Vegetation Classification of the Cabrillo National Monument and Point Loma Navy Base San Diego County, California

A report submitted to

National Park Service
Santa Monica Mountains National Recreation Area
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INTRODUCTION

The U.S. Geological Survey (USGS) and National Park Service (NPS) formed a partnership in 1994 to map the vegetation of United States National Park system units using The Nature Conservancy's National Vegetation Classification, now supported by NatureServe, a standard for reporting vegetation information among federal agencies (Grossman et al. 1998, Jennings et al 2009). Goals of the projects include providing baseline ecological information to resource managers in the parks; putting the data into regional and national contexts; and providing opportunities for future inventory, monitoring, and research activities. Each park developing a vegetation map follows a standardized field sampling and vegetation classification protocol to document the various vegetation types found in that park. This information is used by photo-interpreters to delineate polygons of vegetation communities, which are subsequently subjected to an accuracy assessment process (Stadelmann et al. 1994). The final products consist of a vegetation map, descriptions of each vegetation type, a key to each type, and all related data and metadata files (original field forms, plot database, accuracy assessment points, and other supporting data). This report presents the work at Cabrillo National Monument and the adjacent Point Loma Naval Base conducted from May 2007 to December 2010 to develop the vegetation classification system for the area.

Point Loma in Context

The 400-foot-high, flat-topped raised bluffs of the Point Loma peninsula lie to the northwest of the narrow entrance to San Diego Bay, one of the best natural harbors along the Pacific Coast of North America (Fig. 1). To the southeast of Point Loma is the flat delta of the San Diego River, where the airport is built and where the river used to flow into the bay. Along with the Coronado Peninsula, Point Loma separates San Diego Bay from the Pacific Ocean. The area is collectively known as the Point Loma Ecological Conservation Area (PLECA). The size of the entire study area is 1512.8 acres,

General History of Point Loma

The human history of Point Loma began thousands of years ago when Native Americans inhabited the area. Archeological sites have been dated to as far back as 7000 years ago. The modern history of Point Loma begins in September 1542, when Juan Rodriguez Cabrillo (a Portuguese navigator in the service of Spain) landed here and explored the surrounding area for 6 days. This event marked the first time that a European expedition had set foot on what later became the West Coast of the United States.

Sebastian Vizcaino, a Spanish trader who operated between Mexico and the Orient, visited the bay in November 1602. He renamed it San Diego in honor of San Diego de Alcala, a Franciscan lay brother.
The Spanish built a fort on Point Loma because the peninsula guarded the only access to the Bay. Completed in 1797, it was named Fort Guijarros (Spanish for

"cobblestones") because the point was covered with smooth stones from the late Cretaceous conglomerate rocks exposed at the base of the Point. In later years, English-speaking sailors used these stones as ballast for their sailing vessels - thus the name "Ballast Point." Both Fort Guijarros and Ballast Point are California historical landmarks.

In February 1852 President Fillmore set aside the southern portion of Point Loma (about 1400 acres) for military purposes. Subsequently, it was assigned to the U.S. Army and named Fort Rosecrans, after General Rosecrans, an 1842 graduate of the U.S. Military Academy. In 1898 the Army built a coast artillery installation on the site which remained active until 1945.

Naval Base Point Loma - San Diego, CA
(http://themilitaryzone.com/bases/naval_base_point_loma.html**)**
In 1959 Fort Rosecrans was turned over to the U.S. Navy. The Navy Submarine Support Facility was established in November 1963 on 280 acres of the land. On October 1, 1981 the base was designated as a Naval Submarine Base.

Starting in April 1995, several commands were decommissioned or their homeports changed to meet the down-sizing requirements of the Navy. The six naval installations on Point Loma were consolidated as Naval Base Point Loma on October 1, 1998.

Cabrillo National Monument

Located at the southern tip of the Point Loma Peninsula, Cabrillo National Monument commemorates the landing of Juan Rodríguez Cabrillo at San Diego Bay on September 28, 1542. On October 14, 1913, by presidential proclamation, Woodrow Wilson reserved 0.5 acres of Fort Rosecrans to construct a statue of Juan Rodriguez Cabrillo. By 1926 no statue had been placed, so then President Calvin Coolidge authorized the Native Sons of the Golden West to erect a suitable monument. The statue of Cabrillo was created by sculptor Alvaro de Bree for the Portuguese Government in 1939, who then donated it to the United States. The National Monument was enlarged significantly by Presidents Eisenhower and Ford to its current size of approximately 160 acres.

The area encompassed by the National Monument includes various former military installations, such as coastal artillery batteries, built to protect the harbor of San Diego in World War II. At the highest point of the park (129 meters or 422 feet above sea level) stands the Old Point Loma Lighthouse, a San Diego landmark since 1854. The lighthouse was closed in 1891, because fog and low clouds often obscured the light at this location, and a new one opened at a lower elevation closer to the extreme southwestern tip of the Point.

Landscape and Geologic History of Point Loma

At the time Cabrillo National Monument was established in the 1930's, the surrounding city of San Diego had a population of approximately 150,000, about ten times smaller than it is presently.   In the ensuing 75 years the surrounding landscape of coastal terraces and bluffs have been largely modified and developed. Today the small 1500 acre area consisting of Cabrillo National Monument and Point Loma Naval Base represents a relatively unspoiled island of what once was a much more extensive strip of coastal vegetation in San Diego County stretching from Baja California Norte north toward the cliffs of Laguna Niguel and central Orange County.

Geologic History (http://aese2006.geology-guy.com/sd_geology_marshall.htm**)**

Figure 1. Physiographic drawing of the San Diego area, looking toward the northeast. Point Loma (see arrow) is located at the lower right of the figure (Hertlein and Grant, 1944).

Almost all the rocks exposed on Pt. Loma are marine clastic rocks, including conglomerates, sandstones, and mudstones. The Point Loma peninsula is capped for much of its length by one of the same mid-Pleistocene (0.5-1 Ma) terraces visible on the mesas directly east across San Diego Bay.

These hard Pleistocene sediments of the Linda Vista Formation were deposited on top of Plio-Pleistocene sandstones (about 2 Ma) known as the Torrey Sandstone. The brownish-orange sandstone of the Linda Vista Formation is considerably harder than the underlying light colored Torrey Sandstone. This is because the Linda Vista Formation contains an abundance of iron oxide causing it to be well-cemented. The iron oxide accounts for the distinctive orange-brown color of this formation and forms small pebble-like concretions, which are abundant on outcrops on the tops of the Point Loma bluffs. The presence of this hard, well-indurated sandstone above the softer sediments accounts for the distinctive flat mesas with eroding “badland” landforms along the coast from Del Mar to Mission Valley and Point Loma. Several rare plants and plant associations such as the *Adenostoma fasciculatum* Southern Maritime Association are largely restricted to these settings. On the steep cliffs of Pt. Loma, especially at its southern tip, is a thick section of late Cretaceous (about 75 Ma) conglomerates and mudstones beneath the terrace deposits.

There are several active faults in the vicinity. San Diego Bay is the result of slip on some of them. San Diego Bay is the surface expression of a north-south-trending, graben. The graben is bounded on its east side by the strands of the predominantly dip-slip, down-to-the-west, La Nacion fault zone, and on its west side by strands of the down-to-the-east Point Loma fault zone. Oblique slip strands of the Rose Canyon fault zone run up its center. The deepest part of this graben lies at the south end of the Bay. These faults are probably all less than 1 million years old and are a part of the San Andreas Fault System that extends west some 200 km from the San Andreas fault zone into the continental borderland of this part of south coastal California

Climate

Point Loma has a mild warm temperate climate. It rarely receives frost even in the coolest months of January and February, but commonly is bathed in cool summer maritime fogs from May through September. Rainfall is relatively low, averaging about 10 inches per annum, thus the climate is classified as semi-arid Mediterranean, with the majority of rainfall coming in the winter months of December through March.

Ecological Significance of Point Loma Ecological Reserve

Unlike much of the surrounding portions of San Diego County, Point Loma has not experienced fire for many decades. In fact, this area may be unique to south coastal California in not having experienced a major wildland fire in the past 100 years (Cummins 2003). The fact that several specialized fire-following annual plants such as *Papaver californicum* and *Lotus salsuginosus* were found in a seed bank study with viable seeds suggests that their seeds may remain viable for up to a century (Cummins 2003).

The natural landscape of Point Loma has a relatively high concentration of native succulents including cacti and stonecrops that are now uncommon to rare in the southern coastal strip of California. Since at least the mid-1980’s (Holland 1986) the maritime vegetation of Point Loma has been considered representative of some of the best remaining coastal succulent scrub in California, north of Mexico. The high densities of representative Northern Baja species such as *Euphorbia misera, Bergerocactus emoryi, Ferocactus viridescens, Mamillaria dioica, Lycium californicum,* and *Agave shawii* are well known at Point Loma. Other less conspicuous species such as *Amblyopappus pusillus*, and *Piperia cooperi* are also indicative of this extreme south coastal strip of California.

METHODS

NPS Field Crew and Supporting Staff

NPS and DOD Navy cooperated on this project, which provides the first detailed floristically-based vegetation classification system and map of the area.

The field sampling was performed by three NPS employees from the Santa Monica Mountains National Recreation Area (SAMO). Both Cabrillo National Monument (CABR) and the US Navy supplied staff to assist this effort. The SAMO staff consisted of Plant Ecologist John Tiszler, Botanist Tarja Sagar, and Biological Science Technician Anthony Valois. The CABR staff included the Chief of the Natural Resources Management and Science Andrea Compton, Marine Biologist Benjamin Pister, and Biological Science Technician Tracey Mueller-Gibbs. The US Navy staff included Botany Program Manager Kimberly O'Connor, Biologist Bryan Munson, and Botany Intern "CC." Aerial Information Systems (AIS) was contracted to create the GIS polygon layer used to define the vegetation stands. The AIS team included General Manager Debbie Johnson and Senior Photo Interpreter Ed Reyes. Senior Ecologist Todd Keeler-Wolf of the California Department of Fish and Game (CDFG) was also present for one of their early field reconnaissance and provided AIS with a preliminary vegetation classification of the known plant associations and alliances of the area.

John Tiszler had been the overall coordinator of the creation of the very large and complex vegetation map for SAMO, and both Tarja Sagar and Tony Valois had spent a significant amount of time in the field collecting data for the SAMO map. The efficient collection of field data this experienced crew from SAMO could bring to the project was essential because of the early decision to do an exhaustive sampling of the vegetation stands represented by the AIS delineated polygons.

Timeline

An initial meeting in 2007 was conducted May 21-22 at Point Loma by all parties to discuss the scope of work with the NPS I&M coordinator and staff.

The bulk of the field work was done in the Spring of 2008 during six sampling sessions comprising a total of nineteen days in the field. The actual sampling dates were April 1-2, 7-9, 29-30, May 19-22, and June 2-5 and 16-19. The late April trip was done in conjunction with personnel from AIS and the CDFG Ecologist.

Two additional trips by the SAMO staff in 2009 occurred on March 17-18 and April 21-23. These trips were scheduled earlier in the season and focused on collecting additional data about the herbaceous layer which had been difficult to obtain during the seasonal drying-out of the later spring trips in 2008. These trips were also used to re-examine some of the polygons which had been flagged for re-visit during their first assessment or for which questions arose during the preliminary examination of the data performed during the summer 2008.

An additional single-day trip on January 14, 2010 was performed together with the Ecologists Todd Keeler-Wolf and Anne Klein. This trip was used to examine and discuss the vegetation classification in the context of specific stands and types of vegetation.

Overview

The small sample area enabled the field crews to visit or at least view at close range by binoculars nearly all of the natural stands within the designated sampling area. Because of security concerns regarding the US Navy held lands in the sampled area most of those visits were timed to coincide with the availability of the Navy staff. The much smaller holdings of the Coast Guard, the U.S. Department of Veterans Affairs, and the City of San Diego were, as a rule, significantly degraded and little effort was expended to visit or map those areas.

During the first site visit the field crew spent time examining and familiarizing themselves with the CABR landscape and flora and devised a tentative work plan. During this time the existing data for the site, including the low-resolution digital vegetation map created by the Navy was examined and compared to the vegetation seen in the field. Also during this time AIS produced a preliminary digital vegetation map consisting of vegetation delineated as a digital GIS polygon shape layer and a tentative vegetation assessment. This preliminary map was created by photo-interpretation of the existing aerial imagery in conjunction with several other data sets describing the site. The late April trip was principally a field reconnaissance of this preliminary map with the AIS photo-interpretation staff to answer the many questions that arise in the process of vegetation photo-interpretation. After this trip, AIS provided an updated digital map which was subsequently used in the census of the vegetation stands delineated by the map's polygons.

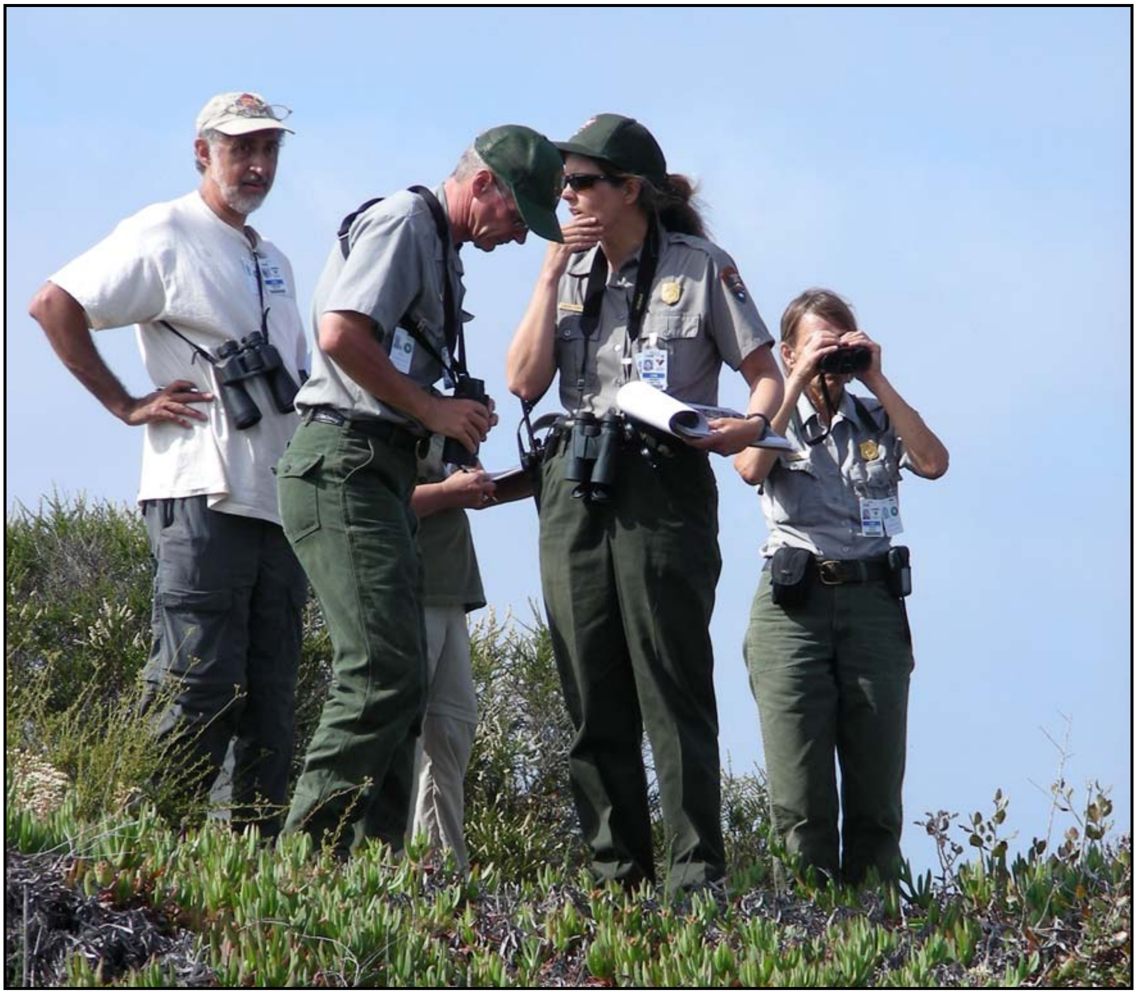

Figure 2. Photo of AIS and NPS crew collecting reconnaissance data during the early mapping phase of the project (left to right Ed Reyes AIS, John Tiszler, Andrea Compton, and Tarija Sagar, NPS).

Typically, if sufficient staff was available, three field teams of two individuals each would be assigned with each led by one of the visiting SAMO staff. The local staff team member provided essential information regarding the site to the visiting SAMO team leader. Usually the local member of the team had at least some experience with the local vegetation and provided a valuable "second opinion" as to the vegetation composition in situations where problematic vegetation was assessed by binoculars. Occasionally the local team member had little plant knowledge and in these cases the vegetation assessment was entirely made by the SAMO team member.

The crews generally worked in widely-separated regions and surveyed all of the polygon stands in an area before moving on. This frequently resulted in a meandering path along a particular landscape feature such as a hillside or a coastal plateau or a ridge top. These regions were often further defined by man-made landmarks such as roadways, buildings, old military installations and other developed areas. The large number of these landmarks meant there was seldom any confusion about the boundaries of any given polygon. Generally if there was any doubt about the vegetation composition the stand was visited and the plants examined at close range. This was done more frequently early on as the field crews were learning to visually identify unfamiliar species by binoculars. A visit to a stand was also necessary in some cases when there was no adequate vantage point from which to remotely observe a stand. In a few instances because of difficult terrain, dense impenetrable old-growth chaparral, or for security reasons, a visit was not practical. In a few of these cases a high powered spotting scope was used to examine the stand from a distance.

In most cases the developed areas had already been identified and labeled as such by AIS and no additional assessment was made (e.g., the lawn and landscaped areas surrounding buildings and the Navy industrial yards.) In cases where it had not been clear from the aerial imagery that a polygon qualified as a developed area, a note describing the situation was made on the master polygon list indicating why no data had been collected. This insured there would be no confusion later as to why a particular polygon lacked quantitative species data (e.g., the nature of the extensive ice plant polygons surrounding the large Veterans Cemetery was not obvious until they were visited and therefore only excluded from assessment at the time of the visit).

Sampling Method

The goal was to perform a Rapid Assessment (RA) of every stand for which the vegetation could be considered a natural type. Initially the field crew used the RA protocol and field form developed during creation of the SAMO vegetation map. This protocol and form was itself a modified version of the standard California Native Plant Society (CNPS) RA/Releve field form and protocol. As the crew became familiar with the vegetation and ecological features of CABR, additional minor modifications were incorporated into a new protocol and RA field form which was then used for the remaining data acquisition. A much briefer observation form was filled out for stands with significant degradation of the natural vegetation. This data included basic plot information and the covers for all significant plants. The field crew generally made a decision at the time of a visit as to which method to apply. In some instances during the assessment of a stand the field crew would modify the polygon shape as it had been defined by AIS to better match the vegetation stand seen on the ground. However, for the most stands the aerial imagery used to create the digital polygons was current and detailed enough that it faithfully represented the vegetation stands on the ground. When sufficient material was available, samples were collected of unknown species for later identification, either by crew members or consulting with major herbaria.

Figure 3. A portion of the collaborative mapping and classification team for the project: From left to right Anthony Valois, Todd Keeler-Wolf, Kimberly O'Connor, Andrea Compton, Debbie Johnson (AIS) , Ed Reyes, and Tarja Sagar.

The vegetation sampling protocol contained only a few basic steps. First, using a set of detailed aerial photographs upon which the GIS polygon layer was superimposed, the field crew identified a specific polygon for assessment. An initial assessment was then made regarding the quality of the stand's vegetation to determine whether to perform a full RA or the Observation. Highly degraded stands and developed areas would have neither an RA nor an Observation made but only a note on the master polygon list verifying or amending the initial assessment made by AIS as recorded in the comment for the stand. Once an assessment format was chosen the appropriate form was filled out for the polygon. In some cases assessments that were begun by binoculars were expanded to include a more detailed walk-through. This was most frequently done when it was determined that the understory was diverse enough to justify the additional effort. The open nature of the coastal sage scrub and moderate slope of the landscape resulted in a large fraction of polygons including a walk-through. Fewer walk-throughs were performed on the denser chaparral types because of both the difficulty of entering the stands and the sparse nature of its understory.

The field forms included basic information about the assessment process and the physical site of the polygon as well as additional comments by the field crew. The most critical data on these forms was the collection of a complete list of plant species and their corresponding ground covers. The covers were recorded for each species as a relative percentage of the entire surface area of the polygon. This means that the listed covers would add up to a value close to 100% for stands completely covered with dense vegetation, but in the typically sparser vegetation found in the sample area the total was frequently significantly less than 100%. These cover values are the principal characteristic of the stand's vegetation used to assign a vegetation type. The two field forms and an example of an aerial photo with the polygon overlay are shown in Appendix A.

Initial Data Entry and Classification Methodology by NPS

After data entry into a CNPS Rapid Assessment database constructed with a MS Windows 2000 Access™ database, the vegetation data was first analyzed by Robert Taylor, John Tiszler and Tarja Sagar of NPS. The following itemized series of steps summarizes their earlier efforts:

1) Out of the 800 vegetated stands visited (all polygons defined by AIS), 550 were entered into RAP database

2) The stands that were removed were either high in exotic species, were restoration sites, did not have complete data, or were noted to have low confidence in identification of species or covers, the latter generally being stands that could not be accessed and were assessed only by binoculars. This left 447 stands potentially good for analysis.

