small 1-acre patch of dense *Toxicodendron diversilobum* on a steep mesic north trending slope above Aliso Creek.



5210 *Toxicodendron diversilobum* Alliance (Poison Oak)

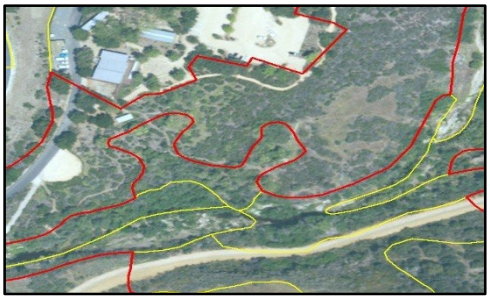
DESCRIPTION:

Although the *Toxicodendron diversilobum* Alliance is mapped in only a few scattered locations primarily within a mile of the coast, it is a frequent component to mesic stands of coastal scrub. Stands assigned to this type were mapped where *T. diversilobum* dominated. Other species such as *Artemisia californica, Diplacus aurantiacus,* and emergent *Sambucus nigra* were present in most of the mapped polygons. Stands are quite small, most being about an acre in size.

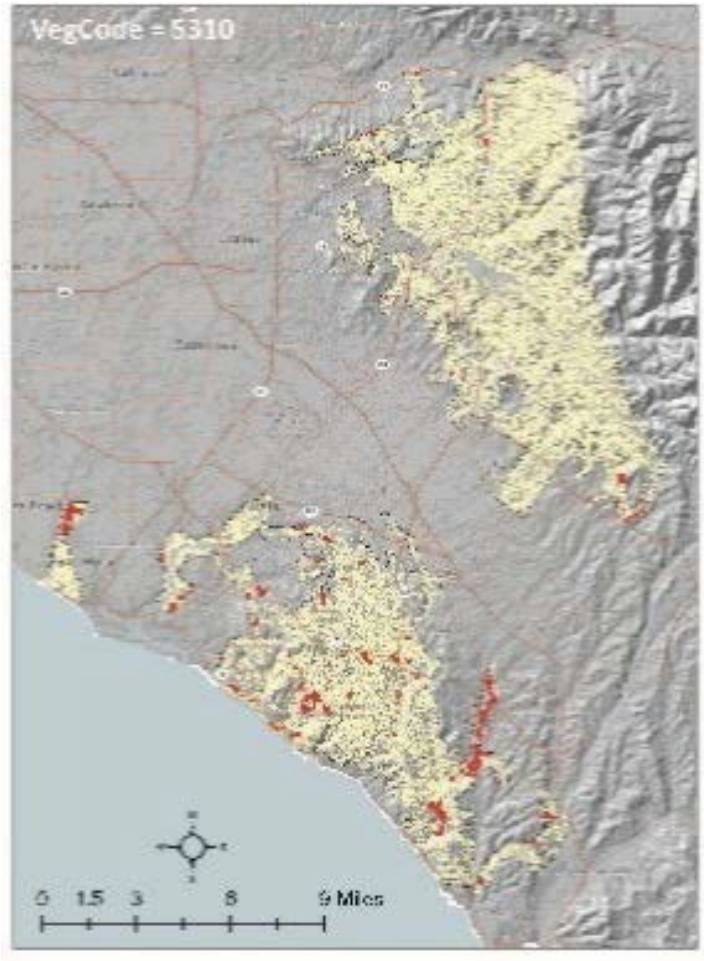
PHOTO INTERPRETATION SIGNATURE:

At the time the NAIP imagery was flown, *Toxicodendron diversilobum* had a light to medium green signature depicting the young leaf phenology of early summer. Texture across the limited extend of the stand is smooth to slightly mottled; stand edges are generally distinct and abrupt.

5310 *Baccharis pilularis* Alliance (Coyote Brush)



The example above depicts *Baccharis pilularis* in open grassy cover (with small dense patches) dominating the shrub layer. The stand is just west of Alicia Parkway.



5310 *Baccharis pilularis* Alliance (Coyote Brush)

DESCRIPTION:

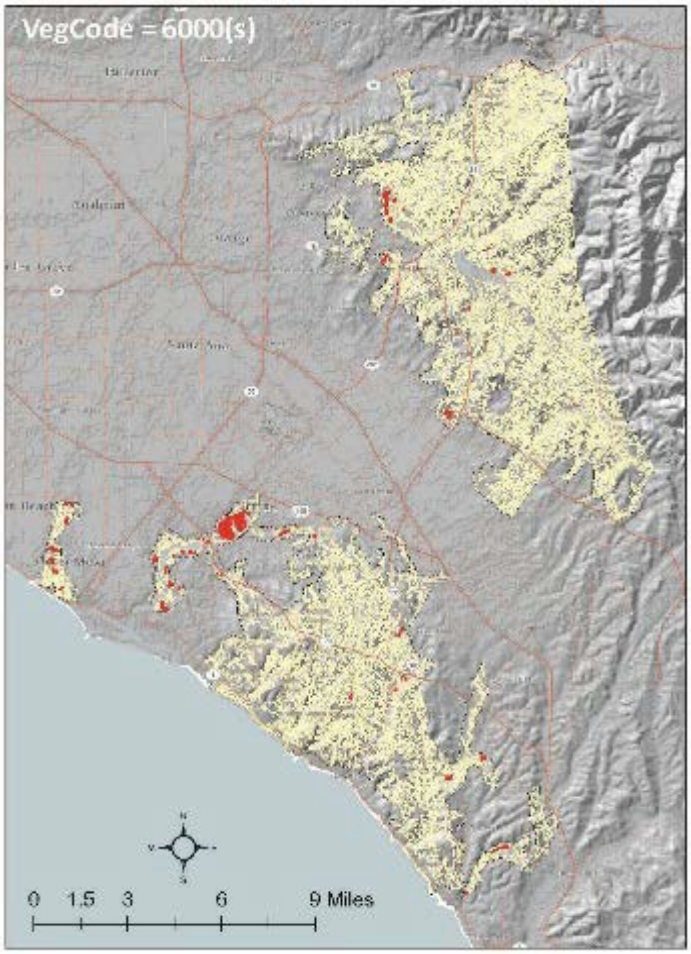
The *Baccharis pilularis* Alliance was mapped where it dominated the shrub layer, generally in open grassy settings. Several stands were mapped where *B. pilularis* co-dominated with *Artemisia californica;* in these settings, cover was generally higher. The type is widespread in the southern section of the mapping area, especially on level to nearly level sites in the Aliso Creek floodplain.