3) After performing outlier analysis and making other rejections based on limited species composition or missing data, 410 stands were used in cluster analysis.

4) 59 species were used in cluster analysis. The following groups of species were combined because they could often be identified with confidence only to genera: three Acacia species were combined as *Acacia* sp.; several common non-native annual grasses were combined as non-native annual grass; various iceplant species were combined as iceplant; three species of *Cylindropuntia* were combined as *Cylindropuntia*; four *Dudleya* species were combined as *Dudleya* sp.; two *Eriogonum fasciculatum* varieties were combined as *Eriogonum fasciculatum*; *Navarretia hamata* subspecies were combined as *Navarretia hamata*; and *Nassella* species were combined as *Nassella* sp.

5) Native species that occurred in extremely low cover (<1%) or in < 3 polygons, and non-naturalized exotics were removed from the data set.

Outlier analysis was performed in PC-Ord to remove sample units with extreme values (species) or sample units with unusual combinations (stands) in order to reduce heterogeneity and to increase normality (McCune-Grace 2002). As a result, 10 stands that were 3 standard deviations away from the mean Euclidian

distance measure (calculated for each species and stand) were removed. The only species rejected in the outlier analysis was *Rhus integrifolia*.
After the above mentioned stands had been removed, one stand was left with only one species and was removed.

Cluster analysis was performed in PC-Ord both with and without *Rhus integrifolia* using Sorensen (Bray-Curtis) distance measure and flexible beta linkage. This method defines groups based on similarities in species composition and abundance (McCune and Mefford 1997). Indicator species analysis (both with and without *R. integrifolia*) was performed in PC-Ord based on the 25 groups derived from cluster analysis.

The species and stands were classified in TWINSPAN (Two-way indicator species analysis) which operates on presence/absence data and classifies the species based on their fidelity to groups of sites (stands). The quantitative nature of the data was preserved somewhat by creating a variable number of "pseudospecies" representing abundance classes. For this purpose, cover values were converted to seven different classes using modified Braun-Blanquet cover categories: 1=<1%, 2=1-5%, 3=>5-15%, 4=>15-25%, 5=>25-50%, 6=>50-75%, 7=>75%. Pseudospecies make it possible to use the species relative abundances as a measure of their indicator power (Dufrêne & Legendre 1997).

The Monte Carlo test for abundances was performed on the resulting indicator species analysis to select cluster group levels with relatively high numbers of significant indicators and relatively low overall mean p-values (McCune and Grace 2002). Dendrograms were examined at cluster grouping levels 11 and 8 (with and without *Rhus integrifolia*) for natural groupings.

Final Data Analysis and Classification work by Klein and Keeler-Wolf

In the winter of 2009 Todd Keeler-Wolf and Anne Klein, acting as independent consultants, were hired by NPS to develop a classification based on their experience with the state-wide classification and analysis of large data sets from southern California. They were given the initial analysis done by NPS ecologists and the notes on the decisions previously made by NPS. All Vegetation Rapid Assessment (RA) data were analyzed in late 2009 and early 2010. A total of 526 surveys were included in the primary analysis. Positively identified non-native species, including grasses and iceplants, were included in the dataset. Taxa that were not identified to species were deleted while ecologically equivalent taxa were merged.

Klein and Keeler-Wolf analyzed the species cover data using the PC-Ord cluster analysis software. Scientific names of all taxa were first converted to standard alpha-numeric codes used by the USDA Plants Database. Abundance (cover) values for all taxa were converted to seven different classes using the following modified Braun-Blanquette (1932) cover categories: 1=<1%, 2=1-5%, 3=>5-15%, 4=>15-25%, 5=>25-50%, 6=>50-75%, 7=>75%. The data were then screened for outliers using Sorensen distance and all surveys greater than three standard deviations away from the mean were removed. Additionally, all surveys with fewer than five species were removed from the analysis.

Next, an initial cluster analysis was conducted on the dataset, using the Sorensen distance and flexible beta linkage method at -0.25 (McCune and Grace 2002). This agglomerative method defines groups based on similarities in species composition and abundance (McCune and Mefford 1997). The first cluster analysis was used to partition the complete dataset into more manageable subsets. Outlier and cluster analyses were then conducted on each subset (as described above) and Indicator species analysis (ISA) was used to select cluster group levels for classification analysis. ISA produced indicator values for each species across different cluster group levels (ranging from 2 to 30), testing for statistical significance using a Monte Carlo test with 1000 randomizations (Dufrene and Legendre 1997). The cluster group levels that had relatively high numbers of significant indicators and relatively low overall mean p-values were chosen for the final evaluation of the community classification (McCune and Grace 2002).

During the classification process, samples were partitioned into groups based on cluster membership. Cluster analysis groupings were exported into MS Access and viewed in cross-tab queries. Membership rules were defined primarily by species constancy and abundance; however, pre-existing classifications and floras were consulted to define analogous/similar vegetation types. Each sample was evaluated for consistency within a group and samples that were misclassified in the cluster analysis were reclassified based on the membership rules.

Rhus integrifolia, which is ubiquitous across the study area, was determined not to be a diagnostic species for differentiating between different types of shrub vegetation. It is so common across most of the shrublands in the project area, that it was largely ignored during the classification analysis, except when it was strongly dominant in the *Rhus integrifolia* Alliance.

The resulting floristic classification of the samples follows the hierarchical National Vegetation Classification System (NVCS, FGDC-STD-005-2008 [Version 2], Jennings et al. 2009) and Manual of California (Sawyer et al. 2009). An Association is defined by a group of samples that have similar dominant and/or characteristic species in the overstory and other important or indicator species, whereby these species are distinctive for a particular environmental setting. A set of similar Associations is grouped hierarchically to the next higher level in the classification, the Alliance level (the finest level represented in this mapping effort). These are grouped sequentially into the Group, MacroGroup, Division, and upwards through the Formation, Sub-class and Class levels.

A summary of the analysis and classification process is provided in the following steps:

a. Run cover category cluster analysis on complete dataset to determine the arrangement of plots based on species abundance and presence.
b. Break up the dataset into smaller, sizeable units for subsequent cluster analysis runs.
c. Run indicator species analysis (ISA) at each cluster group level, from 2 groups up to the maximum number possible (all groups must have at least 2 samples).
d. Use ISA to settle on the final representative group level of each cluster analysis for preliminary labeling.
e. Determine preliminary alliance and association names for each of the samples based on cluster membership, species constancy and abundance.
f. Develop decision rules for each association and alliance based on most conservative group membership possibilities using review of species cover, species constancy, and diagnostic species on a sample-by-sample basis.
g. Use decision rules to assign final Alliance and Association names to all data included in the analysis and all outlier samples removed from the dataset.

In November 2009 Keeler-Wolf and Klein produced a first draft of the classification and the key. This was revised based on comments from the NPS team in February 2010, and was field tested in the spring of 2010. Following the field test where multiple stands were visited and keyed-out, Keeler-Wolf and Klein continued to work on the classification descriptions producing a full draft set of descriptions plus the revised keys and classification list in May 2010.

Final comments from NPS were reviewed and the revised final report was submitted in late summer 2010.

RESULTS

The final classification was developed based on 475 Vegetation RAs, after removing 10 outlier surveys and 41 surveys with less than five species. The full dataset was partitioned into four subsets after an initial cluster analysis was conducted with all the surveys. A total of four outlier surveys were removed from the subsets, leaving 471 surveys total. The top six indicator taxa for each subset (as determined by Indicator Species Analysis) are summarized as follows:

- 177 surveys - *Eriogonum fasciculatum, Artemisia californica, Euphorbia misera, Dudleya edulis, Nassella* and *Ferocactus viridescens* var. *viridescens*
- 67 surveys - *Mesembryanthemum crystallinum, Encelia californica, Hemizonia fasciculata, Lycium californicum, Bromus madritensis* and *Atriplex semibaccata*
- 82 surveys - *Rhus integrifolia, Clematis pauciflora, Cneoridium dumosum* and *Marah macrocarpus var. macrocarpus*
- 145 surveys - *Ceanothus verrucosus, Adenostoma fasciculatum, Xylococcus bicolor, Salvia mellifera, Acacia* spp., and *Malosma laurina*

Cluster and Indicator Species Analyses were conducted on each of the four subsets above to select representative cluster group levels for community classification. Both broad- and fine-scale cluster group levels were selected for each subset based on having relatively high numbers of significant indicators and low average p-values. Twelve Vegetation RA surveys were determined to be unclassifiable, leaving 459 surveys that were incorporated into the formal classification analysis.

The final classification includes 16 Alliances, 16 Associations, and 3 Semi-Natural Stand types (equivalent to alliances but dominated/characterized by non-native plants). After membership rules were established for all of these types, 43 surveys that were thrown out previously (due to being outliers or having less than 5 species) were classified to alliance and association based on the new rules. Hence, a total of 502 surveys were incorporated in the final classification, which includes 1 tree-overstory, 16 shrub-overstory, and 3 herbaceous vegetation types. Table 1 presents the summary of the vegetation classification for the study area arranged within the current National Vegetation Classification Hierarchy (FGDC 2008).

Table 1: Final Vegetation Classification of Point Loma Ecological Conservation Area

The National Vegetation Classification Hierarchy:
Level 1 - FORMATION CLASS
Level 2 - FORMATION SUBCLASS
Level 3 - FORMATION
Level 4 - Division
Level 5 - Macrogroup
Level 6 - Group
Level 7 - Alliance
Level 8 - Association

Class 1. Mesomorphic Tree Vegetation (Forest and Woodland)
- Subclass 1.C. Temperate Forest
  - Formation 1.C.2. Cool Temperate Forest
    - Division 1.C.2.x. North American Introduced Evergreen Broadleaf and Conifer Forest
      - Macrogroup MG027. Introduced North American Mediterranean woodland and forest
        - Group - [No subdivision at group level]
          - *Schinus* (*molle*)–*Myoporum laetum* Semi-natural Stands (n=1)

Class 2. Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
- Subclass 2.B. Mediterranean Scrub and Grassland
  - Formation 2.B.1. Mediterranean Scrub
    - Division 2.B.1.a. California Scrub
      - Macrogroup MG043. California Chaparral
        - Group - Californian xeric chaparral
          - *Adenostoma fasciculatum* Alliance
            - *Adenostoma fasciculatum* Southern Maritime Association (n=33)
          - *Adenostoma fasciculatum-Xylococcus bicolor* Alliance
            - *Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus* Association (n=29)
        - Group - Californian maritime chaparral
          - *Ceanothus verrucosus* Provisional Alliance
            - *Ceanothus verrucosus* Association (n=12)
          - *Quercus dumosa* Provisional Alliance
            - *Quercus dumosa* Association (n=3)
          - *Malosma laurina* Alliance
            - *Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Association (n=2)
          - *Rhus integrifolia* Alliance
            - *Rhus integrifolia* Association (n=91)

Macrogroup MG044. California Coastal Scrub
- Group - Central and South Coastal Californian coastal sage scrub
  - *Artemisia californica* Alliance
    - *Artemisia californica-Encelia californica-Rhus integrifolia* Association (n=45)
  - *Artemisia californica-Eriogonum fasciculatum* Alliance
    - *Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya* (*edulis*) Association (n=61)
  - *Artemisia californica-Salvia mellifera* Alliance
    - *Artemisia californica-Salvia mellifera* Association (n=32)
  - *Encelia californica* Alliance
    - *Encelia californica-Artemisia californica* Association (n=87)
  - *Salvia mellifera* Alliance
    - *Salvia mellifera-Eriogonum fasciculatum* Association (n=55)
- Group - Naturalized non-native Mediterranean scrub
  - *Acacia* (*cyclops*) Semi-natural Stands (n=15)

Formation 2.B.2. Mediterranean Grassland and Forb Meadow
- Division 2.B.2.a. California Grassland and Meadow
  - Macrogroup MG045. California Annual and Perennial Grassland
    - Group - California annual forb/grass vegetation
      - *Deinandra fasciculata* Alliance (n-1)

Formation 2.C.3. Temperate and Boreal Scrub and Herb Coastal Vegetation
- Division 2.C.3.b. Pacific Coast Scrub and Herb Littoral Vegetation
  - Macrogroup MG058. Vancouverian Coastal Dune and Bluff
    - Group - Vancouverian/Pacific dune mat
      - *Abronia latifolia-Ambrosia chamissonis* Alliance
        - *Ambrosia chamissonis-Abronia maritima-Cakile maritima* Association (n=1)
    - Group - California Coastal evergreen bluff and dune scrub
      - *Baccharis pilularis* Alliance
        - *Baccharis pilularis-Artemisia californica-* Association (n=1)
    - Group - California Vancouverian semi-natural littoral scrub and herb vegetation
      - *Carpobrotus edulis* and other iceplants Semi-natural Stands (n=12)

Division 2.C.6.d Western North American Interior Alkali–Saline Wetland

Macrogroup MG083. Warm Semi-Desert/Mediterranean Alkali–Saline Wetland

Group - Southwestern North American salt basin and high marsh

Atriplex lentiformis Alliance

Atriplex lentiformis Association (n=11)

Class 3. Xeromorphic Scrub and Herb Vegetation (Semi-Desert)

Subclass 3.A. Warm Semi-Desert Scrub and Grassland

Formation 3.A.1. Warm Semi-Desert Scrub and Grassland

Division 3.A.1.a Sonoran and Chihuahuan Semi-Desert Scrub and Grassland

Macrogroup MG089. Viscaino - Baja California Desert Scrub

Group - Coastal Baja California Norte maritime succulent scrub

Lycium californcium Provisional Alliance

Lycium californicum Association (n=10)

Philosophy of Vegetation Classification in this report

The developing philosophy of vegetation classification in California has benefited by a large number of recent classification projects centered in southern Coastal California (DeSimone and Burk 1992, Gordon and White 1994, White et al. 1994, Borchert et al. 2004, Evens and San 2005, Keeler-Wolf and Evens 2006, Klein and Evens 2005, AECOM and VegCAMP 2010). These, in conjunction with a growing understanding of state-wide vegetation, have enabled the classification of the vegetation in the current project to proceed within a broader and better framework than would have been possible as little as five years ago. The natural development of most taxonomies, whether they be of species or vegetation, work their way through what can be called an expansive phase, and then a synthetic phase. The first phase is characterized by the proliferation of many taxa based on local descriptions without the benefit of the broad comparison of related types. The second phase is based on a retrospective and broader view of more studies where related taxa can be compared and often shown to be related, and can thus be synonymized. This latter phase has begun to take place in much of California, especially with the publication of the second edition of the Manual of California Vegetation (Sawyer et al. 2009).

For example, earlier sampling in San Diego County by Evens and San (2005) analyzed 78 samples collected in the San Dieguito River drainage which suggested that the mixed alliance characterized by *Adenostoma fasciculatum* and *Xylococcus bicolor* contained 5 associations: *Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus crassifolius-Rhus ovata, Adenostoma* *fasciculatum-Xylococcus bicolor-Ceanothus verrucosus, Adenostoma fasciculatum-Xylococcus bicolor-Cneoridium dumosum, Adenostoma fasciculatum-Xylococcus bicolor-Cneoridium dumosum-Eriogonum fasciculatum, Adenostoma fasciculatum-Xylococcus bicolor-Cneoridium dumosum-Salvia mellifera-Rhus integrifolia,* and *Adenostoma fasciculatum-Xylococcus bicolor-Salvia mellifera-Malosma laurina.*

However, a more extensive analysis of 159 samples taken throughout western San Diego County (AECOM and VegCAMP 2010), plus another 29 samples taken at Cabrillo NM (this study) offered a more well-rounded perspective, suggesting a more parsimonious arrangement of associations in this alliance, which county–wide, include: *Adenostoma fasciculatum-Xylococcus bicolor, Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus crassifolius, Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus tomentosus, Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus, Adenostoma fasciculatum-Xylococcus bicolor-Quercus* (*berberidifolia, xacutidens*)*,* and *Adenostoma fasciculatum-Xylococcus bicolor-Pickeringia montana*.

This more extensive, county-wide classification does not include some of the originally named associations in the San Dieguito River drainage. Why? Because with a broader perspective, including more range-wide sampling of an alliance, we are offered a more synoptic view of the relationships between sampled vegetation stands. For example, the association named *Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus crassifolius-Malosma laurina-Rhus ovata* in Evens and San (2005) becomes part of the more broadly understood *Adenostoma fasciculatum - Xylococcus bicolor-Ceanothus crassifolius* Association. With more sampling across a wider geographic range, it becomes clear that there is a more inland, cool winter version of the alliance best characterized by *Ceanothus crassifolius,* with or without the presence of *Malosma laurina* or *Rhus ovata*. Similarly, the associations: *Adenostoma fasciculatum-Xylococcus bicolor-Cneoridium dumosum, Adenostoma fasciculatum-Xylococcus bicolor-Cneoridium dumosum-Eriogonum fasciculatum,* and *Adenostoma fasciculatum-Xylococcus bicolor-Cneoridium dumosum-Salvia mellifera-Rhus integrifolia* are combined into a single broad association, *Adenostoma fasciculatum-Xylococcus bicolor*, which represents modal conditions typically found inland from the summer fog belt. Some of these stands have *Cneoridium*, some have *Salvia mellifera*, and some have *Eriogonum fasciculatum*, but the differences are insignificant.

Two associations were defined for the broader west county analysis (AECOM and VegCAMP 2010) and were not apparent in the narrower San Dieguito River study. The *Adenostoma fasciculatum-Xylococcus bicolor-Quercus* (*berberidifolia, ×acutidens*) Association represents mesic settings in the foothills, while the *Adenostoma fasciculatum-Xylococcus bicolor-Pickeringia montana* Association occurs on meta-volcanics on the upper reaches of Otay Mountain.

However, more samples throughout the entire coastal maritime chaparral region of San Diego County did not appreciably change our understanding of the *Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus* Association originally defined by Evens and San in 2005.

One of the benefits of collecting so many samples of vegetation stands in this current project, concurrent with a broader analysis of vegetation throughout western San Diego County, is that we now have a more complete approximation of the ranges of cover of species, and environmental conditions for each alliance and association. We have a better sense of where the important "breaks" in species composition are in these patterns, which translate to individual associations. The latest efforts of the National Vegetation Classification Panel point out the significance of classification confidence (Jennings et al. 2009) and emphasize the role of adequate geographic representation across the full range of the type.

The philosophy of this report is consistent with others that have been written for other natural vegetation classification projects in California over the past several years (see VegCAMP and CNPS Vegetation Program websites). A relatively large number of samples is required to set high confidence for the existence of an association. In general, n=10 or more is accepted as a threshold for high confidence. Fewer than 10 samples yields lower confidence, unless the same characteristics of species composition and environmental variables have been well-defined previously from studies elsewhere.

Further revisions are bound to occur in the California state classification as more data are analyzed and compared. Relatively rigorous standards are followed to define an association. The associations that are defined currently in this report are well-substantiated by large sample sizes, with consistent species compositions and relative cover values. The placement of these associations into different alliances would only be reasonable if we saw major environmental differences in the alliances. Future revisions may occur as datasets from different regions are analyzed together in ordinations to identify and differentiate the major environmental patterns of the alliances.

Comparison with Concurrent Western San Diego County Data Analysis

Another interesting aspect of this project was that it occurred roughly in conjunction with the more complete data collection and analysis of western San Diego County (WSD) vegetation (AECOM and VegCAMP 2010). The final WSD classification includes 64 Alliances, 8 Provisional Alliances, 13 Semi-Natural Stand types, 7 Special Stand types (equivalent to alliances but dominated/characterized by rare/listed taxa), 87 Associations, and 15 Provisional Associations. These were based on the analysis of approximately 1300 individual samples selected using a sophisticated random-stratified sampling protocol (AECOM & VegCAMP 2010). This classification was representative of vegetation across approximately 470,000 acres of natural and semi-natural lands in western San Diego County. Comparatively, the 1500 acres of CABR and adjacent lands is only about 3% of the entire assessed area of the west county, but received over 40% of the sampling effort relative to the WSD samples. The 16 Alliances, 16 Associations, and 3 Semi-Natural Stand types of CABR represents 25% of alliances, 18% of the associations, and 23% of the semi-natural stands of the entire WSD study.

The analysis of CABR data came prior to the county-wide analysis, but the review and subsequent analysis of the west county vegetation samples provided a valuable feedback mechanism. The value of the county-wide analysis placed the small park in perspective in terms of the expected diversity of vegetation types. Since a variety of coastal San Diego County sites were sampled outside of CABR, it was possible to relegate some of the minor variation at the phase level seen in the very rich plot data of CABR for what it was and allowed us not to over-split the classification locally at CABR.

KEY TO THE VEGETATION ALLIANCES AND ASSOCIATIONS

A key to vegetation is a useful tool to efficiently identify the vegetation of an area. However, keys are only part of the compendium of information that should be used to help identify a given stand of vegetation. The descriptions, especially the summary tables showing presence, constancy, and the range of cover of various species within the type is also extremely valuable. Those who expect to identify the vegetation of the study area should be equipped with both tools.
The following is a dichotomous key based on quantitative analysis of Rapid Assessment surveys collected during the 2008 field season and analyzed in the Fall of 2009. Below is a glossary of terms used regularly in the key. Most of these terms are standard terms used in the National Vegetation Classification System (see Jennings et al. 2009) and in the second edition of the Manual of California Vegetation (Sawyer et al 2009).

Terms and Concepts Used Throughout the Key:

Dominance by layer: Tree, shrub, and herbaceous layers are considered physiognomically distinct. A vegetation type is considered to belong to a certain physiognomic group if it is dominated by one layer. Layers are prioritized in order of height when naming the type.

Dominant: Dominance refers to the preponderance of vegetation cover in a stand of uniform composition and site history. It may refer to cover of an individual species (as in "dominated by Douglas-fir"), or it may refer to dominance by a physiognomic group, as in "dominated by shrubs." Dominance refers to the relative cover of one species or physiognomic group as compared to another species or physiognomic group. In this report, a dominant species has at least 50 percent relative cover.

Co-dominant: Co-dominance refers to two or more species in a stand that share dominance and have between 30 and 60 percent relative cover each.

Cover: The primary metric used to quantify the importance/abundance of a particular species or a particular vegetation layer within a stand. It is measured by estimating the aerial extent of the living plants, or the bird's-eye view looking from above, for each category. Cover in this and other California National Park Service vegetation classification and mapping projects uses the concept of "porosity" or foliar cover rather than "opacity" or crown cover. Thus, field crews are trained to estimate the amount of shade produced by the canopy of a plant or a stratum by taking into account the amount of shade it casts excluding the openings it may have in the interstitial spaces (e.g., between leaves or branches). This is assumed to provide a more realistic estimate of the actual amount of shade cast by the individual or stratum which, in turn, relates to the actual amount of light available to individual species or strata beneath it.

Relative cover: Refers to the amount of the surface of the plot or stand sampled that is covered by one species (or physiognomic group) as compared to (relative to) the amount of surface of the plot or stand covered by all species (in that group). Thus, 50 percent relative cover means that half of the total cover of all species or physiognomic groups is composed of the single species or group in question. Relative cover values are proportional numbers and, if added, total 100 percent for each stand (sample).

Absolute cover: Refers to the actual percentage of the ground (surface of the plot or stand) that is covered by a species or group of species. For example, *Pinus sabiniana* covers between 5 percent and 10 percent of the stand. Absolute cover of all species or groups if added in a stand or plot may total greater or less than 100 percent because it is not a proportional number.

Consistent/Characteristic/Diagnostic species: Must be present in at least 80 percent of the samples, with no restriction on cover.

Frequently/Often/Usually occurring species: Must be present in at least 50 percent of the samples, with no restriction on cover.

Sparse: Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is less than 8 percent absolute cover.

Trace: Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is less than 5 percent absolute cover.

Open: Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is generally less than 33 percent absolute cover.

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

a. It has *compositional* integrity. Throughout the site, the combination of species is similar. The stand is differentiated from adjacent stands by a discernable boundary that may be abrupt or gradual.
b. It has *structural* integrity. It has a similar history or environmental setting, affording relatively similar horizontal and vertical spacing of plant species. For example, a hillside forest formerly dominated by the same species but has burned on the upper part of the slope and not the lower is divided into two stands. Likewise, a sparse woodland occupying a slope with shallow rocky soils is considered a different stand from an adjacent slope of a denser woodland/forest with deep, more moist soil and the same species.

Tree: Is a one-stemmed woody plant that normally grows to be greater than 5 meters tall. In some cases, trees may be multiple stemmed following ramifying after fire or other disturbance, but the size of mature plants is typically greater than 5 meters. Undisturbed individuals of these species are usually single stemmed.

Shrub: Is normally a multistemmed woody plant that is usually between 0.2 meters and 5 meters tall. Definitions are blurred at the low and high ends of the height scales. At the tall end, shrubs may approach trees based on disturbance frequencies (e.g., old-growth resprouting chaparral species such as *Cercocarpus betuloides, Fraxinus dipetala, Heteromeles arbutifolia, Prunus ilicifolia,* and so forth, may frequently attain "tree size"). At the short end, woody perennial herbs or subshrubs of various species are often difficult to categorize into a consistent life-form.

Herbaceous plant: Is any species of plant that has no main woody stem development and includes grasses, forbs, and dieback perennial species.

Key to Vegetation Types

1. Stands dominated by trees (generally 10% or greater cover evenly distributed across the stand). The trees of the PLECA area are non-native species that were planted or naturalized. Although plantings of *Eucalyptus* species and adventive individuals of *Pinus torreyana* exist in the area, the only stands sampled locally are small and dominated by *Myoporum laetum*, or a related *Myoporum* species. These trees are small and form a few scattered stands near the lighthouse and in other areas of the monument.
***Schinus* (*molle, terebinthifolius*)-*Myoporum laetum* Semi-Natural Stands** (n=1)

1'. Shrubs or herbaceous species form the dominant cover. Trees, if present, have <10% cover and are not evenly distributed across the stand. Shrub stands represent the predominant vegetation throughout the study area. In general, shrublands can be divided into evergreen sclerophyll (chaparral) versus soft-leaved, mostly drought deciduous or partially drought deciduous (coastal sage scrub) categories. One species, *Rhus integrifolia,* is ubiquitous across the study area and can occur in both chaparral and coastal sage scrub settings. While it is characteristic of most of the shrublands in the study area, it is not a useful diagnostic species for differentiating between different types of shrub vegetation. Only when it is strongly dominant does it become useful to distinguish a *Rhus integrifolia* Alliance, otherwise the species can be assumed to be a common member of most of the shrublands. This key focuses on other shrubs that often occur with *Rhus*, despite its sometimes high cover.

2. Shrubs form the dominant layer, generally with >10% cover, or higher cover than the herbaceous layer.

3. The overstory is dominated by shrubs with bright to dark green leaves that are sclerophyllous or evergreen.

4. A non-native species of *Acacia* dominates or co-dominates with *Rhus integrifolia* in the shrub overstory; usually associated with non-natural plantings or obviously disturbed sites such as highly eroded slopes. In such cases shrub cover may be <10%. The evergreen "leaves" are actually phyllodes (i.e., expanded leaf bases). Note: When ice plant species have higher relative cover than *Acacia,* key to 22' below.
***Acacia* (*cyclops*) Semi-Natural Stands**(n=15)

4'. Stands dominated by native chaparral or evergreen scrub species.

5. The soft leaved evergreen *Baccharis pilularis* is dominant or co-dominant with *Artemisia californica* and *Heteromeles arbutifolia;*

associated with mesic disturbed areas in chaparral or coastal scrub. Stands are few and relatively short lived in the study area.

***Baccharis pilularis* Alliance**
***Baccharis pilularis-Artemisia californica* Association** (n=1)

5'. The shrub canopy is characterized (and usually dominated) by either *Adenostoma fasciculatum, Ceanothus verrucosus, Xylococcus bicolor, Quercus dumosa, Malosma laurina,* and/or *Rhus integrifolia.*

6. *Quercus dumosa, Ceanothus verrucosus, Malosma laurina,* and/or *Rhus integrifolia* are co-dominant to dominant in the shrub canopy, while *Adenostoma fasciculatum* and *Xylococcus bicolor* are either absent or insignificant.

7. *Quercus dumosa* is dominant to co-dominant with *Ceanothus verrucosus* in the shrub canopy. *Salvia mellifera* and *Rhus integrifolia* are characteristically present as sub- to co-dominants.

***Quercus dumosa* Provisional Alliance**
***Quercus dumosa* Association** (n=3)

7'. The shrub canopy is strongly dominated by *Rhus integrifolia, Malosma laurina,* or *Ceanothus verrucosus* (*R. integrifolia* and *C. verrucosus* may co-dominate). All other chaparral or coastal sage scrub species are present as sub-dominants.

8. *Ceanothus verrucosus* is strongly dominant or co-dominant with *Rhus integrifolia* (or occasionally *Heteromeles arbutifolia*). *Salvia mellifera, Adenostoma fasciculatum, Xylococcus bicolor,* and *Quercus dumosa* are either absent or sub-dominant.

***Ceanothus verrucosus* Provisional Alliance**
***Ceanothus verrucosus* Association** (n=12)

8'. *Rhus integrifolia or Malosma laurina* is strongly dominant.

9. *Malosma laurina* is dominant with other coastal sage scrub shrubs such as *Eriogonum fasciculatum* and *Salvia mellifera* in lower cover. Generally uncommon in the study area and associated with upper slopes or slopes protected from the open ocean.

***Malosma laurina* Alliance**
***Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Association** (n=2)

9'. *Rhus integrifolia* is strongly dominant with at least 65% relative cover, usually >20% absolute cover - all other shrubs are sub-dominant.

***Rhus integrifolia* Alliance**
***Rhus integrifolia* Association** (n=91)

6’. *Adenostoma fasciculatum* and/or *Xylococcus bicolor* characterize the shrub canopy; Vegetation may be disturbed or may include a variety of evergreen chaparral species or sclerophylls such as *Rhus integrifolia* and *Ceanothus verrucosus.*

10. *Adenostoma fasciculatum* is dominant in open to moderately dense, low growing chaparral on ridges and mesa tops. Sub-dominants such as *Ceanothus verrucosus, Eriogonum fasciculatum, Eriodictyon crassifolium*, and a variety of other shrubs intermix. *Xylococcus bicolor* is either absent or clearly sub-dominant. Stands occur on rocky or shallow soils (sandstone) and are often impacted by foot traffic or other human disturbance.

***Adenostoma fasciculatum* Alliance**
***Adenostoma fasciculatum* Southern maritime Association** (n=33)

10’. *Xylococcus bicolor* characterizes the shrub canopy; *Adenostoma fasciculatum* may be absent to co-dominant. Stands occur on more sheltered slopes and not near the top of ridges or on mesas. *Rhus integrifolia*, *Ceanothus verrucosus, Heteromeles arbutifolia,* and/or *Salvia mellifera* are often present in the shrub overstory as sub- to co-dominants. *Xylococcus bicolor* is the strongest indicator of this type and may have as little as 1% cover when *Adenostoma fasciculatum* is insignificant.

Adenostoma fasciculatum-Xylococcus bicolor Alliance
***Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus* Association** (n=29)

3’. Stands characterized and usually dominated by shrubs in the following genera: *Artemisia, Atriplex, Eriogonum, Cneoridium, Encelia, Lycium,* and *Euphorbia*. These plants have soft leaves that are at least partially drought-deciduous. <u>Stands may include significant cover of the evergreen sclerophyll Rhus integrifolia, but it has ≤20% absolute cover or <65% relative cover in the shrub canopy</u>.

11. Either *Lycium californicum* or *Atriplex lentiformis* is dominant or co-dominant with *Rhus integrifolia* (*R. integrifolia* may occasionally be dominant, but with <15% absolute cover).

13. *Atriplex lentiformis* is conspicuous and has higher cover than other coastal sage scrub shrubs in an open shrub canopy. *Artemisia californica* and *Encelia californica* are often present as sub-dominants with various members of the Aizoaceae.

***Atriplex lentiformis* Alliance**
***Atriplex lentiformis* Association** (n=11)

13’. *Lycium californicum* is conspicuous and has higher cover than other coastal sage scrub shrubs in an open to moderate shrub canopy. *Euphorbia misera* is occasionally co-dominant. *Atriplex semibaccata* and *Encelia californica* are usually present as sub-dominants with various members of the Aizoaceae.

***Lycium californicum* Alliance**
***Lycium californicum* Association** (n=10)

11’. *Atriplex lentiformis and Lycium californicum* are either absent or have low relative cover. Stands dominated or co-dominated by different mixtures of *Artemisia californica, Salvia mellifera, Eriogonum fasciculatum*, and *Encelia californica.* <u>Although Euphorbia misera, Cneoridium dumosum, and Rhus integrifolia may also occur in high cover, these shrubs are not diagnostic in the classification of the following alliances and associations</u>.

14. *Salvia mellifera* is dominant to co-dominant with *Artemisia californica* and/or *Eriogonum fasciculatum*. *Encelia californica,* if present, is sub-dominant.

16. *Salvia mellifera* and *Eriogonum fasciculatum* characterize the shrub layer with significant combined cover. *Artemisia californica* is either absent or sub-dominant.

***Salvia mellifera* Alliance**
***Salvia mellifera-Eriogonum fasciculatum* Association** (n=55)

16’. *Artemisia californica* and *Salvia mellifera* characterize the shrub overstory with significant combined cover (*S. mellifera* being co-dominant to sub-dominant). Stands having co-dominant *A. californica, S. mellifera* and *Eriogonum fasciculatum* key to this type.

***Artemisia californica-Salvia mellifera* Alliance**
***Artemisia californica-Salvia mellifera* Association** (n=32)

14’ *Salvia mellifera* is absent or has low relative cover in the shrub overstory. *Artemisia californica* or *Encelia californica* may have significant cover.

17. *Encelia californica* is dominant to co-dominant while *Artemisia californica* is absent to co-dominant.

***Encelia californica* Alliance**
***Encelia californica-Artemisia californica* Association** (n=87)

17’. *Artemisia californica* is typically dominant to co-dominant with or without *Eriogonum fasciculatum* (*A. californica* is occasionally sub-dominant to *E. fasciculatum*, but the two species have significant combined cover). If *Encelia californica* is present, it is sub-dominant.

18. *Artemisia californica* is clearly dominant with *Encelia californica* sub-dominant. *Eriogonum fasciculatum* is absent or has low relative cover. *Rhus integrifolia* is characteristic with <20% absolute cover.

***Artemisia californica* Alliance**
***Artemisia californica-Encelia californica-Rhus integrifolia* Association** (n=45)

18'. *Artemisia californica* and *Eriogonum fasciculatum* characterize the shrub layer, with either species being co-dominant or dominant.

***Artemisia californica-Eriogonum fasciculatum* Alliance**
***Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya* (*edulis*) Association** (n=61)

2'. Shrubs typically ≤10% cover and herbs generally >10% cover.

21. Stands characterized by the native summer annual *Deinandra fasciculata*, often with many other native and non-native herbs. Occurs on coastal terraces and openings in shrublands. Stands are typically well below the minimum mapping unit size.

***Deinandra fasciculata* Alliance** (n=1)

21'. Stands either of coastal sandy strands with scattered herbs or strongly dominated by various species of introduced Aizoaceae.

22. Sandy coastal strands with *Abronia maritima, Ambrosia chamissonis, Cakile maritima,* and a variety of other coastal species present.

***Abronia latifolia-Ambrosia chamissonis* Alliance**
***Ambrosia chamissonis-Abronia maritima-Cakile maritima* Association** (n=1)

22'. *Carpobrotus edulis*, *C. chilensis, Malephora crocea, Mesembryanthemum crystallinum, M. nodiflorum*, or other iceplants present and comprising the highest cover. The shrub and tree cover may be >10% (*Eucalyptus,* non-native *Acacia* species, and *Rhus integrifolia* may be present), but ice plants have similar or higher relative cover of any other species.

***Carpobrotus edulis* or Other Ice Plants Semi-Natural Stands** (n=12)

VEGETATION DESCRIPTIONS OF CABRILLO NATIONAL MONUMENT AND POINT LOMA NAVAL BASE SAN DIEGO COUNTY, CALIFORNIA

The following set of descriptions uses the same reporting format agreed upon in the document “Vegetation classification of the Santa Monica Mountains National Recreation Area and environs in Ventura and Los Angeles counties, California” (: Keeler-Wolf, T., and J. Evens. 2006). This reporting structure has been approved as acceptable by NPS Vegetation Mapping Program and by NatureServe.

Schinus (*molle, terebinthifolius*) - Myoporum laetum Semi-Natural Woodland Stands

Pepper-tree - Myoporum Grove Semi-Natural Stands

Local Description

Summary:
This woodland association occurs on gentle, upper slopes with flat topography. It is characterized by the dominance of *Myoporum laetum* and other non-native trees in an open overstory. The shrub layer is open and no species were recorded in the understory.

Distribution:
These semi-natural stands are associated with disturbed or built-up areas such as parking lots in the study area.

Environmental Description:
Aspect: no data
Slope: 1 to 5 degrees
Topography (micro; macro): flat; upper slope

Vegetation Description:
One stand of *Schinus* (*molle*, *terebinthifolius*)-*Myoporum laetum* Semi-Natural Woodland forms an open tree layer (18%), with non-native or planted hardwoods and conifers being 5-10m and 10-15m tall, respectively. The shrub layer is open (14%) with shrubs being 2-5m tall. No herbaceous species were recorded in this survey. Total vegetation cover is 30%.

In general, the *Schinus-Myoporum* Semi-Natural Stands are dominated by either *Schinus* spp or *Myoporum* spp. The two genera are in different families, but are considered together in one vegetation type since they often occur in similarly disturbed areas in the warm temperate zone of coastal California. In this stand, the tree layer is characterized by *Myoporum laetum* and a non-native *Pinus* as co-dominants. The most abundant shrubs included *Heteromeles arbutifolia*, *Rhus integrifolia* and *Baccharis pilularis*.

***Schinus* (*molle*, *terebinthifolius*)-*Myoporum laetum* Semi-Natural Stands**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	MYLA5	*Myoporum laetum*	100	10.0	10	10
	PINUS	*Pinus*	100	8.0	8	8
Shrub						
	HEAR5	*Heteromeles arbutifolia*	100	8.0	8	8
	RHIN2	*Rhus integrifolia*	100	3.0	3	3
	BAPI	*Baccharis pilularis*	100	2.0	2	2
	ARCA11	*Artemisia californica*	100	0.2	0.2	0.2
	ENCA	*Encelia californica*	100	0.2	0.2	0.2
	SAME3	*Salvia mellifera*	100	0.2	0.2	0.2

Non-native Species:
Myoporum laetum, *Pinus* sp.

Samples Used in Description: (n = 1)
CABR-0452

Comments:
The single stand sampled is associated with a road and parking lot. It would be valuable to monitor and consider removal if trees are seen dispersing and expanding from this point.

COMMON NAME	Pepper-tree-Myoporum Grove Semi-Natural Stands
SYNONYM	**Calveg:** Non-Native/Ornamental Trees.
CLASS 1.	Mesomorphic Tree Vegetation (Forest and Woodland)
SUBCLASS 1.C.	Temperate Forest
FORMATION 1.C.2.	Cool Temperate Forest
DIVISION 1.C.2.x.	North American Introduced Evergreen Broadleaf and Conifer Forest
MACROGROUP MG027.	Introduced North American Mediterranean Woodland and Forest
GROUP	[No subdivision at group level]
ALLIANCE	[No alliance, *Schinus* (*molle*)-*Myoporum laetum* Semi-Natural Stands]

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bj)

CONSERVATION STATUS RANK Non-Native; **Invasive species ranking:** Cal-IPC: Limited

Global Description

Distribution:
The range of this non-native vegetation in California includes the Central California Coast (261A), Southern California Coast (261B), and Southern California Mountains and Valleys (M262B). Locally, several stands exist associated with planting around buildings, the Ft. Rosecrans cemetery, and other human establishments. Many stands occur along southern and central California beaches and dune/headlands, initially the result of intentional plantings for windbreaks.

Nations:
United States

States or Provinces:
California

Environmental Description:
Locally this semi-natural vegetation is found in disturbed areas (e.g., below the cemetary) and in thin strips along parking lots. The environment can be characterized as disturbed.

Vegetation Description:
The single stand sampled was dominated by *Myoporum laetum*. It also had similar cover of a non-native *Pinus* species. The semi-linear stand was initially planted along a parking lot and has some components of the adjacent natural vegetation. It is likely that all large individuals of *Myoporum* were planted and the stand does not contain significant regeneration at this point. Removal of this potentially invasive species is advisable. The stand, which may or may not be reproducing, was sampled in keeping with the practice of collecting quantifiable data on all vegetated types in this project.

Comments:
Both *Schinus* and *Myoporum* species are introduced in California. DiTomaso and Healey (2007) considered these trees as invasive in California. These trees are evergreen and somewhat frost sensitive. Birds disperse the colored fruits allowing seedlings to establish in wildland vegetation. *Schinus* is not present as stands in the Point Loma Ecological Conservation Area (PLECA). However, *Myoporum laetum*, the ngaio tree, (and possible other *Myoporum* species) does form small mappable groves. *Myoporum laetum* occurs in central and southern California, as an escaped ornamental to 10 m tall. *M*. *laetum* has Cal-IPC rank of Moderate, and it is a native of New Zealand. It forms dense, single-species stands in coastal areas. It has commonly spread from campground plantings in public parks along the central and southern coast. It can sprout easily after fire when top-killed (Kitz 2000b). Other observations of *M*. *laetum* stands include stands at the San Dieguito Lagoon (CNPS unpublished data), in San Juan

Capistrano, along the Santa Clara River with *Arundo donax* and *Baccharis pilularis*, and at McGrath State Beach (Stillwater Sciences and URS 2007).

References:
DiTomaso and Healey 2007, Kitz 2000b, Sawyer et al. 2009, Stillwater Sciences and URS 2007

***Acacia* (*cyclops*) Semi-Natural Shrubland Stands**

Non-Native Acacia Coastal Scrub Semi-Natural Stands

Local Description

Summary:
This shrubland association occurs on variable aspects along gentle to steep, lower to upper slopes and bottoms. The shrub overstory is characterized by the co-dominance or dominance of a non-native species of *Acacia* (e.g., *A. cyclops*, *A. longifolia*). The herb layer is scattered with non-natives being most constant. At PLECA, the emergent tree layer includes non-native species such as *Schinus molle* and *Pinus* sp.