PHOTO INTERPRETATION SIGNATURE:

Baccharis pilularis has a dark green color, occasionally with a brownish hue. Crown margins are more definitive than *B. salicifolia*, and are frequently an emergent to annual grasses, which enable distinct recognition of the shrub layer. *B. pilularis* can be difficult to distinguish from the drier riparian margins containing *B. salicifolia* and *Salix lasiolepis* when the two types are adjacent to one another.

6000 Temperate & Boreal Freshwater Marsh Formation Types

The distribution map shows the range of the nine alliances and more generalized groups mapped in the study. The photo to the left depicts a common interface between species of *Schoenoplectus* (bulrush) and *Typha* (cattail marsh).



6000 – Temperate & Boreal Freshwater Marsh Formation
35 polygons were mapped to the formation level category totaling 45 acres. It was mapped where photo interpreters could not determine herbaceous vegetation to finer levels in the classification, even to the point where the emergent vegetation was marsh like (containing *Typha* spp. or *Schoenoplectus* spp.) or meadow trending with obligate wetland grasses. Several polygons were mapped in the Fairview Park Restoration Project (vernal pools) just west of Placentia Avenue.

6001 – Meadow (*Carex* – *Juncus* – *Eleocharis*) Mapping Unit (Sedge – Rush – Spikerush)
Only 6 polygons were mapped in the study area totaling slightly over three acres. Signature and biogeographical correlations are not developed for these types due to their rarity in the mapping area. Three of the mapped polygons occur west of Santiago Canyon Road in an area noted on the USGS topo map as “The Sinks” and are depicted as water features on the topo map. Accuracy assessment did not include polygons of this type.

6100 – Arid West Freshwater Emergent Marsh Group
77 polygons were mapped totaling slightly more than 104 acres. In most cases, alliance level mapping within this group proved too problematic. Alliance-level mapping of freshwater marsh types often does not yield consistent signatures or biogeographical trends that aid the photo interpreter in mapping at an acceptable accuracy. Mapping to the alliance level within this group was only done where ground-based information through past or present AA or field reconnaissance was present.

6101 – Fresh Water Marsh (bulrush – cattail) Mapping Unit

12 polygons totaling slightly over 13 acres were mapped to this “back-off” category mapping unit when photo interpreters could distinguish that the marsh vegetation was either a species of *Schoenoplectus* or *Typha*. Often, both genera were represented in the stand but it was difficult to ascertain dominance. The stand depicted to the left is an example of the lighter toned *Typha* spp. co-dominating with the darker *Schoenoplectus* spp.

6110 – *Schoenoplectus acutus* Association (Hardstem Bulrush)
3 polygons totaling slightly over 8 acres were mapped to this alliance based on field data. The stand was mapped adjacent to small lakes and reservoirs at inland areas of the study. Polygons were mapped in Laguna Canyon and along the Siphon, and Sulphur Creek Reservoirs. Most stands contained small components of *Typha* spp.

6120 – *Typha (angustifolia, domingensis, latifolia)* Alliance (Cattail)
8 polygons were mapped totaling approximately 13 acres at the mouth of small canyons mainly west of Upper Newport Bay, along the duck ponds at the U.C. Irvine managed wetlands site (San Joaquin Wildlife Sanctuary), and in the San Juan Canyon area. Most stands contained small inclusions of *Schoenoplectus* spp.

6130 – *Schoenoplectus californicus* Association (California Bulrush)
7 polygons were mapped totaling just over 5 acres of marshland located primarily along the fringes of Upper Newport Bay and along the duck ponds and northern portions of the U.C. Irvine managed wetlands site. Stands surrounding the duck ponds were extremely narrow, often below 7 meters in width. Broader stands along the perimeters of the site were larger, often containing small patches of *Typha* spp. forming a matrix within the stand.