Distribution:
Stands occur throughout the study area on steep eroded slopes or adjacent to built-up areas.

Environmental Description:
Aspect: variable
Slope: 1 to >5 degrees
Topography (micro; macro): variable; bottom to upper slopes

Vegetation Description:
Stands of *Acacia* (*cyclops*) Semi-Natural Shrubland form an open to moderate shrub layer (5-60%, mean 30.6%), where a non-native species of *Acacia* (e.g. *A. cyclops*, *A. longifolia*) dominates or co-dominates. Shrubs are 1-10m tall. The herbaceous layer is open (0.2-11%, mean 2.9%) and 0-0.5m tall. Emergent trees are infrequent and include only non-native or planted species that are infrequent (0.2-1% cover, mean 0.2%), with conifers at 2-5m tall and hardwoods at 5-10m tall. Total vegetation cover is 11-60%, mean 37.3%.

In this association, the shrub layer is characterized by a non-native species of *Acacia* (e.g. *A. cyclops*, *A. longifolia*). *Rhus integrifolia* and *Eriogonum fasciculatum* are often present. Trees are emergent and include non-native or planted species *Schinus molle* and *Pinus* sp. The herbaceous layer is open, with non-natives (e.g., *Mesembryanthemum crystallinum*, *Bromus madritensis*, *Carpobrotus chilensis*) being most abundant and constant.

Acacia (*cyclops*) Semi-Natural Stands

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	SCMO	*Schinus molle*	7	1.0	1	1
	PINUS	*Pinus*	7	0.2	0.2	0.2
Shrub						
	RHIN2	*Rhus integrifolia*	80	5.0	0.2	15
	ERFA2	*Eriogonum fasciculatum*	53	1.3	0.2	3
	ACCY2	*Acacia cyclops*	40	36.5	30	49
	ACACI	*Acacia*	33	19.2	6	30
	ACLO	*Acacia longifolia*	27	21.5	4	40
	HEAR5	*Heteromeles arbutifolia*	27	4.3	0.2	15
	MALA6	*Malosma laurina*	27	1.8	0.2	5
	ENCA	*Encelia californica*	20	2.7	1	4
	ARCA11	*Artemisia californica*	20	1.7	1	3
	CNDU	*Cneoridium dumosum*	20	0.5	0.2	1
	ADFA	*Adenostoma fasciculatum*	13	7.6	0.2	15
	CEVE2	*Ceanothus verrucosus*	13	0.6	0.2	1
	NIGL	*Nicotiana glauca*	13	0.6	0.2	1
	BAPI	*Baccharis pilularis*	7	1.0	1	1
	OPLI3	*Opuntia littoralis*	7	0.2	0.2	0.2
	SAME3	*Salvia mellifera*	7	0.2	0.2	0.2
	XYBI	*Xylococcus bicolor*	7	0.2	0.2	0.2
Herb						
	CARPO	*Carpobrotus*	27	2.5	1	5
	CAED3	*Carpobrotus edulis*	20	2.1	0.2	5
	POACXX	*Poaceae*	13	1.5	1	2
	MECR3	*Mesembryanthemum crystallinum*	13	0.6	0.2	1
	BRMA3	*Bromus madritensis*	13	0.2	0.2	0.2
	UNKNO	*Unknown*	13	0.2	0.2	0.2
	CACH38	*Carpobrotus chilensis*	7	10.0	10	10
	GLCO6	*Chrysanthemum coronarium*	7	4.0	4	4
	AVBA	*Avena barbata*	7	0.2	0.2	0.2
	DUCA4	*Dudleya caespitosa*	7	0.2	0.2	0.2
	HEFA	*Deinandra fasciculata*	7	0.2	0.2	0.2
	LECO12	*Leymus condensatus*	7	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	2 of 15	List 2.2	S2.2	G3

Non-native Species:
Schinus molle, *Pinus* sp., *Acacia cyclops*, *Acacia* sp., *Acacia longifolia*, *Nicotiana glauca*, *Carpobrotus* sp., *Carpobrotus edulis*, *Mesembryanthemum crystallinum*, *Bromus madritensis*, *Carpobrotus chilensis*, *Chrysanthemum coronarium*, *Avena barbata*

Samples Used in Description: (n = 15)
CABR-0234, CABR-0289, CABR-0413, CABR-0470, CABR-0472, CABR-0473, CABR-0505, CABR-0512, CABR-0516, CABR-0525, CABR-0535, CABR-0540, CABR-0541, CABR-0549, CABR-0550

Comments:
Stands seem to be expanding from plantings in the study area.

COMMON NAME	Non-Native Acacia Coastal Scrub
SYNONYM	None known from California
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG044.	California Coastal Scrub
GROUP	Naturalized non-native Mediterranean scrub
ALLIANCE	[no alliance; semi-natural, *Acacia* (*cyclops* and others) Semi-natural Stands]

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS These stands occur sporadically through the Southern California Coast (261B)

CONSERVATION STATUS RANK Non-Native; **Invasive species ranking:** Cal-IPC: Limited

Global Description

Distribution:
These semi-natural stands are the result of horticultural plantings of several related shrubby Australian Acacias along California's outer south coast. They may also occur in the northern portion of Baja California, Mexico.

Nations:
United States, Mexico?

States or Provinces:
California, Baja California Norte Mexico?
Environmental Description:
Locally found in steep eroded slopes and near road cuts or bluffs. The stands that are mapped in the CABR-POLO study area are all likely to have been established recently and do not represent old plantings.

Vegetation Description:
Stands consist of several to many small trees or bushes and most resemble *Acacia cyclops* or similar species of *Acacia*. Most stands are dominated by non-native shrubs and also have non-native herbaceous species present. Shrub cover is very open to intermittent. The most conspicuous and constant native species is *Rhus integrifolia*.

Comments:
Stands of phyllodinous Acacias introduced from Australia are becoming more noticeable throughout southern coastal California in recent years. They have been mapped at Ballona Wetlands in coastal Los Angeles County (VegCAMP 2007) and also in interior parts of the Santa Monica Mountains (John Tiszler pers. comm.). They seem to originate from plantings and appear to be easily dispersed to nearby germination sites. This grouping of semi-natural stands has not been previously described in Sawyer et al. 2009. It will be important to monitor stands of shrubby invasive Acacias, particularly because of their tendency to invade fragmented and localized stands of native vegetation near the coast.

References:
Sawyer et al. 2009, VegCAMP 2007

Adenostoma fasciculatum Southern Maritime Shrubland Association

Chamise Southern Maritime Chaparral Association
Adenostoma fasciculatum Alliance
Chamise Southern Maritime Chaparral Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects along middle to upper slopes and ridge tops that are flat to steep. The substrate is typically sandstone. It is typically characterized by the dominance of *Adenostoma fasciculatum* in the shrub layer, and an open herb layer with a variety of forbs, grasses and succulents. The emergent tree layer includes only non-native or planted species: *Myoporum laetum*, *Pinus* sp., and *Pinus torreyana*.

Distribution:
Stands occur on upper slopes and mesas on both CABR and Point Loma Naval Station. They are often fragmented by road cuts, trails, and building structures.

Environmental Description:
Aspect: flat, variable
Slope: 0 to >25 degrees
Topography (micro; macro): variable;

Vegetation Description:
This association often occurs on upper slopes or mesa tops, with *Adenostoma fasciculatum* ranging from dominant or co-dominant with *Rhus integrifolia* or *Ceanothus verrucosus*. Stands form an open to moderate shrub layer (5-45%, mean 27.2%) with shrubs sometimes occurring in two different strata and ranging in height from 0.5-5m tall. The herbaceous layer is open (0.2-5%, mean 0.7%) at 0-0.5m tall. Trees are either non-native or planted and occur infrequently as emergents (0.2-2% cover, mean 0.2%). Total vegetation cover is 5-45%, mean 27.6%.

In this association, the shrub layer is characterized by *Adenostoma fasciculatum* and *Rhus integrifolia*. *Eriogonum fasciculatum*, *Ceanothus verrucosus*, *Salvia mellifera* and *Cneoridium dumosum* are usually present, with *C. verrucosus* occasionally being co-dominant. When *Xylococcus bicolor* is present, it is clearly sub-dominant. Non-native or planted trees are infrequently present as emergents, including *Myoporum laetum*, *Pinus* sp., and *Pinus torreyana*. The herbaceous layer is diverse with *Carpobrotus* and *Dudleya edulis* being most constant.

***Adenostoma fasciculatum* Southern Maritime Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	ADFA	*Adenostoma fasciculatum*	100	14.7	2	40
	RHIN2	*Rhus integrifolia*	91	2.8	0.2	15
	ERFA2	*Eriogonum fasciculatum*	76	1.9	0.2	4
	CEVE2	*Ceanothus verrucosus*	70	4.5	0.2	12
	SAME3	*Salvia mellifera*	67	2.0	0.2	5
	CNDU	*Cneoridium dumosum*	67	0.7	0.2	3
	ARCA11	*Artemisia californica*	42	1.1	0.2	3
	XYBI	*Xylococcus bicolor*	36	1.6	0.2	5
	ACACI	*Acacia*	33	0.5	0.2	3
	LOSCS2	*Lotus scoparius* var. *scoparius*	27	0.3	0.2	1
	MALA6	*Malosma laurina*	24	3.3	0.2	6
	HEAR5	*Heteromeles arbutifolia*	24	1.0	0.2	5
	ERCRC	*Eriodictyon crassifolium* var. *crassifolium*	24	0.3	0.2	1
	RHCR	*Rhamnus crocea*	21	0.3	0.2	1
	ERCO25	*Eriophyllum confertiflorum*	21	0.2	0.2	0.2
	ACCY2	*Acacia cyclops*	18	2.6	0.2	10
	ENCA	*Encelia californica*	18	0.6	0.2	2
	BAPI	*Baccharis pilularis*	12	0.4	0.2	1
	FEVI2	*Ferocactus viridescens* var. *viridescens*	12	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	12	0.2	0.2	0.2
	EUMI4	*Euphorbia misera*	9	1.7	0.2	4
	ACLO	*Acacia longifolia*	6	0.2	0.2	0.2
	CLPA2	*Clematis pauciflora*	6	0.2	0.2	0.2
	CLIS	*Cleome isomeris*	6	0.2	0.2	0.2
	DIAUA	*Diplacus aurantiacus* ssp. *aurantiacus*	6	0.2	0.2	0.2
Herb						
	CAED3	*Carpobrotus edulis*	27	2.8	0.2	12
	DUED	*Dudleya edulis*	24	0.2	0.2	0.2
	CARPO	*Carpobrotus*	12	1.1	0.2	2
	CARA3	*Cardionema ramosissimum*	9	0.2	0.2	0.2
	DULA	*Dudleya lanceolata*	9	0.2	0.2	0.2
	MEIM	*Melica imperfecta*	9	0.2	0.2	0.2
	STDI6	*Stephanomeria diegensis*	9	0.2	0.2	0.2
	CACH38	*Carpobrotus chilensis*	6	1.0	1	1
	BOBA3	*Bothriochloa barbinodis*	6	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	6	0.2	0.2	0.2
	CAWEW	*Calochortus weedii* var. *weedii*	6	0.2	0.2	0.2

***Adenostoma fasciculatum* Southern Maritime Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	CABI12	*Camissonia bistorta*	6	0.2	0.2	0.2
	CRCA5	*Croton californicus*	6	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	6	0.2	0.2	0.2
	NAHA2	*Navarretia hamata*	6	0.2	0.2	0.2
	PSEUD43	*Pseudognaphalium*	6	0.2	0.2	0.2
	SILA2	*Silene laciniata* ssp. *laciniata*	6	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Achnatherum diegoense	1 of 33	List 4.2	S3.2	G3
Ceanothus verrucosus	23 of 33	List 2.2	S2.2	G3
Euphorbia misera	3 of 33	List 2.2	S3.2	G5
Ferocactus viridescens	4 of 33	List 2.1	S3.1	G4

Non-native Species:
Myoporum laetum, *Pinus* sp., *Acacia* sp., *Acacia cyclops*, *Acacia longifolia*, *Carpobrotus edulis*, *Carpobrotus* sp., *Carpobrotus chilensis*, *Bromus madritensis*, *Bromus* sp., *Limonium perezii*, *Mesembryanthemum crystallinum*, *Mesembryanthemum nodiflorum*, *Schismus barbatus*

Samples Used in Description: (n = 33)
CABR-0051, CABR-0057, CABR-0154, CABR-0155, CABR-0160, CABR-0165, CABR-0167, CABR-0168, CABR-0173, CABR-0179, CABR-0183, CABR-0195, CABR-0196, CABR-0201, CABR-0206, CABR-0238, CABR-0248, CABR-0266, CABR-0271, CABR-0275, CABR-0277, CABR-0278, CABR-0288, CABR-0400, CABR-0401, CABR-0402, CABR-0412, CABR-0461, CABR-0482, CABR-0491, CABR-0492, CABR-0527, CABR-0531

Comments:
The number of non-natives present in the local stands is indicative of the vulnerable nature of this association, which stems from its restriction to accessible upper slopes and viewpoints.

COMMON NAME	Chamise Southern Maritime Chaparral
SYNONYM	**MCV (1995):** Chamise Series. **NVCS:** *Adenostoma fasciculatum* Shrubland Alliance. **Calveg:** Chamise. **Holland:** Southern Maritime Chaparral, Chamise chaparral, **Munz:** Chaparral. **WHR:** Chamise-Redshank Chaparral.

CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG043.	California Chaparral
GROUP	Californian Xeric Chaparral
ALLIANCE	*Adenostoma fasciculatum* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bi) and Coastal Hills (261Bj) subsections.

CONSERVATION STATUS RANK G2S2

Global Description

Distribution:
The *Adenostoma fasciculatum* Alliance is one of the most widespread chaparral alliances in California. However, it only occurs along the immediate coast on oligotrophic soils (nutrient poor) in certain areas. This alliance is expressed by this association along the southern California coastal mesas, which are limited to San Diego County and adjacent Baja California Norte, Mexico. Stands are now highly fragmented due to development.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Habitats: Slopes, ridges, coastal terraces. Elevation: 20-500 m. Stands tend to occur on upper slopes and gently sloping mesas along the southern California Coastal Terraces subsection of San Diego County. Soils are rocky and derived from sandstone including the brownish-orange Pleistocene age Linda Vista Formation. Although the Linda Vista Formation is younger than the underlying Torrey Sandstone (as well as the other Eocene age sediments such as the Del Mar Formation, Ardath Shale and others), it is considerably harder. This is because the Linda Vista Formation contains an abundance of iron oxide causing it to be well-cemented. The iron oxide also accounts for the distinctive orange-brown color of this formation and also forms small pebble-like concretions, which are abundant on outcrops of the Linda Vista Formation. The presence of this hard, well-indurated sandstone above the softer Eocene sediments accounts for

the distinctive flat mesas with eroding “badland” landforms along the coast from Del Mar to Mission Valley and Point Loma. The *Adenostoma fasciculatum* Southern Maritime Association is largely restricted to these settings.

Vegetation Description:
Adenostoma fasciculatum characterizes the shrub overstory and co-occurs with other coastal species such as *Ceanothus verrucosus*, *Rhus integrifolia*, *Salvia mellifera* and *Cneoridium dumosum*. It is often present with relatively low cover. The herbaceous layer may be sparse to well developed including a variety of native species including *Camissonia* spp., *Galium* spp., *Marah macrocarpus*, and *Melica* spp.

Comments:
The newly defined association is expected to be restricted to San Diego County and adjacent northwestern Baja California. It is highly threatened by development and by high recreational use in the areas where it is protected. The Linda Vista Formation on which it tends to grow, is also home for several rare plant species such as *Dudleya blochmaniae* var. *brevifolia*, *Mucronea* (*Chorizanthe*) *californica*, and *Chorizanthe procumbens*.

References:
Bergen et al. 1997, Sawyer et al. 2009, Taylor 2004

Figure 4. Chamise Southern Maritime Chaparral on top of a bluff at Point Loma Navy Base, May 2008 (Todd Keeler-Wolf).

***Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus* Shrubland Association**

Chamise - Mission Manzanita – Wart-stemmed Ceanothus Association
Adenostoma fasciculatum-Xylococcus bicolor Alliance
Chamise - Mission Manzanita Alliance

Local Description

Summary:
This shrubland association occurs primarily on north-facing aspects along lower to upper slopes and ridge tops that are gentle to steep. It is characterized by the presence of *Xylococcus bicolor* as a sub-dominant to dominant in the shrub layer, and a sparse herbaceous layer. Stands occur on more sheltered slopes and not near the top of ridges or on mesas. The emergent tree layer is infrequent and may include non-native or planted species such as *Eucalyptus*, *Myoporum laetum*, and *Pinus*.

Distribution:
Stands are found on most sheltered, mesic slopes throughout the remaining naturally vegetated portion of the study area.

Environmental Description:
Aspect: variable, but typically NE or NW
Slope: 1 to >25 degrees
Topography (micro; macro): variable; lower to upper slopes

Vegetation Description:
Stands of *Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus* Shrubland form an open to moderate shrub layer (29-65%, mean 40.2%), with *Xylococcus bicolor* being a strong indicator and having as little as 1% cover when *Adenostoma fasciculatum* is insignificant. Shrubs range in height from 0.5-5m tall. The herbaceous layer is sparse (0.2-1%, mean 0.4%) at 0-0.5m tall. Non-native or planted trees are infrequent as emergents (0.2% cover, mean 0.2%). Total vegetation cover is 29-65%, mean 40.3%.

In this association, the shrub layer is characterized by *Xylococcus bicolor* as a strong indicator. *Rhus integrifolia*, *Ceanothus verrucosus*, *Eriogonum fasciculatum*, *Heteromeles arbutifolia*, and/or *Salvia mellifera* are often present in the shrub overstory as sub- to co-dominants. The emergent tree layer is infrequent and may include *Eucalyptus*, *Myoporum laetum*, and non-native or planted species of *Pinus*. The herbaceous layer is diverse and sparse, with *Marah macrocarpus* var. *macrocarpus*, *Calochortus weedii* var. *weedii*, and *Melica imperfecta* being the most constant.

***Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	7	0.2	0.2	0.2
Shrub						
	XYBI	*Xylococcus bicolor*	100	10.3	1	25
	RHIN2	*Rhus integrifolia*	97	8.8	1	20
	CEVE2	*Ceanothus verrucosus*	83	5.9	0.2	15
	ERFA2	*Eriogonum fasciculatum*	83	1.5	0.2	5
	SAME3	*Salvia mellifera*	79	5.5	0.2	19
	HEAR5	*Heteromeles arbutifolia*	72	2.6	0.2	11
	ADFA	*Adenostoma fasciculatum*	69	8.7	0.2	25
	CNDU	*Cneoridium dumosum*	69	1.6	0.2	10
	MALA6	*Malosma laurina*	28	3.1	0.2	12
	ARCA11	*Artemisia californica*	28	1.5	0.2	5
	ACACI	*Acacia*	17	1.7	0.2	7
	QUDU	*Quercus dumosa*	17	1.3	0.2	4
	BAPI	*Baccharis pilularis*	17	0.9	0.2	3
	CLPA2	*Clematis pauciflora*	14	0.8	0.2	1
	ACCY2	*Acacia cyclops*	10	3.0	1	5
	ENCA	*Encelia californica*	10	0.2	0.2	0.2
	ERCO25	*Eriophyllum confertiflorum*	7	0.2	0.2	0.2
	ISME5	*Isocoma menziesii*	7	0.2	0.2	0.2
	LOSCS2	*Lotus scoparius* var. *scoparius*	7	0.2	0.2	0.2
Herb						
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	17	0.4	0.2	1
	CAWEW	*Calochortus weedii* var. *weedii*	10	0.2	0.2	0.2
	MEIM	*Melica imperfecta*	10	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	7	0.2	0.2	0.2
	CARPO	*Carpobrotus*	7	0.2	0.2	0.2
	HEFA	*Deinandra fasciculata*	7	0.2	0.2	0.2
	NALE2	*Nassella lepida*	7	0.2	0.2	0.2
	SANU6	*Sairocarpus nuttallianus*	7	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	24 of 29	List 2.2	S2.2	G3
Quercus dumosa	5 of 29	List 1B.1	S1.1	G1G2

Non-native Species:
Eucalyptus, *Myoporum laetum*, *Pinus* sp., *Acacia*, *Acacia cyclops*, *Bromus madritensis*, *Carpobrotus* sp.

Samples Used in Description: (n = 29)
CABR-0064, CABR-0074, CABR-0076, CABR-0082, CABR-0083, CABR-0085, CABR-0095, CABR-0106, CABR-0110, CABR-0113, CABR-0116, CABR-0118, CABR-0128, CABR-0131, CABR-0134, CABR-0138, CABR-0152, CABR-0163, CABR-0191, CABR-0205, CABR-0208, CABR-0211, CABR-0213, CABR-0251, CABR-0254, CABR-0274, CABR-0283, CABR-0330, CABR-0361

Comments:
This is the most common chaparral of the Point Loma Peninsula and tends to occur on more sheltered locations than the *Adenostoma fasciculatum* Southern Maritime Association; the former being mostly present on north-facing slopes, while the latter occupies ridges. It can be replaced by the *Ceanothus verrucosus* Association after fire or other disturbance, or if mechanically disturbed may be replaced by several types of coastal scrub including the *Artemisia californica-Encelia californica* Association, or the *Salvia mellifera-Eriogonum fasciculatum* Association.

COMMON NAME	Chamise-Mission Manzanita-Wart-stemmed Ceanothus Association
SYNONYM	**MCV**: Chamise-Mission Manzanita-Woollyleaf Ceanothus Series. **NVCS**: *Adenostoma fasciculatum* Alliance. **Calveg**: Chamise Series, Southern Mixed Chaparral. **Holland:** Chamise Chaparral, Granitic Southern Mixed Chaparral, Mafic Southern Mixed Chaparral, Southern Mixed Chaparral, Southern Maritime Chaparral. **Munz:** Chaparral. **WHR:** Chamise-Redshank Chaparral.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG043.	California Chaparral
GROUP	Californian Xeric Chaparral
ALLIANCE	*Adenostoma fasciculatum-Xylococcus bicolor* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bi) and Coastal Hills (261Bj) subsections.

CONSERVATION STATUS RANK G2S2

Global Description

Distribution:
The Alliance is unique to San Diego and Western Riverside Counties on lower to upper slopes from the coast to inland foothills. Its range includes the South Coast (including San Diego County coastal terraces and coastal hills) to the Peninsular Ranges (including Western Riverside-Santa Ana Mountains south to San Diego County: western foothills). The association (Evens and San 2005, AECOM and VegCAMP 2010) occurs in the coastal terraces, coastal hills, and western foothills of San Diego County. It probably continues south along the northern Baja California coast.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Stands may occur on moderate to steep slopes. The parent material of this association is mostly sandstone, other sedimentary rocks, and alluvium. Soil texture is often sandy loams, occasionally clay loams, loams or sands. As discussed under the following *Ceanothus verrucosus* Association, there is a successional relationship with this association following fires and other disturbances.

Vegetation Description:
Locally, stands are typically mature, represented by large shrubs sometimes >4 m, which have not burned for many years. Steep slopes tend to have some patchiness, due to senescing shrubs, erosion rills, or even swaths of shrubs removed by occasional cars that have plunged off local roads and down embankments.

Comments:
Some confusion has existed around the definition of vegetation commonly referred to as “Southern Maritime Chaparral”. Holland (1986) considered fragmented coastal San Diego County stands with *Arctostaphylos glandulosa* ssp. *crassifolia* (a CNPS list 1B.1 plant), *Comarostaphylis diversifolia* ssp. *diversifolia* (a CNPS list 1B.2 plant), *Ceanothus verrucosus* (a CNPS list 2.2 plant), and *Quercus dumosa* (a CNPS list 1B.1 plant) to be indicative of southern maritime chaparral. Hogan et al. (1996) considered the stands along the coastal summer fog belt with these rare plants to be members of the *Adenostoma fasciculatum-Salvia mellifera* Alliance, and placed the more inland stands in this alliance.Gordon and White (1994) were the first to quantitatively define a

localized alliance in the lower elevation chaparral of the Peninsular Range foothills, which they called the *Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus tomentosus* series. Since then, Evens and San (2005) inventoried this vegetation elsewhere in San Diego County, and Klein and Evens (2006) found it in Western Riverside County, where it is common and particularly variable, including stands with the rare and local *Arctostaphylos rainbowensis* (a CNPS list 1B.1 plant). This new research has broadened the alliance to include stands lacking *C*. *tomentosus*. In all likelihood, *X*. *bicolor* is the better indicator species. Evens and San (2005) distinguished a similar association, the *Adenostoma fasciculatum-Xylococcus bicolor-Rhus integrifolia-Ceanothus verrucosus* Association, in the coastal portion of the San Dieguito River watershed. Several local stands without *Adenostoma fasciculatum* but with *X*. *bicolor*, show nearly identical ecologies to those with both species present. Evens and San (2005) inventoried similar stands in central San Diego County.

References:
Evens and San 2005, Gordon and White 1994, Hogan et al. 1996, Holland 1986, Klein and Evens 2006, AECOM and VegCAMP 2010 (unpublished report).

Figure 5. An old-growth stand of Chamise-Mission Manzanita-Wart-stemmed Ceanothus Association, Point Loma (Todd Keeler-Wolf).

***Artemisia californica-Encelia californica-Rhus integrifolia* Shrubland Association**

California Sagebrush - California Brittle Bush - Lemonade Berry Scrub Association
Artemisia californica Alliance
California Sagebrush Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, primarily along lower to upper slopes that are gentle to steep. It is characterized by the presence of *Artemisia californica* as a strong dominant in the shrub layer, and a sparse herbaceous layer. The emergent tree layer is infrequent and may include planted or escaped individuals of *Pinus torreyana*.

Distribution:
Stands are widespread in the study area especially on seaward exposures and on lower convex slopes.

Environmental Description:
Aspect: variable
Slope: 1 to >25 degrees
Topography (micro; macro): variable; occasionally bottoms and ridge tops, but more often lower to upper slopes

Vegetation Description:
Stands of *Artemisia californica-Encelia californica-Rhus integrifolia* Shrubland form an open to moderate shrub layer (14-45%, mean 30.7%), where *Artemisia californica* is a strong dominant and *Encelia californica* and *Rhus integrifolia* are characteristically present (*Rhus integrifolia* may have high cover, but is not diagnostic). Shrubs may occur in two different strata, ranging in height from 0-5m tall. The herbaceous layer is open (0.2-7%, mean 1.0%) at 0-1m tall. Trees (all non-native or planted species) are infrequent as emergents (0.2% cover, mean 0.2%). Total vegetation cover is 14-45%, mean 31.1%.

In this association, the shrub layer is characterized by the clear dominance of *Artemisia californica*. *Encelia californica* is sub-dominant while *Eriogonum fasciculatum* is absent or has low relative cover. *Rhus integrifolia* is characteristic with <20% absolute cover. The emergent tree layer is infrequent and may include *Pinus torreyana*. The herbaceous layer is open and includes a variety of species, with *Dudleya edulis*, *Nassella lepida*, *Melica imperfecta*, and *Deinandra fasciculata* being the most constant.

***Artemisia californica-Encelia californica-Rhus integrifolia* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	ARCA11	*Artemisia californica*	100	12.7	2	25
	ENCA	*Encelia californica*	100	2.4	0.2	7
	RHIN2	*Rhus integrifolia*	98	8.9	1	20
	ERFA2	*Eriogonum fasciculatum*	80	1.6	0.2	8
	CNDU	*Cneoridium dumosum*	78	1.9	0.2	12
	EUMI4	*Euphorbia misera*	67	3.6	0.2	15
	SAME3	*Salvia mellifera*	36	1.3	0.2	5
	CLPA2	*Clematis pauciflora*	20	0.9	0.2	2
	CLIS	*Cleome isomeris*	16	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	16	0.2	0.2	0.2
	LYCA	*Lycium californicum*	13	0.3	0.2	1
	CYLIN2	*Cylindropuntia*	13	0.2	0.2	0.2
	FEVI2	*Ferocactus viridescens* var. *viridescens*	13	0.2	0.2	0.2
	HEAR5	*Heteromeles arbutifolia*	9	1.3	1	2
	ACACI	*Acacia*	9	0.4	0.2	1
	OPLI3	*Opuntia littoralis*	9	0.2	0.2	0.2
	LOSCS2	*Lotus scoparius* var. *scoparius*	7	0.2	0.2	0.2
Herb						
	DUED	*Dudleya edulis*	49	0.2	0.2	0.2
	NALE2	*Nassella lepida*	29	0.3	0.2	1
	MEIM	*Melica imperfecta*	27	0.2	0.2	0.2
	HEFA	*Deinandra fasciculata*	13	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	9	0.4	0.2	1
	MECR3	*Mesembryanthemum crystallinum*	7	0.5	0.2	1
	CARPO	*Carpobrotus*	7	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	7	0.2	0.2	0.2
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	7	0.2	0.2	0.2

Other Noteworthy Species:

*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	1 of 45	List 2.2	S2.2	G3
Euphorbia misera	30 of 45	List 2.2	S3.2	G5
Ferocactus viridescens	6 of 45	List 2.1	S3.1	G4
Lycium californicum	6 of 45	List 4.2	S3.2	G4
Selaginella cinerascens	1 of 45	List 4.1	S3S4	G3G4
Viguiera laciniata	2 of 45	List 4.2	S3.2	G4

Non-native Species:
Acacia sp., *Bromus madritensis*, *Mesembryanthemum crystallinum*, *Carpobrotus* sp., *Malephora crocea*, *Avena sativa*, *Cortaderia selloana*, *Atriplex semibaccata*, *Avena fatua*, *Carpobrotus chilensis*, *Carpobrotus edulis*, *Hypericum canariense*, *Mesembryanthemum nodiflorum*, *Avena* sp.

Samples Used in Description: (n = 45)
CABR-0014, CABR-0035, CABR-0049, CABR-0101, CABR-0123, CABR-0137, CABR-0139, CABR-0140, CABR-0159, CABR-0171, CABR-0177, CABR-0180, CABR-0200, CABR-0216, CABR-0244, CABR-0250, CABR-0252, CABR-0259, CABR-0267, CABR-0272, CABR-0279, CABR-0280, CABR-0294, CABR-0299, CABR-0304, CABR-0305, CABR-0307, CABR-0309, CABR-0310, CABR-0311, CABR-0312, CABR-0313, CABR-0341, CABR-0343, CABR-0349, CABR-0364, CABR-0370, CABR-0372, CABR-0373, CABR-0383, CABR-0386, CABR-0390, CABR-0392, CABR-0410, CABR-0547

Comments:
This is the sole representative of the *Artemisia californica* Alliance in the study area. It differs from the other stands of coastal sage scrub by having a strong dominance of *A. californica* without any significant presence of *Eriogonum fasciculatum* or *Salvia mellifera*. It tends to occupy lower finer textured soils and slopes than other coastal sage scrub stands and may have higher average cover of shrubs. Although other similar *Artemisia* dominated scrubs exist in many parts of coastal southern California, stands in this study area are different than others described so far, by virtue of the high cover of *Rhus integrifolia* and the constant presence of *Encelia californica*. They also differ from other similar stands due to the irregular presence of several locally rare succulents such as *Ferrocactus*, *Mammilaria*, *Euphorbia misera*, and occasionally *Bergerocactus emoryi*. In this among other associations of coastal scrub in the PLECA area, *Rhus integrifolia* is likely to have spread and increased in recent decades (Taylor 2004).

COMMON NAME	California Sagebrush-California Brittle Bush-Lemonade Berry Coastal Scrub Association
SYNONYM	**MCV (1995):** California Sagebrush Series. **NVCS:** *Artemisia californica* Shrubland Alliance. **Calveg:** California sagebrush. **Holland:** Central Lucian Coastal Scrub, Diablan Sage Scrub, Northern Coastal Bluff Scrub, Riversidean Upland Sage Scrub, Southern Coastal Bluff Scrub, Venturan Coastal Sage Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub

DIVISION 2.B.1.a. California Scrub
MACROGROUP MG044. California Coastal Scrub
GROUP Central and South Coastal Californian Coastal Sage Scrub
ALLIANCE *Artemisia californica* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Coastal Terraces (261Bj) and Coastal Hills (261Bi)

CONSERVATION STATUS RANK G3S3?

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Coastal Terraces (261Bj) and Coastal Hills (261Bi)

CONSERVATION STATUS RANK G3S3?

Global Description

Distribution:
Artemisia californica Alliance: Central and South Coast (including Marin County south to Western Riverside and San Diego Counties), Peninsular and Transverse Ranges (including the Santa Monica, southern San Bernardino, and Santa Ana Mountains, and western foothills of San Diego County), Channel Islands, Baja California. The *Artemisia californica-Encelia californica-Rhus integrifolia* Association has not been defined prior to this study, although similar vegetation in this alliance has been described in the Santa Monica Mountains, San Dieguito River Drainage and elsewhere in San Diego County.

Nations:
United States, Mexico

States or Provinces:
California

Environmental Description:
Slopes that are usually steep and rarely flooded, usually close to the coast and exposed to salt spray and bathed in fog during the summer months. Soils are alluvial or colluvial and shallow. Elevation ranges from 0 to 100 m.

Vegetation Description:
The *Artemisia californica-Encelia californica-Rhus integrifolia* Association is found along the immediate coast of the study area on slopes above the immediate sea cliffs and bluffs. Stands are dominated by *Artemisia californica*

and *Rhus integrifolia*, with substantially less cover of *Encelia californica*. *Euphorbia misera*, *Ferocactus viridescens*, *Mammillaria dioica*, and scattered herbs such as *Selaginella cinerascens*, *Deinandra fasciculata*, etc. may be present.

Comments:
Encelia californica is indicative of largely coastal settings with slope instability or other recent or frequent disturbance. The similar *Encelia californica-Artemisia californica Shrubland* Association defined from the Santa Monica Mountains (Keeler-Wolf and Evens 2006) differs from this association by having *Artemisia californica* clearly dominant and *Encelia californica* sub-dominant. Recent sampling from Western San Diego County (AECOM and VegCAMP 2010) suggests that some *Artemisia californica* Alliance stands have *Encelia californica* and *Rhus integrifolia*, however no association is yet defined. It is likely that this association is restricted to the immediate coast in San Diego County and adjacent Baja California. This association may be differentiated from other coastal scrub stands in the study area by containing a mixture of *Artemisia californica* and *Encelia californica*, without significant cover of *Salvia mellifera* or *Eriogonum fasciculatum*; although, *Rhus integrifolia* is commonly present with insignificant to significant cover.

References:
Sawyer et al. 2009, Keeler-Wolf and Evens 2006, Taylor 2004, AECOM and VegCAMP 2010 (unpublished report).

Figure 6. California Sagebrush-California Brittle Bush-Lemonade Berry Coastal Scrub on a south-western exposure near the tip of Poin Loma (T Keeler-Wolf).

***Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya* (*edulis*) Shrubland Association**

California Sagebrush - California Buckwheat - Coast Prickly Pear / Dudleya spp. Scrub Association
Artemisia californica-Eriogonum fasciculatum Alliance
California Sagebrush - California Buckwheat Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, primarily along lower to upper slopes that are gentle to steep. It is characterized by the combined presence of *Artemisia californica* and *Eriogonum fasciculatum*, with either species being co-dominant or dominant. The herb layer is open. The emergent tree layer is infrequent and may include *Eucalyptus*, *Myoporum laetum*, and *Schinus molle*.

Distribution:
Stands occur on mid to upper slopes on exposed and well drained, often convex exposures throughout the study area.

Environmental Description:
Aspect: variable
Slope: 0 to >25 degrees
Topography (micro; macro): variable; occasionally bottoms and ridge tops, but more often lower to upper slopes

Vegetation Description:
Stands of *Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya* (*edulis*) Shrubland form an open to moderate shrub layer (4-60%, mean 23.4%), and are characterized by the combined presence of *Artemisia californica* and *Eriogonum fasciculatum*, with either species being co-dominant or dominant. Various combinations of cacti (e.g., *Opuntia*, *Cylindropuntia*, and *Ferocactus*) are present in the shrub layer as diagnostic species. Shrubs may occur in two different strata, and range in height from 0-5m tall. The herbaceous layer is open (0.2-5%, mean 0.9%) at 0-0.5m tall. Non-native or planted trees are infrequent as emergents. Total vegetation cover is 4-60%, mean 24.1%.

In this association, the shrub layer is characterized by the combined presence of *Artemisia californica* and *Eriogonum fasciculatum*, with either species being co-dominant or dominant. *Rhus integrifolia* and *Cneoridium dumosum* are usually present. The emergent tree layer is infrequent and may include *Eucalyptus*, *Myoporum laetum*, and *Schinus molle*. A species of *Dudleya* is often in the herb layer, co-occuring with a variety of other herbs such as *Deinandra fasciculata*, *Melica imperfecta*, *Nassella lepida*, *Bromus madritensis*, and *Calochortus weedii* var. *weedii*.

***Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya* (*edulis*) Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	ARCA11	*Artemisia californica*	100	6.3	0.2	22
	ERFA2	*Eriogonum fasciculatum*	100	4.4	0.2	15
	RHIN2	*Rhus integrifolia*	89	5.9	0.2	30
	CNDU	*Cneoridium dumosum*	56	2.7	0.2	20
	EUMI4	*Euphorbia misera*	48	4.1	0.2	13
	SAME3	*Salvia mellifera*	41	1.2	0.2	4
	ENCA	*Encelia californica*	41	1.1	0.2	4
	FEVI2	*Ferocactus viridescens* var. *viridescens*	25	0.3	0.2	2
	CYLIN2	*Cylindropuntia*	16	0.3	0.2	1
	HEAR5	*Heteromeles arbutifolia*	15	0.2	0.2	0.2
	ACACI	*Acacia*	11	3.1	0.2	10
	OPLI3	*Opuntia littoralis*	11	0.2	0.2	0.2
	BAPI	*Baccharis pilularis*	10	1.1	0.2	4
	ISME5	*Isocoma menziesii*	10	1.0	0.2	4
	LYCA	*Lycium californicum*	10	0.5	0.2	1
	CLIS	*Cleome isomeris*	10	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	10	0.2	0.2	0.2
	MALA6	*Malosma laurina*	8	3.0	0.2	8
	ACCY2	*Acacia cyclops*	8	0.7	0.2	2
	LOSCS2	*Lotus scoparius* var. *scoparius*	8	0.2	0.2	0.2
	ADFA	*Adenostoma fasciculatum*	7	2.1	0.2	5
	ERCRC	*Eriodictyon crassifolium* var. *crassifolium*	7	0.4	0.2	1
	RHCR	*Rhamnus crocea*	5	2.1	0.2	6
	CEVE2	*Ceanothus verrucosus*	5	1.1	0.2	3
	ACLO	*Acacia longifolia*	5	0.5	0.2	1
	BASA2	*Baccharis sarothroides*	5	0.5	0.2	1
	BEEM	*Bergerocactus emoryi*	5	0.2	0.2	0.2
	CLPA2	*Clematis pauciflora*	5	0.2	0.2	0.2
	ERCO25	*Eriophyllum confertiflorum*	5	0.2	0.2	0.2
	MADI3	*Mammillaria dioica*	5	0.2	0.2	0.2
Herb						
	DUED	*Dudleya edulis*	56	0.3	0.2	1
	HEFA	*Deinandra fasciculata*	43	0.5	0.2	5
	MEIM	*Melica imperfecta*	23	0.3	0.2	1
	NALE2	*Nassella lepida*	20	0.4	0.2	2
	BRMA3	*Bromus madritensis*	16	0.2	0.2	0.2
	CAWEW	*Calochortus weedii* var. *weedii*	15	0.2	0.2	0.2

***Artemisia californica-Eriogonum fasciculatum-Opuntia littoralis/Dudleya* (*edulis*) Association cont.**

Layer	**Code**	**Species Name**	**Con**	**Avg**	**Min**	**Max**
Herb						
	CARPO	*Carpobrotus*	13	0.9	0.2	5
	DUPU	*Dudleya pulverulenta*	13	0.2	0.2	0.2
	MENO2	*Mesembryanthemum nodiflorum*	11	0.2	0.2	0.2
	STEPH	*Stephanomeria*	11	0.2	0.2	0.2
	ATSE	*Atriplex semibaccata*	10	0.2	0.2	0.2
	CAED3	*Carpobrotus edulis*	8	0.2	0.2	0.2
	MECR3	*Mesembryanthemum crystallinum*	8	0.2	0.2	0.2
	UNKNO	*Unknown*	7	0.2	0.2	0.2
	ASTR6	*Astragalus trichopodus*	5	0.2	0.2	0.2
	DUCA4	*Dudleya caespitosa*	5	0.2	0.2	0.2
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	5	0.2	0.2	0.2
	SANU6	*Sairocarpus nuttallianus*	5	0.2	0.2	0.2
Cryptogam						
	SECI	*Selaginella cinerascens*	5	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Agave shawii	2 of 61	List 2.1	S1.2	G2G3
Bergerocactus emoryi	3 of 61	List 2.2	S2.1	G2G3
Calandrinia breweri	1 of 61	List 4.2	S3.2?	G4
Camissonia lewisii	1 of 61	List 3	S1S3	G2G3
Ceanothus verrucosus	3 of 61	List 2.2	S2.2	G3
Euphorbia misera	29 of 61	List 2.2	S3.2	G5
Ferocactus viridescens	15 of 61	List 2.1	S3.1	G4
Lycium californicum	6 of 61	List 4.2	S3.2	G4
Quercus dumosa	1 of 61	List 1B.1	S1.1	G1G2
Selaginella cinerascens	3 of 61	List 4.1	S3S4	G3G4
Viguiera laciniata	2 of 61	List 4.2	S3.2	G4

Non-native Species:
Eucalyptus sp., *Myoporum laetum*, *Schinus molle*, *Acacia* sp., *Acacia cyclops*, *Acacia longifolia*, *Ricinus communis*, *Bromus madritensis*, *Carpobrotus* sp., *Mesembryanthemum nodiflorum*, *Atriplex semibaccata*, *Carpobrotus edulis*, *Mesembryanthemum crystallinum*, *Erodium cicutarium*, *Lamarckia aurea*,

Malephora sp., *Carpobrotus chilensis*, *Avena fatua*, *Centaurea melitensis*, *Cortaderia selloana*, *Mesembryanthemum* sp.