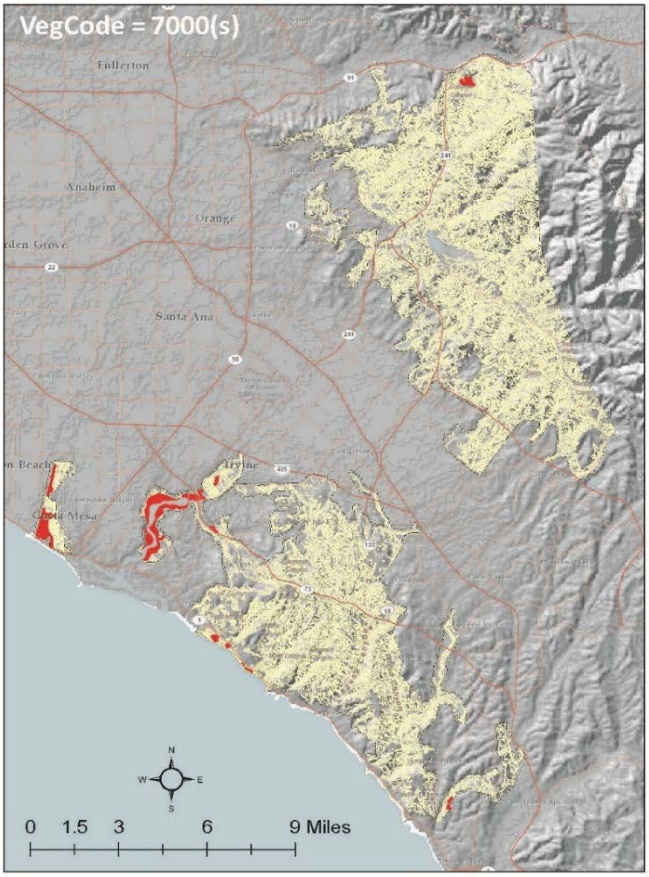
6140 – *Scirpus robustus* Alliance (Big Bulrush)
2 sinuous polygons were mapped along the roadside margins bordering a dozen or so duck ponds of the U.C. Irvine site. The area is frequently mowed late in the growing cycle. The mapped polygons include the road proper.

6310 – *Lepidium latifolium* Semi-Natural Stands (Perennial Pepperweed)
5 polygons were mapped totaling 8 acres below the Costa Mesa Bluffs west of the Santa Ana River. Stands are located on disturbed weedy sites.

7000 Temperate & Boreal Salt Marsh Formation Types

***Note** – Original linework was extracted from a study done in April of 2012 for the Upper Newport Bay Ecosystem Post-Restoration Monitoring Program done by Merkel & Associates, Inc. The linework was modified slightly to conform to the 2012 NAIP imagery, and in areas where vegetation breaks between the salt marsh types were noted. The data was updated in 2022 using the March 2021 version of the Merkel & Associates data and the 2022 base imagery.

The distribution map shows the range of the seven alliances and more generalized groups mapped in the study. The photo at left depicts a common interface between the *Sarcocornia pacifica* Alliance (higher range tidal portions of the marsh) and the *Spartina foliosa* Alliance (lower range tidal portions by the open water).



7100 – Temperate Pacific Tidal Salt & Brackish Marsh Group
108 polygons were mapped totaling 317 acres. In most cases, alliance level mapping within this group was insufficiently sampled or proved too problematic. Alliance-level mapping of saltmarsh types often does not yield consistent signatures or biogeographical trends that aid the photo interpreter in mapping at an acceptable accuracy. With the exception of the *Spartina foliosa* Alliance, mapping to the alliance level within this group was only done where ground-based evaluations were present in the stand.

Saltmarsh communities often form an extremely fine matrix between alliances making accurate delineations highly ambiguous for this effort. A typical example of this vegetation complexing is visible on the ground photo above; in this case, a very fine matrix of *Sarcocornia pacifica* and *Spartina foliosa,* forms patches of saltmarsh types below 1/10 of an acre in size. Other alliances within this group may form patches consistently too small to reliably photo interpret with even finer sub-meter imagery. These included *Frankenia salina,* and *Distichlis spicata*, both of which often may be adjacent to larger areas forming the *Sarcocornia pacifica* Alliance.

7110 – *Sarcocornia pacifica (Salicornia depressa)* Alliance (Pickleweed)
10 polygons totaling approximately 36 acres were mapped to this alliance, occurring in two regions of the study. Most of the stands defining this type were mapped in the Upper Newport Bay totaling almost 32 acres. The remaining areas occur in the restoration effort adjacent to the mouth of the Santa Ana River. This alliance was mapped where *S. pacifica* dominated or co-dominated the stand. Included in this alliance are related species such as *Batis maritima, Suaeda* spp*.,* and *Jaumea carnosa,* all of which may at times locally dominate the stand. Common associate species that occurred within the mapped polygons also include *Frankenia salina* and *Distichlis spicata.*

7120 – *Spartina foliosa* Alliance (California Cordgrass)
83 polygons totaling slightly over 89 acres rim the tidal mudflats and open channels on the Upper Newport Bay and the Banning Ranch oil field just west of the Santa Ana River mouth. The alliance was mapped where *Spartina foliosa* dominated the stand or co-dominate the stand with an understory of *S. pacifica.* This type was adequately sampled and accuracy was acceptable in 2012 to the point of retaining these polygons to the alliance level in the classification.

7130 – *Bolboschoenus maritimus* Alliance (Salt Marsh Bulrush)
3 polygons totaling slightly less than 1 acre form extremely small patches along the margins of the Upper Newport Bay saltmarsh. Mapped stands are sometimes less than 5 meters in width. Most stands line the road along the east side of the bay. Mapped

stands are often monotypic and are overwhelmingly dominated by *B. maritimus.* Several stands are immediately adjacent to less brackish marsh types such as *Typha* spp and *Schoenoplectus* spp. Boundaries of this type to the *Sarcocornia pacifica* Alliance are quite distinct.

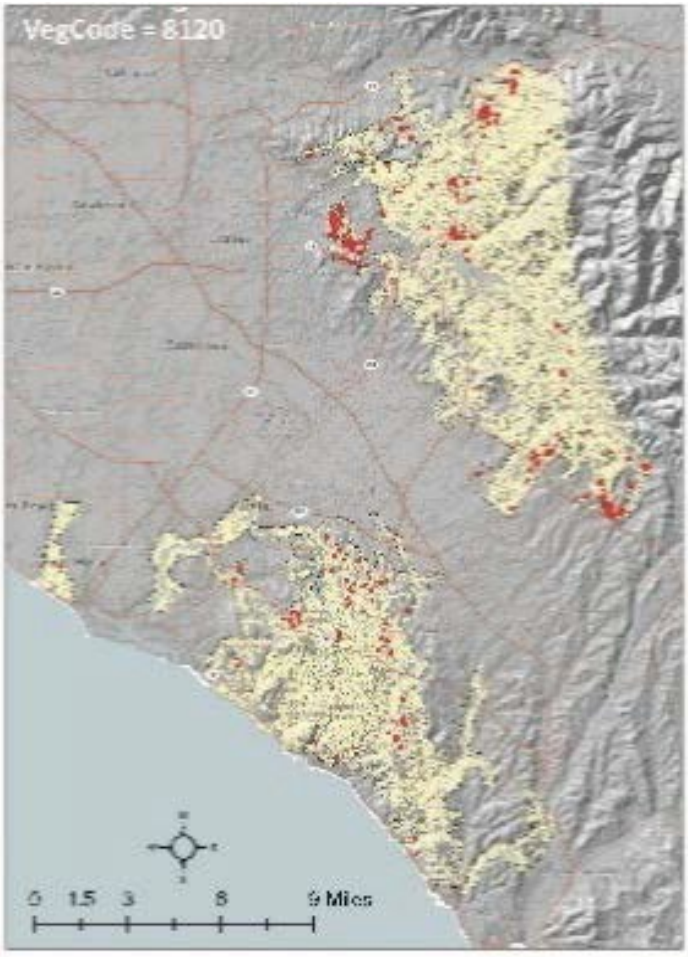
7140 – *Distichlis spicata* Alliance (Salt Grass)
Only one polygon was mapped from field data. totaling a fraction of an acre. Most *D. spicata* patches, which could possibly be defined to this alliance, may occur within the *S. pacifica* Alliance and could not reliably be pulled out with existing imagery.

7200 – Southwest North American Salt Basin & High Marsh Group
Stands mapped to this level of the classification (32 polygons) were dominated by an *Atriplex* shrub. It was not possible to separate out *Atriplex lentiformis* and other species identified on the bluffs adjacent to the Upper Newport Bay such as *A. semibaccata* or *A. lentiformis* ssp. *breweri. Atriplex* spp. was also found at the Gypsum Canyon landfill site.

7210 – *Atriplex lentiformis* Alliance (Quailbush)
8 polygons mapped totaling slightly 32 acres were mapped to this type along the base of coastal bluffs and adjacent terraces from mouth of the Santa Ana River at Talbert Regional Park and the Banning Ranch oil field, southeast along the coast to Reef Point. Stands mapped on the bluffs to this type are monotypic, strongly dominated by *Atriplex lentiformis,* while stands on the terrace tend to have a variety of coastal bluff scrub species as a minor component to the stand.

8120 *Opuntia littoralis* Alliance (Coast Prickly Pear)

The example above depicts a stand of *Opuntia littoralis* dominating (or possibly strongly co-dominating) with *Eriogonum fasciculatum* on a steep south facing slope above Weir Canyon near the Villa Park Dam spillway.



8120 *Opuntia littoralis* Alliance (Coast Prickly Pear)

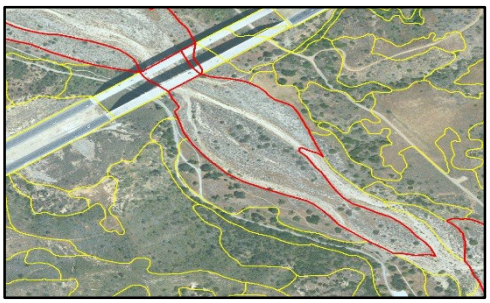
DESCRIPTION:

Stands assigned to the *Opuntia littoralis* Alliance were mapped on steep, exposed slopes, generally trending southerly. This alliance was mapped when *Opuntia littoralis* dominated or co-dominated the stand with *Eriogonum fasciculatum* and/or *Artemisia californica.* Stands containing sub-dominant *Opuntia* with coastal scrub species were usually mapped to the appropriate coastal scrub alliance. The above settings (where several coastal scrub species co-dominated with *Opuntia*) were common on xeric slopes throughout the study area. *Opuntia littoralis* was mapped on occasion in open grassland settings where it was a strong dominant or sole component to the stand. Some stands contained a sparse emergent of *Sambucus nigra*, generally below 5% cover. A separate effort identifying *Opuntia littoralis* and other species of cactus generated by The Nature Conservancy and NROC from 2006 – 2011 (provided for the 2012 mapping effort) identifies more polygons but were not mapped to the descriptions and key defined in 2012 project. Many of the polygons defined in this study had too high of a coastal scrub component and were assigned in most cases to either the *Eriogonum fasciculatum* or the *Artemisia californica* – *Eriogonum fasciculatum* Alliances.