Samples Used in Description: (n = 61)
CABR-0008, CABR-0023, CABR-0034, CABR-0050, CABR-0058, CABR-0066, CABR-0070, CABR-0104, CABR-0108, CABR-0109, CABR-0117, CABR-0124, CABR-0127, CABR-0130, CABR-0132, CABR-0145, CABR-0146, CABR-0149, CABR-0174, CABR-0175, CABR-0186, CABR-0187, CABR-0188, CABR-0214, CABR-0219, CABR-0228, CABR-0231, CABR-0232, CABR-0240, CABR-0247, CABR-0249, CABR-0268, CABR-0270, CABR-0276, CABR-0281, CABR-0287, CABR-0306, CABR-0327, CABR-0356, CABR-0358, CABR-0382, CABR-0384, CABR-0395, CABR-0405, CABR-0409, CABR-0415, CABR-0416, CABR-0430, CABR-0439, CABR-0442, CABR-0447, CABR-0463, CABR-0465, CABR-0483, CABR-0489, CABR-0504, CABR-0513, CABR-0526, CABR-0529, CABR-0533, CABR-0537

Comments:
This association contains a high diversity of cacti, Dudleya, and semi-desert coastal shrubs. At least 6 cacti species, a yucca, two dudleya, a pachycaul, *Euphorbia*, and a thorny Lycium have been sampled in stands of this association at PLECA. Such stands bear a resemblance to those that extend farther south into northwestern Baja California.

COMMON NAME	California Sagebrush-California Buckwheat-Coast Prickly Pear/Dudleya spp. Association
SYNONYM	**MCV (1995):** California Sagebrush-California Buckwheat Series. **NVCS**: *Artemisia californica-Eriogonum fasciculatum* Shrubland Alliance. **Calveg:** Alluvial Fan Sage Scrub, California Buckwheat, California Sagebrush. **Holland:** Diegan Coastal Sage Scrub, Riversidean Upland Sage Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG044.	California Coastal Scrub
GROUP	Central and South Coastal Californian Coastal Sage Scrub
ALLIANCE	*Artemisia californica-Eriogonum fasciculatum* Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Probably the South Coast (San Diego County), including Coastal Hills (261Bi) and Western Granitic Foothills (M262Bn) subsections and adjacent Baja. This association was defined for the first time in this study, so distributional knowledge is incomplete.

CONSERVATION STATUS RANK G3S2

Global Description

Distribution:
The *Artemisia californica-Eriogonum fasciculatum* Alliance is found along California's, outer and inner central coast ranges, southward to the Transverse and Peninsular ranges of southern California. It may also occur in the northern portion of Baja California, Mexico. Local distribution of the alliance in San Diego County is widespread. For example, Evens and San (2005) note the *Artemisia californica-Eriogonum fasciculatum* Alliance was sampled in the Coastal Hills (261Bi) and Western Granitic Foothills (M262Bn) Subsections, especially near Lake Hodges and east to the Pamo Valley area. Inland from the coast Evens and San found it on anthropogenically disturbed slopes (e.g., foot traffic, grazing) more regularly than the pure *Artemisia californica* or *Artemisia californica-Salvia apiana* Alliances. This association, characterized by several succulent species of herbs and shrubs, has not been described formally before. Although ongoing work on the vegetation of Western San Diego County (AECOM and VegCAMP 2010) shows an analogous association present along coastal bluffs both north and south of the Pt. Loma study area. It probably occurs farther south along the north coast of Baja California, Mexico.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
The alliance occurs on steep and usually south-facing slopes. Soils are derived from colluvial substrate. Elevation for the alliance: 250-950 m

Vegetation Description:
As defined in California (Sawyer et al. 2009), in this alliance *Artemisia californica* and *Eriogonum fasciculatum* are co-dominant in the shrub canopy with a number of other shrubs, both chaparral and coastal sage scrub species, present at lower cover. Most shrubs are <2 m, though some are <5 m tall (such as *Malosma* and *Rhus integrifolia*); canopy is two tiered, and intermittent to continuous. The herbaceous layer is seasonally present.
This particular association appears to be a warm coastal bluff expression of the alliance. It has several species of limited extent associated with it including *Cneoridium dumosum*, *Euphorbia misera*, *Ferocactus viridescens*, *Lycium*

californicum, *Yucca schidigera*, *Bergerocactus emoryi*, and *Mammillaria dioica*. Collectively, these species may be considered representative of a semi-desert succulent flora that is even more pronounced further south in Baja California. Although any single stand may not have all of these species, the sum total of these species suggests the reason for the colloquial name for the association.

Comments:
This association occurs on rocky slopes and bluffs and is differentiated from other coastal scrub stands in the study area by containing a mixture of *Artemisia californica* and *Eriogonum fasciculatum* without any significant cover of *Salvia mellifera* or *Encelia californica*. Although *Rhus integrifolia* is commonly present and may be co-dominant with *A*. *californica* and *E*. *fasciculatum*, the most noticeable presence are low to moderate cover of several species of succulent herbs or pachycaulous shrubs such as *Euphorbia misera*, *Ferocactus viridescens*, *Bergerocactus emoryi*, *Cylindropuntia*, *Opuntia*, *Dudleya* and *Mammilaria dioica*.

References:
Evens and San 2005, Sawyer et al. 2009, AECOM and VegCAMP 2010 (unpublished report).

Figure 7. California Sagebrush-California Buckwheat-Coast Prickly Pear/Dudleya spp. Association on a bluff above the Pacific Ocean, Pt. Loma NM, May 2008 (T. Keeler-Wolf).

Artemisia californica-Salvia mellifera **Shrubland Association**

California Sagebrush - Black Sage Scrub Association
Artemisia californica-Salvia mellifera Alliance
California Sagebrush - Black Sage Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, along lower to upper slopes that are gentle to steep. It is characterized by the combined presence of *Artemisia californica* and *Salvia mellifera*, with *A*. *californica* being co-dominant or dominant. The herb layer is open. The emergent tree layer is infrequent and may include non-native or planted species such as *Eucalyptus* or *Pinus*.

Distribution:
Stands of this association are found on upper slopes usually away from the immediate outer coast. They are well represented along the Bayside Trail at CABR.

Environmental Description:
Aspect: variable
Slope: 5 to >25 degrees
Topography (micro; macro): variable; lower to upper slopes

Vegetation Description:
Stands of *Artemisia californica-Salvia mellifera* Shrubland form an open to moderate shrub layer (1-50%, mean 28.1%), that is characterized by the combined presence of *Artemisia californica* and *Salvia mellifera* (*S*. *mellifera* being co-dominant to sub-dominant). Shrubs may occur in two different strata, with heights ranging up to 5m tall. The herbaceous layer is open (0.2-24%, mean 2.3%) at 0-1m tall. Non-native or planted trees are infrequent as emergents (0.2% cover, mean 0.2%). Total vegetation cover is 16-50%, mean 29%.

In this association, the shrub layer is characterized by *Artemisia californica* and *Salvia mellifera*, with *A*. *californica* being dominant to co-dominant. *Rhus integrifolia* and *Eriogonum fasciculatum* are characteristically present, with *Eriogonum fasciculatum* occasionally being co-dominant. The emergent tree layer is infrequent and may include *Eucalyptus* or a non-native species of *Pinus*. The herbaceous layer may include a variety of species, with *Dudleya edulis*, *Melica imperfecta*, *Nassella lepida*, and *Deinandra fasciculata* being the most constant.

***Artemisia californica-Salvia mellifera* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	9	0.2	0.2	0.2
Shrub						
	ARCA11	*Artemisia californica*	100	7.2	3	13
	SAME3	*Salvia mellifera*	100	5.2	0.2	10
	RHIN2	*Rhus integrifolia*	97	9.1	0.2	30
	ERFA2	*Eriogonum fasciculatum*	94	3.5	0.2	10
	CNDU	*Cneoridium dumosum*	50	2.5	0.2	5
	HEAR5	*Heteromeles arbutifolia*	47	1.2	0.2	5
	ENCA	*Encelia californica*	38	1.5	0.2	5
	EUMI4	*Euphorbia misera*	31	2.3	0.2	5
	CLPA2	*Clematis pauciflora*	28	0.6	0.2	1
	CEVE2	*Ceanothus verrucosus*	16	0.9	0.2	2
	ADFA	*Adenostoma fasciculatum*	16	0.2	0.2	0.2
	RHCR	*Rhamnus crocea*	13	0.4	0.2	1
	XYBI	*Xylococcus bicolor*	13	0.2	0.2	0.2
	ACCY2	*Acacia cyclops*	9	0.8	0.2	2
	FEVI2	*Ferocactus viridescens* var. *viridescens*	9	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	9	0.2	0.2	0.2
	ACACI	*Acacia*	6	6.0	1	11
	CLIS	*Cleome isomeris*	6	0.2	0.2	0.2
	CYLIN2	*Cylindropuntia*	6	0.2	0.2	0.2
Herb						
	DUED	*Dudleya edulis*	34	0.2	0.2	0.2
	MEIM	*Melica imperfecta*	22	0.2	0.2	0.2
	NALE2	*Nassella lepida*	22	0.2	0.2	0.2
	HEFA	*Deinandra fasciculata*	16	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	6	0.2	0.2	0.2
	CAWEW	*Calochortus weedii* var. *weedii*	6	0.2	0.2	0.2
	DULA	*Dudleya lanceolata*	6	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	6	0.2	0.2	0.2
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	6	0.2	0.2	0.2
	STEPH	*Stephanomeria*	6	0.2	0.2	0.2
Cryptogam						
	SECI	*Selaginella cinerascens*	6	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Agave shawii	1 of 11	List 2.1	S1.2	G2G3
Lycium californicum	3 of 11	List 4.2	S3.2	G4
Viguiera laciniata	1 of 11	List 4.2	S3.2	G4

Non-native Species:
Eucalyptus sp., *Pinus* sp., *Acacia cyclops*, *Acacia* sp., *Acacia longifolia*, *Bromus madritensis*, *Carpobrotus edulis*, *Cyperus involucratus*, *Mesembryanthemum nodiflorum*

Samples Used in Description: (n = 32)
CABR-0011, CABR-0015, CABR-0022, CABR-0045, CABR-0063, CABR-0067, CABR-0073, CABR-0081, CABR-0087, CABR-0148, CABR-0164, CABR-0169, CABR-0172, CABR-0176, CABR-0181, CABR-0189, CABR-0199, CABR-0210, CABR-0246, CABR-0258, CABR-0282, CABR-0292, CABR-0338, CABR-0340, CABR-0363, CABR-0376, CABR-0377, CABR-0380, CABR-0437, CABR-0445, CABR-0485, CABR-0500

Comments:
This association occurs on rocky slopes and bluffs and is differentiated from other coastal scrub stands in the study area by containing a mixture of *Artemisia californica* and *Salvia mellifera* with insignificant *Encelia californica*. *Rhus integrifolia* is commonly present and may be co-dominant to dominant with *A. californica* and *Salvia mellifera*. Several species of succulent or pachycaulous shrubs such as *Euphorbia misera*, *Ferocactus viridescens*, *Bergerocactus emoryi*, *Cylindropuntia oricola*, *Dudleya* spp. and *Yucca schidigera* may be present; however, no individual succulent has particularly high constancy or cover.

This association is often found on convex ridges and spurs. These are well drained and relatively hot and dry exposures, despite the proximity to the Pacific Ocean

COMMON NAME	California Sagebrush-Black Sage Coastal Scrub
SYNONYM	**MCV (1995):** California Sagebrush-California Buckwheat Series. **NVCS**: *Artemisia californica-Salvia mellifera* Shrubland Alliance. **Calveg:** Alluvial Fan Sage Scrub, California Buckwheat, California Sagebrush. **Holland:** Diegan Coastal Sage Scrub, Riversidean Upland Sage Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)

SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG044.	California Coastal Scrub
GROUP	Central and South Coastal Californian Coastal Sage Scrub
ALLIANCE	*Artemisia californica-Salvia mellifera* Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Probably the South Coast (San Diego County), including Coastal Hills (261Bi) and Western Granitic Foothills (M262Bn) subsections and adjacent Baja.

CONSERVATION STATUS RANK G3S3

Global Description

Distribution:
Alliance: Central Coast (including Santa Clara and San Benito Counties), Transverse and Peninsular Ranges (including Santa Ana Mountains and San Jacinto Foothills), southern California along the Coast Ranges, northward along the coast.
As currently understood, the *Artemisia californica-Salvia mellifera* Association occurs in the Peninsular Ranges (Western Riverside County: Santa Ana Mountains and San Jacinto Foothills-Cahuilla Mountains Subsections), south through San Diego County, to NW Baja. Its full distribution is not known. In San Diego County the association has previously been called the *A. californica-S. mellifera-Baccharis sarothroides* Association (Evens and San 2005), although a more complete analysis of the western county vegetation (AECOM and VegCAMP 2010) suggests that the *A. californica-S. mellifera* Association, is a single broadly defined association within the county. This single association is found mainly in the western portion of the county in the Coastal Hills (261Bi) and Coastal Terraces (261Bj) Subsections.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Slopes that are steep and usually south-facing. Soils are colluvial derived. Elevation ranges from 250-950 m.

Vegetation Description:
Stands of *Artemisia californica-Salvia mellifera* Shrubland Association analyzed from Western San Diego County (AECOM and VegCAMP 2010) form an open to continuous shrub layer (13-90%, mean 43.8%), with *Artemisia californica* and *Salvia mellifera* characterizing stands, often as co-dominants. Shrubs range from 0.5-5m tall. The herbaceous layer is sparse to open (0.2-40%, mean 10.3%) at 0-2m tall. Trees infrequently occur as emergents at 5-10m tall. Total vegetation cover is 15-92%, mean 51.7%.

Comments:
Although this same association has been described from the Santa Monica Mountains (Keeler-Wolf and Evens 2006), Western Riverside County (Klein and Evens 2006), San Dieguito River Park (Evens and San 2005), and recent work in other parts of Western San Diego County (AECOM and VegCAMP 2010), the local PLECA stands are distinctive in having the presence of *Euphorbia misera*, *Ferocactus viridescens*, and other unusual species. Other stands of this association occur in San Diego County and usually do not contain the local rarities. We follow the convention of not naming a new association with local variation based on a very small geographic area. It is likely that the PLECA stands are a local phase or variant of a widespread association.

References:
Evens and San 2005, Gordon and White 1994, Desimone and Burk 1992, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Sawyer and Keeler-Wolf 1995, Sawyer et al. 2009, AECOM and VegCAMP 2010 (unpublished report).

Figure 8. California Sagebrush - Black Sage Scrub Association (Todd Keeler-Wolf).

***Atriplex lentiformis* Shrubland Association**

Quailbush Scrub Association
Atriplex lentiformis Alliance
Quailbush Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, generally with exposures facing the ocean or San Diego Bay. It can be found along lower to upper slopes that are gentle to steep. *Atriplex lentiformis* is typically dominant in the shrub layer, associated with lower cover of other coastal sage scrub species. This is the only shrub *Atriplex* vegetation type found in the PLECA study area (non-native *A semibaccata* does not form stands here). The herb layer is open and often contains several non-native species of iceplant. Emergent non-native or planted trees layer are infrequent with low cover.

Distribution:
Stands occur locally on roadsides and on the top or edges of coastal bluffs scattered throughout the study area. Stands also occur along the protected shore of San Diego Bay on sand.

Environmental Description:
Aspect: variable
Slope: usually between 0 to 25 degrees, rarely >25 degrees
Topography (micro; macro): often flat, sometimes concave or convex; bottom to middle slopes

Vegetation Description:
Stands of *Atriplex lentiformis* Shrubland form an open to moderate shrub layer (8-38%, mean 22.9%), where *Atriplex lentiformis* is conspicuous and has higher cover than other coastal sage scrub shrubs. Shrubs may occur in two different strata, with heights ranging from 0.5-5m tall. The herbaceous layer is open (0.2-14%, mean 3.9%) at ≤0.5m tall. Non-native or planted trees are infrequent as emergents (1% cover, mean 0.2%). Total vegetation cover is 11-40%, mean 26.1%.

In this association, the shrub layer is characterized by *Atriplex lentiformis* with higher cover than other coastal sage shrubs. *Artemisia californica* and *Encelia californica* are often present as sub-dominants while *Rhus integrifolia* is characteristic and occasionally co-dominant. The emergent tree layer is infrequent and includes *Eucalyptus* or other planted/escape species. The herbaceous layer may include a variety of species, the most constant being *Mesembryanthemum nodiflorum*, *Bromus madritensis*, *Mesembryanthemum crystallinum*, *Malephora crocea*, *Carpobrotus edulis*, and *Amblyopappus pusillus*.

Atriplex lentiformis Association

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	9	1.0	1	1
Shrub						
	ATLE	*Atriplex lentiformis*	100	17.5	5	37
	RHIN2	*Rhus integrifolia*	82	2.4	0.2	7
	ENCA	*Encelia californica*	73	1.6	0.2	5
	ARCA11	*Artemisia californica*	73	0.9	0.2	2
	ACACI	*Acacia*	45	1.8	0.2	5
	ERFA2	*Eriogonum fasciculatum*	36	0.7	0.2	2
	LYCA	*Lycium californicum*	27	0.2	0.2	0.2
	BAPI	*Baccharis pilularis*	18	1.5	1	2
	BASA2	*Baccharis sarothroides*	18	0.6	0.2	1
	ISME5	*Isocoma menziesii*	9	4.0	4	4
	ATCAC	*Atriplex canescens* var. *canescens*	9	2.0	2	2
	SAEX	*Salix exigua*	9	1.0	1	1
	VILA3	*Viguiera laciniata*	9	1.0	1	1
	AGSH	*Agave shawii* var. *shawii*	9	0.2	0.2	0.2
	ECCA5	*Echium candicans*	9	0.2	0.2	0.2
	ENFA	*Encelia farinosa*	9	0.2	0.2	0.2
	ERGIG	*Eriogonum giganteum* var. *giganteum*	9	0.2	0.2	0.2
	LOSCS2	*Lotus scoparius* var. *scoparius*	9	0.2	0.2	0.2
	MALA6	*Malosma laurina*	9	0.2	0.2	0.2
	SAME3	*Salvia mellifera*	9	0.2	0.2	0.2
Herb						
	MENO2	*Mesembryanthemum nodiflorum*	55	0.7	0.2	1
	BRMA3	*Bromus madritensis*	45	0.9	0.2	2
	MECR3	*Mesembryanthemum crystallinum*	36	0.4	0.2	1
	MACR3	*Malephora crocea*	27	0.5	0.2	1
	CAED3	*Carpobrotus edulis*	18	3.6	0.2	7
	AMPU3	*Amblyopappus pusillus*	18	0.6	0.2	1
	CARPO	*Carpobrotus*	9	10.0	10	10
	POACXX	*Poaceae*	9	3.0	3	3
	BRDI3	*Bromus diandrus*	9	1.0	1	1
	ARDO3	*Artemisia douglasiana*	9	0.2	0.2	0.2
	ATSE	*Atriplex semibaccata*	9	0.2	0.2	0.2
	ATSES	*Atriplex serenana* var. *serenana*	9	0.2	0.2	0.2

***Atriplex lentiformis* Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	BRHO2	*Bromus hordeaceus*	9	0.2	0.2	0.2
	DISP	*Distichlis spicata*	9	0.2	0.2	0.2
	EUCH	*Eucrypta chrysanthemifolia*	9	0.2	0.2	0.2
	HEFA	*Deinandra fasciculata*	9	0.2	0.2	0.2
	HORDE	*Hordeum*	9	0.2	0.2	0.2
	LIPE	*Limonium perezii*	9	0.2	0.2	0.2
	MALEP	*Malephora*	9	0.2	0.2	0.2
	MEIN2	*Melilotus indicus*	9	0.2	0.2	0.2
	PAIN	*Parapholis incurva*	9	0.2	0.2	0.2
	SANU6	*Sairocarpus nuttallianus*	9	0.2	0.2	0.2
	SCBA	*Schismus barbatus*	9	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Agave shawii	1 of 11	List 2.1	S1.2	G2G3
Lycium californicum	3 of 11	List 4.2	S3.2	G4
Viguiera laciniata	1 of 11	List 4.2	S3.2	G4

Non-native Species:
Eucalyptus sp., *Echium candicans*, *Eriogonum giganteum* var. *giganteum*, *Mesembryanthemum nodiflorum*, *Bromus madritensis*, *Mesembryanthemum crystallinum*, *Malephora crocea*, *Carpobrotus edulis*, *Carpobrotus* sp., *Bromus diandrus*, *Atriplex semibaccata*, *Atriplex serenana* var. *serenana*, *Bromus hordeaceus*, *Limonium perezii*, *Malephora* sp., *Melilotus indicus*, *Parapholis incurva*, *Schismus barbatus*

Samples Used in Description: (n = 11)
CABR-0032, CABR-0224, CABR-0329, CABR-0389, CABR-0397, CABR-0399, CABR-0406, CABR-0419, CABR-0423, CABR-0475, CABR-0519

Comments:
The local stands of Atriplex lentiformis Association are small and patchy. The associated species are also found in adjacent more extensive stands of the *Encelia californica*, *Lycium californicum*, and Artemisia californica Alliances. This suggests that *Atriplex lentiformis* has recently colonized (or was recently introduced to) the area and stands have little ecological integrity.