PHOTO INTERPRETATION SIGNATURE:

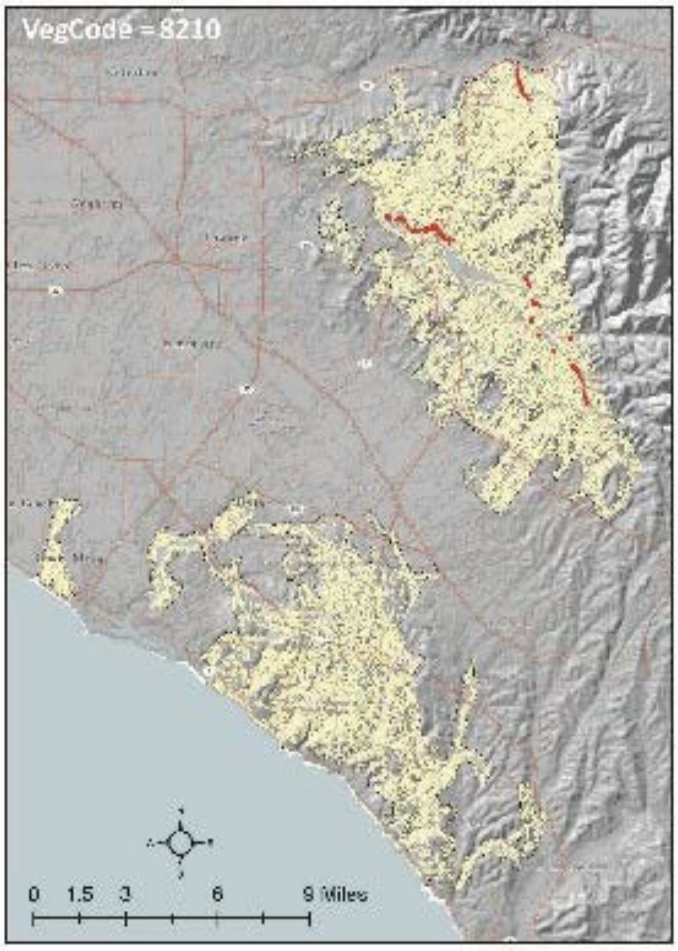
Opuntia littoralis has a very light green signature that forms a mottled pattern with light colored substrate and the dark brown *Eriogonum fasciculatum.* Stands that were under 1 acre in size and where the cactus was not a strong dominant in fairly high cover were difficult to identify using only the NAIP imagery. Supplemental Google Earth imagery aided in determining the relative cover of *Opuntia* and coastal scrub.

8210 *Lepidospartum squamatum* Alliance (Scale Broom)



A

The example above depicts a stand of *Lepidospartum squamatum* in sparse cover with a small component of *Baccharis salicifolia* and *Bebbia juncea.* The stand is located along a sandy portion of the Santiago Creek just below the Santiago Reservoir.



8210 *Lepidospartum squamatum* Alliance (Scale Broom)

DESCRIPTION:

Stands assigned to the *Lepidospartum squamatum* Alliance were mapped on well drained, sandy to gravelly substrate in seasonal to temporarily flooded washes in cover ranging from as little as 2-5%. The alliance was mapped where *L. squamatum* was present in the defined polygon (sometimes just a few individuals) to where it co-dominated with other shrubs including *Baccharis salicifolia, Eriogonum fasciculatum, Bebbia juncea* and/or *Brickellia incana. *Note – In the 2012 mapping effort, the identification of several stands was accomplished from the funding through the USDA Forest Service, Pacific Southwest Region Native Plant Materials Program and the Riverside-Corona RCD; in partnership with the CNPS vegetation program, Riverside Fire Lab, & the Riverside-Corona RCD for data collection.*

PHOTO INTERPRETATION SIGNATURE:

The key in identifying this alliance is recognizing the photo signature of the landform and substrate that characterize this species' modal habitat. In the mapping area, shrub cover is too sparse to ascertain a reliable photo signature of the actual vegetation. The substrate in temporarily flooded washes is highly reflective. In seasonally flooded systems, *L. squamatum* is often located adjacent to the active wash. In these settings, vegetative cover is usually higher, (often with some annual grasses in the understory) and the substrate reflectance is lower.

Generalized Vegetation types and types with a limited presence in the Mapping Area

1110 – *Juglans californica* Alliance (California Walnut)

2 Polygons (~15 acres) on disturbed sites with an exotic component were mapped off of Camino Grande in Anaheim. Stands increase to the north of the Santa Ana River in the Chino and Puente Hills.

1200 – California Evergreen Coniferous Forest & Woodland Group

2 polygons (less than 1 acre total) were mapped containing planted pine in the Talbert Regional Park restoration site along the Santa Ana River.

1410 – *Pseudotsuga macrocarpa* Alliance (Bigcone Douglas Fir)

2 polygons (~5 acres) were mapped in steep canyons in the northeastern portion of the mapping area in the upper portions of Gypsum and Coal canyon near the 1800' level.

1610 – *Alnus rhombifolia* Alliance (White Alder)

4 polygons (~22 acres) were mapped along Santiago Creek just above the Santiago Reservoir. Mapped stands have a component of *Salix gooddingii* and *S. lasiolepis.*

1700 – Southwest North American Riparian Woodland Group

28 polygons totaling approximately 101 acres are assigned to this riparian group category for reasons that make it difficult for photo interpreters to map to an alliance level:

- Stands are young, generally in sapling stature, making it difficult to establish a reliable photo signature.
- Stands are heavily influenced by disturbance, making the vegetation cover very low (often below 15%). This low cover makes it difficult to ascertain a reliable stand-based photo signature.
- Stands have a high component of non-native vegetation (palms, *Eucalyptus,* etc.) which affect the photo signature of the native component.

1740 – *Populus fremontii* Alliance (Fremont Cottonwood)

11 polygons mapped totaling 29 acres were mapped where *Populus fremontii* dominated or co-dominated the stand with *Salix laevigata* and/or *S. gooddingii.* Other stands mapped to a tree willow alliance often had small components of *P. fremontii*.

1800 – Southwest North American Riparian/Wash Scrub Group

24 polygons totaling approximately 21 acres are assigned to this "thicket" type group for similar reasons as stated for type 1700. Stands often contain young sapling tree species (without an emergent tree-stature component) and often mix with *Baccharis salicifolia.*

2000 – California Chaparral Macrogroup
1 polygon (~4 acres) mapped adjacent to an excavation site in Baker Canyon – difficult to distinguish between the various chaparral species at the site.

2100 – California Xeric Chaparral Group
15 polygons totaling approximately 72 acres were mapped in the higher elevations of the study along the eastern fringes of the study area in the Santa Ana Mountains. A portion of the total acreage mapped to this category were in areas where regenerating cypress is a component to a dense chaparral layer. The polygons are noted in the comments field and assigned a cover class value of 2-9% in the conifer field. Other stands noted to this level in the hierarchy were difficult to classify to the alliance level for reasons of disturbance from fire, unusual species composition or overall low shrub cover.

2200 – California Maritime Chaparral Group
7 polygons (~44 acres) were mapped in the southernmost portion of the study area near the vicinity of Niguel Hill in South Laguna. These stands were never verified during the mapping or accuracy assessment phase of the study. Some may contain components of *Adenostoma fasciculatum, Ceanothus megacarpus* with components of coastal scrub species.

2300 – California Mesic Chaparral Group
8 polygons totaling 35 acres were mapped where it was not possible to estimate mixed cover of species including *Heteromeles arbutifolia, Fraxinus dipetala, Quercus berberidifolia, Ceanothus tomentosus* and in steeper areas, *Cercocarpus montanus.*

2320 – *Cercocarpus montanus* Alliance (Birchleaf Mountain Mahogany)
2 polygons (26 acres) were mapped on steep terrain just below the Claymont Clay Mine off a small tributary of Coal Canyon. The polygons were not verified by accuracy assessment, nor were they visited during the mapping phase of the project.

3100 – Central & South Coastal Californian CSS Group
This is by far the most commonly mapped group-level category in the vegetation mapping effort, with 162 polygons mapped totaling approximately 777 acres throughout the study region. This category is frequently referred to as “coastal sage scrub” but more often than not in the mapping area will contain a minimal component of *Salvia* spp*.* Common mixes do sometimes include either *Salvia mellifera*, *S. apiana,* or *S. leucophylla,* along with *Artemisia californica* and/or *Eriogonum fasciculatum*. Most stands include varying amounts of drought deciduous species that cannot for one or more reasons be accurately estimated and identified to an alliance level in the hierarchy. The most common reason for unreliable alliance-level determinations is the stands short length of recovery time after fire. Stands affected by recent burn often

contain components of seral scrub such as *Acmispon glaber* and/or *Malacothamnus fasciculatus* making an alliance level determination even more difficult.

3160 – *Eriogonum fasciculatum* – *Salvia apiana* Alliance (California Buckwheat – White Sage)

Only 4 polygon mapped totaling almost 9 acres based on ground-based reconnaissance or accuracy assessment. This alliance may occur more frequently. Photo interpreters assigned polygons to either of the single-species alliance. It was not possible to accurately estimate the relative cover of these two species in order to confidently map to this mixed-species alliance.

3170 – *Keckiella antirrhinoides* Alliance (Bush Penstemon)

6 polygons totaling approximately 16 acres were mapped to this alliance. Field data justified most of the stands, all of which occurred on steep mid to lower slopes; mostly in the Black Star Canyon watershed and above Santiago Creek. This type possibly is under-mapped due to its topographical setting (steep northerly settings often in poor image quality zones).

3300 – Central & South Coastal Californian Seral Scrub Group

19 polygons totaling approximately 145 acres were mapped primarily in post burn environments in the northern section of the study area in areas that were burned in 2017 or 2020. They often contain varying amounts of species from this group (*Acmispon glaber, Malacothamnus fasciculatus)* with components of species from the CSS group (3100). The above mixes are mapped to the group level when it is not possible to ascertain relative cover of the stands' diagnostic and co-dominant species.

3310 – *Ericameria palmeri* Alliance (Palmer's Goldenbush)

22 polygons totaling approximately 46 acres are mapped to this type, primarily in low cover adjacent to and in small openings in coast live oak stands. Numerous stands contained components of *Stipa pulchra* in the stand based on surveys done by the Irvine Ranch Conservancy. Stands identified to this alliance have *E. palmeri* dominating the low shrub layer; generally, in cover below 15%; with a dense herbaceous layer nearly the same height.