COMMON NAME	Quailbush Scrub
SYNONYM	**MCV (1995):** Mixed Salt Shrub Series. **NVCS:** *Atriplex* (*lentiformis*, *polycarpa*) Shrubland Alliance. **Calveg:** Saltbush. **Holland:** Alkali Meadow, Desert Saltbush Scrub, Desert Sink Scrub, Valley Saltbush Scrub, Venturan Coastal Sage Scrub. **Munz:** Alkali Sink, Coastal Sage Scrub. **WHR:** Alkali Desert Scrub, Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.C.	Temperate and Boreal Shrubland and Grassland
FORMATION 2.C.6.	Temperate and Boreal Salt Marsh
DIVISION 1.C.2.x.	Western North American Interior Alkali-Saline Wetland
MACROGROUP MG083.	Warm Semi-Desert/Mediterranean Alkali-Saline Wetland
GROUP	Southwestern North American Salt Basin and High Marsh
ALLIANCE	*Atriplex lentiformis* Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Central California Coast (261Aa), Central California Coast Ranges (M262Ai-j), Colorado Desert (322Ca-c), Great Valley (262Ag, Al, Aq, Av-y), Mojave Desert (322Aa, Ag), Mono (341Di)., Southern California Coast (261Bd-g, Bj), Southern California Mountains and Valleys (M262Bj, Bl, Bp).

CONSERVATION STATUS RANK G4S4

Global Description

Distribution:
This alliance is very widespread. However, the stands along the south coast of California may be largely introduced because of their supposed restoration and colonization qualities. Stands in the study area are typically associated with disturbed roadsides, cliffsides, trailsides, and eroded slopes near the sea or sheltered coast.

Nations:
United States, Mexico

States or Provinces:
Oregon, California, Nevada, Arizona, New Mexico, Baja California Norte Mexico

Environmental Description:
Bluffs, disturbed land, sand dunes of immediate coastline, coastal and alkaline terraces. Elevation**:** 0-100 m.

Vegetation Description:
As defined in California (Sawyer et al. 2009), *Atriplex lentiformis* is dominant in the shrub canopy with *Artemisia californica*, *Baccharis pilularis*, *Encelia californica*, *Malosma laurina*, *Myoporum laetum*, *Rhus integrifolia*, and a number of other shrub species present. Shrubs <5 m, the canopy is open to intermittent. The herbaceous layer is variable. Locally, stands have *R*. *integrifolia*, *Encelia californica*, *Artemisia californica*, and *Lycium californicum* and others as sub-dominants.

Comments:
The tolerance of *Atriplex lentiformis* for salty soils makes this species a favorite amongst restoration ecologists. The native status of the local stands is unclear. Similar comments were made by Keeler-Wolf and Evens (2006) about stands in the Santa Monica Mountains.

References:
Keeler-Wolf and Evens 2006, Sawyer et al. 2009.

Figure 9. Quailbush Scrub Association nears the sheltered beach at Pt Loma Navy Base (T. Keeler-Wolf).

Baccharis pilularis-Artemisia californica **Shrubland Association**

Coyote Brush - California Sagebrush Association
Baccharis pilularis Alliance
Coyote Brush Scrub Alliance

Local Description

Summary:
This shrubland association may occur on steep slopes with northwest aspect and flat topography. It is characterized by the dominance or co-dominance of *Baccharis pilularis* in the shrub layer with *Artemisia californica* and an assortment of other shrub species. Emergent non-native or planted trees are infrequent.

Distribution:
This alliance is not well represented in the study area. Locally, stands are rare and occupy recently disturbed or eroded areas.

Environmental Description:
Aspect: NW
Slope: >25 mean degrees
Topography (micro; macro): flat; upper slope

Vegetation Description:
One stand of *Baccharis pilularis-Artemisia californica* Shrubland forms an open shrub layer (18%), where *Baccharis pilularis* is dominant or co-dominant with *Artemisia californica* and *Heteromeles arbutifolia*. Shrubs may occur in two different strata, ranging in height from 0.5-5m tall. The herbaceous layer is sparse (2%) at 0-0.5m tall. Non-native or planted trees may be emergent. Total vegetation cover is 20%.

In this association, the shrub layer is characterized by the soft leaved evergreen *Baccharis pilularis* as a dominant or co-dominant with *Artemisia californica*. Other shrub species may include *Heteromeles arbutifolia*, *Rhus integrifolia*, *Eriogonum fasciculatum*, and *Salvia mellifera*. The emergent trees are infrequent and may include *Eucalyptus*. The herbaceous layer may include *Bromus madritensis*, *Bromus diandrus*, *Hypericum canariense*, *Leymus condensatus*, *Pseudognaphalium* spp.

***Baccharis pilularis-Artemisia californica* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	100	0.2	0.2	0.2
Shrub						
	BAPI	*Baccharis pilularis*	100	7.0	7	7
	HEAR5	*Heteromeles arbutifolia*	100	7.0	7	7
	ARCA11	*Artemisia californica*	100	4.0	4	4
	RHIN2	*Rhus integrifolia*	100	3.0	3	3
	ERFA2	*Eriogonum fasciculatum*	100	1.0	1	1
	SAME3	*Salvia mellifera*	100	0.2	0.2	0.2
Herb						
	BRMA3	*Bromus madritensis*	100	1.0	1	1
	BRDI3	*Bromus diandrus*	100	0.2	0.2	0.2
	HYCA11	*Hypericum canariense*	100	0.2	0.2	0.2
	LECO12	*Leymus condensatus*	100	0.2	0.2	0.2
	PSCA13	*Pseudognaphalium californicum*	100	0.2	0.2	0.2
	PSST7	*Pseudognaphalium stramineum*	100	0.2	0.2	0.2

Non-native Species:
Eucalyptus sp., *Bromus madritensis*, *Bromus diandrus*, *Hypericum canariense*

Samples Used in Description: (n = 1)
CABR-0094

Comments:
This association is poorly represented in the study area and has been described primarily from the Santa Monica Mountains in Los Angeles and Ventura counties (Keeler-Wolf and Evens 2006), California.

COMMON NAME	Coyote Brush-California Sagebrush Coastal Scrub
SYNONYM	**MCV (1995):** Coyote Brush Series. **NVCS:** *Baccharis pilularis* Shrubland Alliance. **Calveg:** Coyote Brush. **Holland:** Diablan Sage Scrub, Northern Dune Scrub, Northern (Franciscan) Coastal Bluff Scrub, Northern Coyote Brush Scrub. **Munz:** Coastal Sage Scrub, Northern Coastal Scrub. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.C.	Temperate and Boreal Shrubland and Grassland
FORMATION 2.C.3.	Temperate and Boreal Scrub and Herb Coastal Vegetation
DIVISION 2.C.3.b.	Pacific Coast Scrub and Herb Littoral Vegetation

MACROGROUP MG058. Vancouverian Coastal Dune and Bluff
GROUP California Coastal Evergreen Bluff and Dune Scrub
ALLIANCE *Baccharis pilularis* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Central California Coast (261A), Central California Coast Ranges (M262Aa-f, Ah), Southern California Coast (261B), Southern California Mountains and Valleys (M262Bf, Bj-k, Bn-o).

CONSERVATION STATUS RANK G4?S4?

Global Description

Distribution:
This alliance occurs throughout much of cismontane California and adjacent Oregon and NW Baja California. Throughout most of south-coastal California stands are mostly early seral, persisting usually for short periods, transitional to other more persistent alliances of coastal sage scrub, or riparian groups. The *Baccharis pilularis-Artemisia californica* Association is restricted to the central and south coastal areas of California. The probable range is in the outer and inner coast ranges from the San Francisco Bay Area to NW Baja California.

Nations: US, Mexico

States or Provinces: California, Oregon, Baja California Norte

Environmental Description:
Globally, stands of the *Baccharis pilularis* Alliance occupy river mouths, stream sides, terraces, stabilized dunes of coastal bars, spits along the coastline, coastal bluffs, open slopes, ridges. Soils are variable, sandy to relatively heavy clay. Elevations range from 0-1500 m. This particular association has been sampled largely from south coastal California where it ranges from sea level to over 500 m elevation. It occurs on a variety of substrates from sedimentary to igneous and tends to occur on moderately fine silty or sandy clay loam soils.

Vegetation Description:
As defined in California (Sawyer et al. 2009), *Baccharis pilularis* is dominant to co-dominant in the shrub canopy with *Artemisia californica*, *Ceanothus thyrsiflorus*, *Corylus cornuta*, *Diplacus aurantiacus*, *Eriogonum fasciculatum*, *Eriophyllum staechadifolium*, *Frangula californica*, *Garrya elliptica*, *Gaultheria shallon*, *Holodiscus discolor*, *Lotus scoparius*, *Lupinus arboreus*, *Morella californica*, *Rubus ursinus*, *Salvia apiana*, *S. leucophylla*, and *Toxicodendron diversilobum*. Shrubs <3 m; canopy is variable. The herbaceous layer is variable.

Comments:
As with other *B. pilularis* Associations in the south coastal area of California, this association is indicative of seral conditions and is often found in relatively mesic low-lying settings. The large number of non-native species is also indicative of the disturbed/seral nature of this association. In the Santa Monica Mountains, there are stands that appear to be colonizing annual grassland areas, especially in regions of flood disturbance or erosion (similar to the conditions of the single stand sampled at CABR).

References:
Keeler-Wolf and Evens 2006, Sawyer et al. 2009

Figure 10. Coyote Brush - California Sagebrush Association (Todd Keeler-Wolf).

***Ceanothus verrucosus* Shrubland Association**

Wart-stemmed Ceanothus Chaparral Association
Ceanothus verrucosus Alliance
Wart-stemmed Ceanothus Chaparral Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, along lower to upper slopes that are gentle to steep. *Ceanothus verrucosus* is strongly dominant or co-dominant with *Rhus integrifolia*. The herb layer is sparse. The emergent tree layer is infrequent and may include a non-native species of *Pinus* planted near the CABR visitor center.

Distribution:
Locally distributed along the upper and mid-slopes adjacent to stands of the *Adenostoma fasciculatum* or *Adenostoma fasciculatum-Xylococcus bicolor* Alliances.

Environmental Description:
Aspect: variable
Slope: 1 to 25 degrees
Topography (micro; macro): variable, but more often flat or convex; primarily middle to upper slopes, but occasionally bottoms and ridge tops.

Vegetation Description:
Stands of *Ceanothus verrucosus* Shrubland form an open to moderate shrub layer (20-50%, mean 32.6%), where *Ceanothus verrucosus* is a strong dominant or co-dominates with *Rhus integrifolia*. Shrubs may occur in two different strata, with heights ranging from 0.5-5m tall. The herbaceous layer is sparse (0.2-1%, mean 0.4%) at 0-0.5m tall. Non-native or planted trees are infrequent as emergents. Total vegetation cover is 20-50%, mean 32.6%.

Ceanothus verrucosus is strongly dominant or co-dominant with *Rhus integrifolia* (or occasionally *Heteromeles arbutifolia*). *Eriogonum fasciculatum*, *Salvia mellifera*, *Cneoridium dumosum*, *Adenostoma fasciculatum*, and *Xylococcus bicolor* are often present as sub-dominants.
Emergent trees are infrequent and may include a non-native species of *Pinus*. The herbaceous layer is sparse, with *Croton californicus*, *Dudleya edulis*, *Silene laciniata* ssp. *laciniata*, and *Stephanomeria diegensis* having the highest constancies.

***Ceanothus verrucosus* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	PINUS	*Pinus*	8	1.0	1	1
Shrub						
	CEVE2	*Ceanothus verrucosus*	100	14.2	7	25
	RHIN2	*Rhus integrifolia*	100	7.0	0.2	20
	ERFA2	*Eriogonum fasciculatum*	92	2.3	0.2	6
	SAME3	*Salvia mellifera*	92	2.2	0.2	8
	CNDU	*Cneoridium dumosum*	92	1.8	0.2	5
	ADFA	*Adenostoma fasciculatum*	58	2.9	0.2	5
	XYBI	*Xylococcus bicolor*	58	0.8	0.2	3
	HEAR5	*Heteromeles arbutifolia*	42	4.3	0.2	18
	MALA6	*Malosma laurina*	42	1.7	0.2	7
	RHCR	*Rhamnus crocea*	33	1.1	0.2	2
	ENCA	*Encelia californica*	33	0.7	0.2	2
	ARCA11	*Artemisia californica*	33	0.4	0.2	1
	LOSCS2	*Lotus scoparius* var. *scoparius*	33	0.4	0.2	1
	ACACI	*Acacia*	17	0.6	0.2	1
	ACCY2	*Acacia cyclops*	17	0.2	0.2	0.2
	CLPA2	*Clematis pauciflora*	17	0.2	0.2	0.2
	ERCRC	*Eriodictyon crassifolium* var. *crassifolium*	17	0.2	0.2	0.2
	ISME5	*Isocoma menziesii*	17	0.2	0.2	0.2
	EUMI4	*Euphorbia misera*	8	1.0	1	1
	DIAUA	*Diplacus aurantiacus* ssp. *aurantiacus*	8	0.2	0.2	0.2
	OPLI3	*Opuntia littoralis*	8	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	8	0.2	0.2	0.2
Herb						
	CRCA5	*Croton californicus*	17	0.2	0.2	0.2
	DUED	*Dudleya edulis*	17	0.2	0.2	0.2
	SILA2	*Silene laciniata* ssp. *laciniata*	17	0.2	0.2	0.2
	STDI6	*Stephanomeria diegensis*	17	0.2	0.2	0.2
	CACH38	*Carpobrotus chilensis*	8	1.0	1	1
	CAED3	*Carpobrotus edulis*	8	1.0	1	1
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	8	1.0	1	1
	CABI12	*Camissonia bistorta*	8	0.2	0.2	0.2
	CRMU2	*Cryptantha muricata*	8	0.2	0.2	0.2
	CUSCU	*Cuscuta*	8	0.2	0.2	0.2
	DULA	*Dudleya lanceolata*	8	0.2	0.2	0.2
	HYCA11	*Hypericum canariense*	8	0.2	0.2	0.2

***Ceanothus verrucosus* Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	MEIM	*Melica imperfecta*	8	0.2	0.2	0.2
	PSEUD43	*Pseudognaphalium*	8	0.2	0.2	0.2
	SANU6	*Sairocarpus nuttallianus*	8	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	12 of 12	List 2.2	S2.2	G3
Euphorbia misera	1 of 12	List 2.2	S3.2	G5

Non-native Species:
Pinus sp., *Acacia* sp., *Acacia cyclops*, *Carpobrotus chilensis*, *Carpobrotus edulis*, *Hypericum canariense*

Samples Used in Description: (n = 12)
CABR-0078, CABR-0102, CABR-0143, CABR-0192, CABR-0203, CABR-0257, CABR-0261, CABR-0264, CABR-0290, CABR-0291, CABR-0357, CABR-0523

Comments:
Some stands are senescent and contain many dead shrubs.

COMMON NAME	Wart-stemmed Ceanothus Chaparral
SYNONYM	**MCV (1995):** Chamise-Mission Manzanita-Woollyleaf Ceanothus Series, Chamise-Black Sage Series. **NVCS:** Not treated. **Calveg:** Chamise: **Holland:** Southern Maritime Chaparral. **Munz:** Chaparral. **WHR:** Mixed Chaparral
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG043.	California Chaparral
GROUP	Californian Maritime Chaparral
ALLIANCE	*Ceanothus verrucosus* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bi) and Coastal Hills (261Bj) subsections

CONSERVATION STATUS RANK G2S2

Global Description

Distribution:
The *Ceanothus verrucosus* Alliance is found along California's southern coast, largely within the summer fog belt. It may also occur in the northern portion of Baja California, Mexico. Outside of the CABR study, stands have been sampled in the San Dieguito River drainage, Torrey Pines State Park, and on several other coastal terraces in San Diego County (AECOM and VegCAMP 2010). The most interior stands have been sampled near Lake Hodges and Escondido about 18 km from the coast (Evens and San 2005, SDNHM Plant Atlas Project).

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Habitats: Slopes, ridges, coastal terraces. Elevation: 20-800 m. On rocky exposures, most prominent following recent chaparral fire. *Ceanothus verrucosus* is an obligate seeding species which tends to live for less than a century. Seedlings do germinate from scarification as well as from fire. It is likely that many of the younger shrubs in the study area, especially along roads and trails, are the result of mechanical disturbance, not fire. Natural successional pathways probably alternate between relatively short-lived stands of this alliance being replaced by *Adenostoma fasciculatum* Southern Maritime Association, or in less exposed situations, by *Adenostoma fasciculatum-Xylococcus bicolor-Rhus integrifolia* Association. The small fragmented stands at CABR are probably maintained by disturbance other than fire. Several senescent stands are probably the result of the last fires that swept the peninsula many decades ago.

Vegetation Description:
As defined in California (Sawyer et al. 2009), this shrubland is characterized by an intermittent to continuous canopy of the characteristic and dominant *Ceanothus verrucosus*. Other shrubs in lower cover include *Adenostoma fasciculatum*, *Cneoridium dumosum*, *Eriogonum fasciculatum*, *Lotus scoparius*, *Malosma laurina*, *Rhus integrifolia*, *Salvia mellifera*, and *Xylococcus bicolor*. Shrubs are <3 m with an open to intermediate canopy. The herbaceous layer is variable. Locally the stands appear to have a mixture of drought-deciduous coastal scrub and sclerophyllous chaparral shrub species present.

Comments:
The species is restricted to San Diego County and adjacent northwestern Baja California. It is a characteristic species of southern maritime chaparral (Hogan et al. 1996, Holland 1986). It is ecologically similar to *Ceanothus megacarpus*, and hybrids have been observed in coastal Orange County (Fred Roberts 1994 pers. comm.).
As an obligate-seeding species, *C. verrucosus* has a persistent seed bank, and stands of almost pure Ceanothus grow rapidly and dominate a few years following fire. These stands tend to senesce and transition to other types following several decades without fire. Locally stands at CABR are sometimes initiated by disturbance other than fire (notably clearing). Seedlings also seem to germinate on recently cleared cutbanks and erosion gullies. Cummins (2003) found *C. verrucosus* seeds widespread in a seed bank study (mean seed density in 6 sample areas 12/ m square). This suggests that this shrub would likely germinate following any fires throughout much of the study area.
Taylor (2004) analyzed old Vegetation Type Map (VTM) samples in coastal San Diego County and found that *Eriodictyon crassifolium* and *Ceanothus verrucosus* dominated a group of related plots, the only group in the study lacking a statistically significant preference for any factor studied other than fire. He hypothesized that this group's distribution was closely tied to recent site history. It is likely that all the stands sampled by the VTM crews had burned within 1-3 decades of sampling. This conclusion is divergent from facts about fire history at PLECA, where there is no record of fire having occurred in the past 100 years (Cummins 2003). Because *C. verrucosus* is generally short-lived, the stands and individuals at PLECA must largely have germinated due to other disturbance factors, such as erosion, scraping, or other clearing activities.

References:
Cummins 2003, Evens and San 2005, Hogan et al. 1996, Holland 1986, Sawyer et al. 2009, SDNHM Plant Atlas Project (http://www.sdnhm.org/plantatlas), Taylor 2004

Figure 11. Wart-stemmed Ceanothus Chaparral Association. Point Loma Navy Base, May 2008 (T. Keeler-Wolf).

***Encelia californica-Artemisia californica* Shrubland Association**

California Brittle Bush - California Sagebrush Scrub Association
Encelia californica Alliance
California Brittle Bush Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, but more often on southern exposures along lower to upper slopes that are flat to steep. *Encelia californica* is dominant to co-dominant while *Artemisia californica* is absent to co-dominant. The herb layer is open. Emergent trees are infrequent and may include a non-native species of *Pinus*.

Distribution:
At PLECA this association occurs on lower to mid slopes that face southerly. They are widely distributed particularly on the outer coastal portion of the study area.

Environmental Description:
Aspect: variable, but primarily southern
Slope: 0 to >25 degrees
Topography (micro; macro): variable, but most often flat; primarily lower to upper slopes, but occasionally bottoms and ridge tops.

Vegetation Description:
Stands of *Encelia californica-Artemisia californica* Shrubland form an open to moderate shrub layer (20-50%, mean 24.5%), where *Encelia californica* is dominant to co-dominant while *Artemisia californica* is absent to co-dominant. Shrubs may occur in two different strata, with heights ranging from 0-5m tall. The herbaceous layer is open (0.2-22%, mean 2.3%) at 0-0.5m tall. Non-native or planted trees are infrequent as emergents (0.2% cover, mean 0.2%). Total vegetation cover is 5-50%, mean 26%.

In this association, the shrub layer is characterized by *Encelia californica*, with *Artemisia californica* being absent to co-dominant. *Rhus integrifolia*, *Eriogonum fasciculatum*, and *Euphorbia misera* are often present in the shrub layer. Emergent trees are rare and only include non-native or planted trees. A variety of herbs may be present, the most constant being *Deinandra fasciculata*, *Dudleya edulis*, *Mesembryanthemum crystallinum*, and *Dudleya pulverulenta*.