3330 – *Isocoma menziesii* Alliance (Menzie's Golden Bush)

12 polygons totaling approximately 32 acres were mapped in disturbance settings mainly in the southern portion of the study area. Several polygons were noted as part of vegetation restoration sites, which were observed during the mapping phase of the project. The alliance was mapped where *Isocoma menziesii* dominated the shrub layer, often with a component of *Baccharis pilularis.* Annual grasses were generally a dense component to the vegetation.

4100 – California Perennial Grassland Group
7 polygons totaling slightly under 42 acres were mapped where field reconnaissance noted the presence of native grasslands from a distance but not to a species level. All polygons viewed had a high component of non-native annual grasses.

4110 – *Leymus condensatus* Alliance (Giant Wild Rye)
Although occasionally noted as a component to mesic stands of *Artemisia californica,* stands where this tall grass dominated the vegetation with less than 5% shrub cover were mapped on only three occasions totaling just under 3.5 acres.

4260 – ***Cortaderia (jubata, selloana)* Semi-Natural Stands (Pampas Grass)**
9 polygons were identified in the mapping area, mainly around the restoration sites adjacent to the Santa Ana River (Banning Ranch oil field), totaling approximately 15 acres. Stands were strongly dominated with this grass, generally in very small but dense patches. Other patches were noted within several hundred meters from the coast but were well under ¼ acre in size.

5410 – *Carpobrotus edulis* or other Ice Plants Semi-Natural Stands (Ice Plant)
9 polygons mapped totaling approximately 16 acres were mapped along the steep bluffs that form the southwest edge of the city of Costa Mesa (Banning Ranch oil field). Mapped stands were strongly dominated by ice plant in dense cover.

8100 – Coastal Baja California Norte Maritime Succulent Scrub Group
9 polygons were mapped to this sparsely vegetated group level category (totaling approximately 25 acres). The category is used to denote the coastal bluffs adjacent to the mean high tide and above portions of the Upper Newport Bay. Vegetation along portions of the bluffs may exceed 5% over small areas; however, cover is never high enough to reliably assign vegetation to an alliance level floristic call. Common associate species noted along the bluffs include *Encelia californica, Lycium californicum, Eriogonum fasciculatum* and *Carpobrotus* spp.

Miscellaneous Classes not defined by the Manual of California Vegetation (MCV2)

9100 – Introduced Trees, Shrubs (not in hierarchy)

Mapped where exotic trees (other than *Eucalyptus* spp.*)* and/or shrubs dominate the canopy, approximately 555 acres total. Native planted species can be a component to the canopy, especially *Quercus agrifolia* and *Platanus racemosa.* Mapped throughout the study area but most frequently adjacent to or near urban areas and regional parks. Some stands of this category are correlated to the Land Use Field code 1000 = Urban/Built-up or 1800 = Special Linkage Areas.

9200 – Agriculture

Based on the 2022 NAIP imagery, there are approximately 618 acres under agricultural use within the mapping area. These include areas planted with orchard crops (citrus & avocado) that were producing at the time of the imagery or possibly in transition (new plants or in the process of abandonment). Also included in this category are vineyards, field, vegetable and fruit crops and recently fallow fields that have been in use within the past 5 years. The Agriculture class is correlated to the Land Use field code value of 2000 = Agriculture.

9300 – Urban/Disturbed

Approximately 15,678 acres (just over 18% of the total study area) are mapped to this category as urban regions that are built up along with their adjacent surfaced areas directly associated with the built-up portions of the parcel. Generally included in this category also are the unsurfaced landscaped areas associated with the mapped urban polygon. Areas of exotic vegetation within the large urban window are not separated out from the urban polygon unless they form an extensive fringe with the adjacent open space. The Urban/Disturbed class is correlated to the Land Use field code values of 1000 = Urban/Built-up or 1800 = Special Linkage Areas.

9320 – Fuel Mod Zones

316 polygons totaling approximately 1257 acres were mapped. This is a special category that is mapped along the fringes of urban areas and is designed as a buffer to natural vegetation. The buffer serves as a fire protection zone to the adjacent urban development. Generally, vegetative cover is below 10%, but often varies depending on vegetation removal intervals. At times, some natural vegetation may colonize these zones; more frequently, the areas contain patches of exotic vegetation including pines, *Eucalyptus,* and *Acacia.*

9330 – Anthropogenic Area of Little or No Vegetation

The study area contains approximately 416 acres of this category. Polygons mapped to this type contain no built-up land; however, the surface has been scraped or otherwise

denuded of most of the natural vegetation. Vegetation generally falls below 10% overall cover.

9340 – Vegetation Restoration Zones

Vegetation restoration zones total approximately 722 acres throughout the mapping area in widely ranging sizes and species composition. This type is mapped when efforts of restoring natural landscape has occurred, or is in the process of occurring. Restoration efforts include the colonization of coastal scrub types, chaparral habitats and riparian vegetation. The example in this picture includes restoration of several coastal scrub species, elderberry and red willow. Vegetation is mapped to this category because the actual sites rarely form defined alliances, but often contain a high variety of species composition within small areas that are difficult to classify.

9400 – Sparsely Vegetated to Non-vegetated

6 polygons (~6 acres) were mapped to this higher-level category since they do not fit well into a finer level of the classification.

9411 – Rocky Shore

The Rocky Shore type was mapped from the closest interpretation of the mean high-water line (generally the seaward margin of the coastal bluff vegetation as viewed on the NAIP imagery) out to a buffer distance of approximately 60 meters. This category is not to be used as accurate representations of high and low tidal zones, but are denoted to designate rocky shore substrate for habitat value only. 15 polygons were mapped to this category. Acreage counts are not given in this report due to the approximation of high and low tide determinations.

9412 – Beach Sands

The Beach Sand was mapped from the closest interpretation of the mean high-water line (generally the seaward margin of the coastal bluff vegetation as viewed on the NAIP imagery) out to a buffer distance of approximately 60 meters. This category is not to be used as accurate representations of high and low tidal zones, but are denoted to designate sandy beach substrate for habitat value only. 12 polygons were mapped to this category. Acreage counts are not given in this report due to the approximation of high and low tide determinations.

9420 – Cliff, Bluffs, Scree, and Rock Outcroppings
206 polygons were mapped to this category totaling nearly 287 acres across both the northern and southern subregions of the study area, some below 1 acre in size. These were deemed important by ecologists as habitat nesting sites for raptors. These sparsely vegetated areas are mapped when vegetative cover generally falls below 8-10%.

9430 – Riverine & Lacustrine
Only 3 polygons totaling approximately 4 acres were mapped in areas that form small areas of open water where the stream channel empties into the Pacific Ocean. They include a small area near Crystal Cove, an area just to the south at the mouth of Muddy Canyon and at the mouth of Aliso Creek. This category is reserved for perennial water occupying natural stream courses or lakes. Within the mapping area, this occurs only on the three small intertidal areas mentioned above.

9431 – Streambed
Polygons are mapped to this category in settings where intermittent to seasonally flooded stream channels contain less than 10% vegetative cover. These streambeds are naturally pervious and contain all or portions of their adjacent floodplain. They encompass 139 acres, over half of which are assigned to Santiago Creek in the northern portion of the study. Not included in this study are the concrete lined channels of the Santa Ana River along the northern and western margins of the study area in addition to other contained channels within the study.

9440 – Tidal Mudflat
8 polygons totaling approximately 153 acres were mapped within the Upper Newport Bay, generally on the lower tidal margins of the adjacent saltmarsh. The boundaries mapped were based on the units of the 2021 Habitat Map produced for the Post-Restoration Monitoring Program by Merkel & Associates, Inc. and integrated into the existing classification system. The original units were modified slightly to conform to the existing margins of the salt marsh as depicted on the 2022 NAIP imagery.

9450 – Salt Panne
37 very small polygons totaling only just above 8 acres of land have been assigned to this sparsely to unvegetated category; mainly in the Upper Newport Bay and the nearby mouth of the Santa Ana River (Banning Ranch oil field). Most of these features are probably above the mean high tide and nearly all are surrounded by stands of *Sarcocornia pacifica.* Vegetative cover is below 10% and often below 1%. *Distichlis spicata* was noted during the 2012 reconnaissance as a sparse component, increasing along the fringes of the panne.

9460 – Recently Burned Areas – Undetermined Vegetation Type
This class represents burned and recovering vegetation typically within 2 years of a fire for which the vegetation type cannot be photo interpreted with confidence. Vegetation may be totally obliterated, or have regrowth from seeds and/or regeneration from basal roots or branches, however, the species and/or composition of the stand components are difficult to determine in order to assign an alliance type. In some cases, the original vegetation species may eventually grow back at different rates depending on moisture availability in a given year, the seed bank, or other conditions. In other cases, seral post-fire herb and shrub species may begin to grow right after the fire and remain for a variable number of years. Some shrub species present before the fire may have died and not recover from seed and grow to significant cover for many years.

9800 – Water Body (Land Use Code Field 9800)
127 polygons totaling approximately 741 acres were mapped including all water features not defined to a more refined category in the mapping area. Out of this total, approximately 521 acres were temporarily to permanently flooded water features while the remaining 220 acres were in the Pacific Ocean. Most are tidally influenced, and include the Upper Newport Bay and the Santa Ana River (Talbert Regional Park/Banning Ranch oil field). Also included in this broad category are water bodies which are intermittently or temporarily flooded that were not flooded at the time of the NAIP 2022 Imagery.

9810 – Perennial Stream Channel (Land Use Code Field 9800)
A small portion of the San Diego Creek channel, totaling 28 acres, north of Campus Drive in Irvine was included into this category. It was noted on the 2022 NAIP as being flooded (NAIP was flown in late spring through mid-summer season).

9820 – Reservoirs and other Artificial Water Features (Land Use Code Field 9800)
55 polygons (~872 acres) were mapped to this category and include large reservoirs such as Silverado and San Joaquin Reservoirs, and smaller water features with only a minor earthen dam used to contain the flow of intermittent stream channels. Flooding regimes range from intermittently to permanently flooded. Delineations represent the average high-water line using historic imagery and the USGS Topographic Digital Raster Graphic, and include beach areas. Vegetation could be visible within the Reservoir delineation due to lower water level shown on the 2022 imagery. Note that the 2012 delineation of certain reservoirs may have been modified during the current effort if the mapper was compelled to adjust the interpretation where vegetation was visible on the 2012 imagery.