***Encelia californica-Artemisia californica* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	ENCA	*Encelia californica*	100	10.2	2	40
	ARCA11	*Artemisia californica*	90	4.8	0.2	14
	RHIN2	*Rhus integrifolia*	89	5.5	0.2	25
	ERFA2	*Eriogonum fasciculatum*	55	1.6	0.2	9
	EUMI4	*Euphorbia misera*	52	4.2	0.2	12
	CYLIN2	*Cylindropuntia*	26	0.2	0.2	1
	SAME3	*Salvia mellifera*	25	1.8	0.2	9
	CNDU	*Cneoridium dumosum*	25	1.7	0.2	5
	LYCA	*Lycium californicum*	23	0.6	0.2	4
	ISME5	*Isocoma menziesii*	22	0.2	0.2	1
	FEVI2	*Ferocactus viridescens* var. *viridescens*	15	0.2	0.2	0.2
	ACACI	*Acacia*	14	1.5	0.2	8
	CLPA2	*Clematis pauciflora*	14	0.4	0.2	1
	ATLE	*Atriplex lentiformis*	13	1.3	0.2	4
	BAPI	*Baccharis pilularis*	13	0.8	0.2	3
	RHCR	*Rhamnus crocea*	11	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	11	0.2	0.2	0.2
	MADI3	*Mammillaria dioica*	9	0.2	0.2	0.2
	LOSCS2	*Lotus scoparius* var. *scoparius*	8	0.4	0.2	1
	OPLI3	*Opuntia littoralis*	7	0.2	0.2	0.2
	HEAR5	*Heteromeles arbutifolia*	6	1.5	0.2	4
	CEVE2	*Ceanothus verrucosus*	6	0.4	0.2	1
	CLIS	*Cleome isomeris*	6	0.2	0.2	0.2
Herb						
	HEFA	*Deinandra fasciculata*	36	1.3	0.2	15
	DUED	*Dudleya edulis*	33	0.2	0.2	1
	MECR3	*Mesembryanthemum crystallinum*	28	0.6	0.2	3
	DUPU	*Dudleya pulverulenta*	26	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	18	0.6	0.2	2
	STEPH	*Stephanomeria*	15	0.2	0.2	0.2
	AMPU3	*Amblyopappus pusillus*	11	0.3	0.2	1
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	10	0.2	0.2	0.2
	DISP	*Distichlis spicata*	9	0.4	0.2	1
	MENO2	*Mesembryanthemum nodiflorum*	9	0.4	0.2	1
	ASTR6	*Astragalus trichopodus*	9	0.2	0.2	0.2
	MEIM	*Melica imperfecta*	9	0.2	0.2	0.2

***Encelia californica-Artemisia californica* Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	PTDR	*Pterostegia drymarioides*	8	0.9	0.2	4
	ATSE	*Atriplex semibaccata*	8	0.6	0.2	3
	BRDI3	*Bromus diandrus*	7	1.1	0.2	3
	LECO12	*Leymus condensatus*	7	0.5	0.2	1
	CAWEW	*Calochortus weedii* var. *weedii*	7	0.2	0.2	0.2
	HORDE	*Hordeum*	6	0.8	0.2	3
	SATR12	*Salsola tragus*	6	0.4	0.2	1
	CRYPT	*Cryptantha*	6	0.2	0.2	0.2
	DEPIM	*Descurainia pinnata* ssp. *menziesii*	6	0.2	0.2	0.2
	DULA	*Dudleya lanceolata*	6	0.2	0.2	0.2
	LAAU	*Lamarckia aurea*	6	0.2	0.2	0.2
	NALE2	*Nassella lepida*	6	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Abronia maritima	1 of 87	List 4.2	S3?	G4?
Agave shawii	4 of 87	List 2.1	S1.2	G2G3
Aphanisma blitoides	1 of 87	List 1B.2	S1.1	G2
Calandrinia maritima	1 of 87	List 4.2	S3.2	G3G4
Camissonia lewisii	2 of 87	List 3	S1S3	G2G3
Ceanothus verrucosus	5 of 87	List 2.2	S2.2	G3
Euphorbia misera	45 of 87	List 2.2	S3.2	G5
Ferocactus viridescens	13 of 87	List 2.1	S3.1	G4
Lycium californicum	20 of 87	List 4.2	S3.2	G4
Quercus dumosa	1 of 87	List 1B.1	S1.1	G1G2
Selaginella cinerascens	1 of 87	List 4.1	S3S4	G3G4
Suaeda taxifolia	1 of 87	List 4.2	S2S3	G3?
Viguiera laciniata	1 of 87	List 4.2	S3.2	G4

Non-native Species:
Pinus sp., *Myoporum laetum*, *Acacia* sp., *Acacia cyclops*, *Acacia longifolia*, *Yucca brevifolia*, *Mesembryanthemum crystallinum*, *Bromus madritensis*, *Mesembryanthemum nodiflorum*, *Atriplex semibaccata*, *Bromus diandrus*, *Hordeum* sp., *Salsola tragus*, *Lamarckia aurea*, *Carpobrotus edulis*, *Carpobrotus* sp., *Erodium cicutarium*, *Chrysanthemum coronarium*, *Carpobrotus chilensis*, *Avena fatua*, *Avena sativa*, *Centaurea melitensis*, *Malephora crocea*, *Brassica nigra*, *Carduus pycnocephalus*, *Bromus hordeaceus*, *Malephora* sp., *Melilotus* sp., *Phalaris minor*, *Silene gallica*, *Sisymbrium irio*, *Vulpia* sp.

Samples Used in Description: (n = 87)
CABR-0003, CABR-0004, CABR-0005, CABR-0006, CABR-0009, CABR-0012, CABR-0016, CABR-0018, CABR-0021, CABR-0027, CABR-0029, CABR-0033, CABR-0041, CABR-0043, CABR-0052, CABR-0053, CABR-0059, CABR-0068, CABR-0071, CABR-0072, CABR-0096, CABR-0099, CABR-0142, CABR-0147, CABR-0151, CABR-0170, CABR-0190, CABR-0193, CABR-0194, CABR-0204, CABR-0215, CABR-0217, CABR-0221, CABR-0222, CABR-0225, CABR-0235, CABR-0237, CABR-0241, CABR-0243, CABR-0255, CABR-0260, CABR-0263, CABR-0265, CABR-0296, CABR-0298, CABR-0314, CABR-0317, CABR-0318, CABR-0321, CABR-0324, CABR-0326, CABR-0332, CABR-0344, CABR-0348, CABR-0352, CABR-0353, CABR-0355, CABR-0360, CABR-0365, CABR-0374, CABR-0375, CABR-0378, CABR-0394, CABR-0404, CABR-0411, CABR-0428, CABR-0429, CABR-0431, CABR-0433, CABR-0435, CABR-0436, CABR-0438, CABR-0441, CABR-0454, CABR-0455, CABR-0457, CABR-0466, CABR-0467, CABR-0468, CABR-0469, CABR-0478, CABR-0480, CABR-0488, CABR-0506, CABR-0534, CABR-0545, CABR-0548

Comments:
The large diversity of non-native species reflects the early-seral status of this vegetation.

COMMON NAME	California Encelia-California Sagebrush Shrubland Association
SYNONYM	**MCV (1995):** California Encelia Series. **NVCS:** *Encelia californica* Shrubland Alliance. **Calveg:** Coastal Scrub, Encelia Scrub. **Holland:** Diegan Coastal Sage Scrub, Southern Coastal Bluff scrub, Venturan Coastal Sage Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG044.	California Coastal Scrub
GROUP	Central and South Coastal Californian Coastal Sage Scrub
ALLIANCE	*Encelia californica* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS Probably the South Coast (San Diego County), including Coastal Hills (261Bi), Western Granitic Foothills (M262Bn) subsections, and adjacent Baja.

CONSERVATION STATUS RANK G4S3-4?

Global Description

Distribution:
This association is known from the Santa Monica Mountains as well as other parts of south coastal California including Western Riverside and San Diego Counties. Malanson 1984 also describes this association from southern California. It is not known from Baja California, although it may occur there.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
In Western Riverside County and San Diego County, stands are found on gentle to somewhat steep slopes at low elevations (below 1,000 m). The ground typically has a moderate to high amount of rock cover and bare exposed soil. Parent material is often granite, less often sedimentary. Soil texture is usually sandy loam. In the Santa Monica Mountains National Recreation Area stands occur on gentle to very steep southwest-and southeast-facing slopes at low elevations between 3-423 m.

Vegetation Description:
In Western Riverside County (Klein and Evens 2006), *Artemisia californica* is either co-dominant or sub-dominant. Other shrubs may intermix at low cover, the most common species being *Eriogonum fasciculatum*, *Opuntia parryi*, and *Lessingia filaginifolia*. A variety of native and non-native forbs and grasses occupies the herb understory. In San Diego County (Evens and San 2005, AECOM and VegCAMP 2010), *Encelia californica* is dominant or co-dominant with *Artemisia californica* in the shrub layer. Non-native annuals may dominate the herbaceous layer. Locally the stands are characterized by *Encelia californica* with the other diagnostic shrubs *Artemisia californica* and *Rhus integrifolia*, averaging about ½ the cover of *Encelia*. *Euphorbia misera* is found in >50% of the stands and averages >2% cover when present.

Comments:
This association is characterized by relatively high cover of *Encelia californica* and often occupies disturbed sites near the coast. These include clearings, roadcuts, trail margins, and eroding bluffs. It is ecologically similar to the *Artemisia californica*, the *Artemisia californica-Eriogonum fasciculatum*, and *Artemisia californica-Salvia mellifera* Alliances. However, the dominance of *Encelia californica* or the co-dominance of *A*. *californica* and *E*. *californica* is not a trait of these other related alliances. *Encelia californica* is an excellent colonizer within its preferred coastal southern California range, and these stands may be considered a transitional stage of the *Artemisia californica* and related

mixed alliances mentioned above. It is not particularly common in San Diego County, but occurs more commonly in the Santa Monica Mountains of Ventura and Adjacent Los Angeles County. It appears to be restricted to slopes near the immediate coast that are perhaps naturally prone to slumping and rapid erosion.

References:
Evens and San 2005, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Malanson 1984, Sawyer et al. 2009, AECOM and VegCAMP 2010 (unpublished report).

Figure 12. California Brittle Bush-California Sagebrush Scrub Association (Todd Keeler-Wolf).

Lycium californicum Shrubland Association

California Desert-thorn Scrub Association
Lycium californicum Alliance
California Desert-thorn Scrub Alliance

Local Description

Summary:
This shrubland association occurs most often on southwestern aspects, primarily on bottoms or along lower slopes that are gentle to steep. *Lycium californicum* is conspicuous and has higher cover than other coastal sage scrub shrubs. Trees are absent and the herb layer is open.

Distribution:
Stands of this or similar associations have been described from Baja California Norte (Peinado et al. 2008). Otherwise, stands are known from San Diego county coast north to perhaps the Palos Verdes Peninsula (K. Sikes pers comm. 2009). Stands have also been observed on San Clemente and Santa Catalina islands (Sawyer et al. 2009).

Environmental Description:
Aspect: primarily southwestern, but occasionally northwestern or variable
Slope: 1 to >25 degrees
Topography (micro; macro): flat or undulating; primarily bottoms or lower slopes, but rarely middle slopes

Vegetation Description:
Stands of *Lycium californicum* Shrubland form an open to moderate shrub layer (5-33%, mean 16.3%), where *Lycium californicum* is conspicuous and has higher cover than other coastal sage scrub shrubs. Shrubs may occur in two different strata, with heights ranging from 0-1m tall. The herbaceous layer is sparse (1-8%, mean 4.3%) at 0-0.5m tall. Trees are absent. Total vegetation cover is 5-35%, mean 19.2%.

In this association, *Lycium californicum* is conspicuous and has higher cover than other coastal sage scrub shrubs in an open to moderate shrub canopy. *Euphorbia misera* is occasionally co-dominant. *Rhus integrifolia*, *Encelia californica*, *Cylindropuntia* spp, and *Artemisia californica* are often present as sub-dominants. The tree layer is absent. The herbaceous layer may include a variety of species, *Atriplex semibaccata*, *Mesembryanthemum crystallinum*, *Mesembryanthemum nodiflorum*, *Deinandra fasciculata*, *Amblyopappus pusillus*, and *Bromus madritensis* having the highest constancy values.

Lycium californicum **Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	LYCA	*Lycium californicum*	100	5.1	2	12
	RHIN2	*Rhus integrifolia*	80	3.6	0.2	12
	ENCA	*Encelia californica*	80	1.4	0.2	4
	EUMI4	*Euphorbia misera*	70	2.8	0.2	9
	CYLIN2	*Cylindropuntia*	70	0.2	0.2	0.2
	ARCA11	*Artemisia californica*	50	2.1	0.2	7
	ERFA2	*Eriogonum fasciculatum*	40	1.9	0.2	5
	ISME5	*Isocoma menziesii*	40	0.4	0.2	1
	ATCA	*Atriplex californica*	20	0.2	0.2	0.2
	CLIS	*Cleome isomeris*	20	0.2	0.2	0.2
	AGSH	*Agave shawii* var. *shawii*	10	4.0	4	4
	ATLE	*Atriplex lentiformis*	10	2.0	2	2
	ATRIP	*Atriplex*	10	0.2	0.2	0.2
	ATWA	*Atriplex watsonii*	10	0.2	0.2	0.2
	FEVI2	*Ferocactus viridescens* var. *viridescens*	10	0.2	0.2	0.2
Herb						
	ATSE	*Atriplex semibaccata*	70	1.0	0.2	6
	MECR3	*Mesembryanthemum crystallinum*	60	1.4	0.2	5
	MENO2	*Mesembryanthemum nodiflorum*	60	0.3	0.2	1
	HEFA	*Deinandra fasciculata*	50	2.7	0.2	7
	AMPU3	*Amblyopappus pusillus*	50	1.1	0.2	2
	BRMA3	*Bromus madritensis*	50	0.2	0.2	0.2
	DISP	*Distichlis spicata*	40	0.4	0.2	1
	PTDR	*Pterostegia drymarioides*	30	0.5	0.2	1
	DUED	*Dudleya edulis*	30	0.2	0.2	0.2
	SATR12	*Salsola tragus*	30	0.2	0.2	0.2
	CHPR4	*Chorizanthe procumbens*	20	0.6	0.2	1
	BRDI3	*Bromus diandrus*	20	0.2	0.2	0.2
	GLCO6	*Chrysanthemum coronarium*	20	0.2	0.2	0.2
	ERCI6	*Erodium cicutarium*	20	0.2	0.2	0.2
	HOMU	*Hordeum murinum*	20	0.2	0.2	0.2
	STDI6	*Stephanomeria diegensis*	20	0.2	0.2	0.2
	SUES	*Suaeda esteroa*	10	1.0	1	1
	ASTR6	*Astragalus trichopodus*	10	0.2	0.2	0.2
	BRHO2	*Bromus hordeaceus*	10	0.2	0.2	0.2
	CARA3	*Cardionema ramosissimum*	10	0.2	0.2	0.2
	CARPO	*Carpobrotus*	10	0.2	0.2	0.2

***Lycium californicum* Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	CEME2	*Centaurea melitensis*	10	0.2	0.2	0.2
	CHGLG2	*Chaenactis glabriuscula* var. *glabriuscula*	10	0.2	0.2	0.2
	COMA10	*Coreopsis maritima*	10	0.2	0.2	0.2
	CYDA	*Cynodon dactylon*	10	0.2	0.2	0.2
	DUCA4	*Dudleya caespitosa*	10	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	10	0.2	0.2	0.2
	HORDE	*Hordeum*	10	0.2	0.2	0.2
	LAAU	*Lamarckia aurea*	10	0.2	0.2	0.2
	LUSP2	*Lupinus sparsiflorus*	10	0.2	0.2	0.2
	MACR3	*Malephora crocea*	10	0.2	0.2	0.2
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	10	0.2	0.2	0.2
	MILAC4	*Mirabilis laevis* var. *crassifolia*	10	0.2	0.2	0.2
	PAIN	*Parapholis incurva*	10	0.2	0.2	0.2
	VUOCH	*Vulpia octoflora* var. *hirtella*	10	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Agave shawii	1 of 10	List 2.1	S1.2	G2G3
Coreopsis maritima	1 of 10	List 2.2	S2.2	G3
Euphorbia misera	7 of 10	List 2.2	S3.2	G5
Ferocactus viridescens	1 of 10	List 2.1	S3.1	G4
Lycium californicum	10 of 10	List 4.2	S3.2	G4
Suaeda esteroa	1 of 10	List 1B.2	S3.2	G4

Non-native Species:
Atriplex semibaccata, *Mesembryanthemum crystallinum*, *Mesembryanthemum nodiflorum*, *Bromus madritensis*, *Salsola tragus*, *Bromus diandrus*, *Chrysanthemum coronarium*, *Erodium cicutarium*, *Hordeum murinum*, *Bromus hordeaceus*, *Carpobrotus* sp., *Centaurea melitensis*, *Cynodon dactylon*, *Hordeum* sp., *Lamarckia aurea*, *Malephora crocea*, *Parapholis incurva*

Samples Used in Description: (n = 10)
CABR-0036, CABR-0047, CABR-0055, CABR-0061, CABR-0337, CABR-0347, CABR-0354, CABR-0407, CABR-0426, CABR-0432

Comments:
Lycium californicum stands are uncommon in California, only occurring from Palos Verdes Peninsula (CNPS 2010), the southern Channel Islands, and coastal San Diego County. Prior to this study and recent sampling in adjacent San Diego County (AECOM and VegCAMP 2010), stands were considered rare and not numerous enough to warrant a full alliance description in Sawyer et al. (2009).

COMMON NAME	California Desert-thorn Coastal Bluff Scrub
SYNONYM	**MCV (1995):** Not treated. **NVCS:** Not treated. **Calveg:** Coastal Bluff Scrub. **Holland:** Maritime Succulent Scrub, Southern Coastal Bluff Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub.
CLASS 3.	Xeromorphic Scrub and Herb Vegetation (Semi-Desert)
SUBCLASS 3.A.	Warm Semi-Desert Scrub and Grassland
FORMATION 3.A.1.	Warm Semi-Desert Scrub and Grassland
DIVISION 3.A.1.a	Sonoran and Chihuahuan Semi-Desert Scrub and Grassland
MACROGROUP MG089.	Viscaino-Baja California Desert Scrub
GROUP	Coastal Baja California Norte Maritime Succulent Scrub
ALLIANCE	*Lycium californicum* Provisional Alliance

CLASSIFICATION CONFIDENCE LEVEL **2**

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bi) and Coastal Hills (261Bj) subsections

CONSERVATION STATUS RANK G3S2?

Global Description

Distribution:
The *Lycium californicum* Alliance occurs in San Diego County and in adjacent Baja California, Mexico. Johnson and Rodriguez (2001), Junak et al. (2007) described *L. californicum* stands as a phase of maritime succulent scrub on Santa Catalina and San Clemente islands. Recently completed sampling and analysis in Palos Verdes Peninsula (CNPS 2010) and for a larger area of Western San Diego County (AECOM and VegCAMP 2010) substantiates the validity of a *L. californicum* Alliance (>10 samples beyond the PLECA study area)

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:

Habitats: Coastal bluffs and terraces. Soils are sandy or gravelly. Elevation ranges from 5-150 m. Most stands are within a short distance of the coast and many are on steep and eroded slopes or bluffs.

Vegetation Description:
As defined in California (Sawyer et al. 2009), *Lycium californicum* is dominant or co-dominant in the shrub layer with *Artemisia californica*, *A. nesiotica*, *Bergerocactus emoryi*, *Coreopsis gigantea*, *Cylindropuntia prolifera*, *Encelia californica*, *Eriogonum giganteum*, *Opuntia oricola*, and *Rhus integrifolia*. Shrubs <4 m; canopy is open to intermittent. Herbaceous layer is usually continuous.

Comments:
Lycium californicum is a CNPS list 4.2 plant. It has been noted well south of the border in Baja California Norte (Wiggins 1980). It is a member of multiple stands of coastal succulent scrub associations, but defines its own alliance based on current data from south coastal California and a survey of coastal bluff and littoral vegetation in Baja California (Peinado et al. 2008)

References:
CNPS 2010 (unpublished report), Johnson and Rodriguez 2001, Junak et al. 2007, Peinado et al. 2008, Sawyer et al. 2009, AECOM and VegCAMP 2010 (unpublished report), Wiggins 1980.

Figure 13. California Desert-thorn Scrub Association. Point Loma NM along a coastal bluff adjacent to the Pacific Ocean(Todd Keeler-Wolf).

***Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Shrubland Association**

Laurel Sumac Scrub - California Buckwheat - Black Sage Scrub Association
Malosma laurina Alliance
Laurel Sumac Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, along upper slopes and ridge tops slopes that are gentle to steep. *Malosma laurina* is dominant with other coastal sage scrub shrubs such as *Eriogonum fasciculatum* and *Salvia mellifera*. Trees and herbs are absent in the surveys that represent this association.

Distribution:
Stands are locally distributed on upper slopes and ridge tops away from the outer coast.

Environmental Description:
Aspect: variable, northwest
Slope: 5 to 25 degrees
Topography (micro; macro): convex; upper slopes and ridge tops

Vegetation Description:
Two adjacent stands of *Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Shrubland form a moderate shrub layer (40-45%, mean 42.5%), where *Malosma laurina* is dominant with *Eriogonum fasciculatum* and *Salvia mellifera* having lower cover. Shrubs occur in two different strata, with heights ranging from 0.5-5m tall. No herbs or trees were recorded in the two surveys collected for this project. Total vegetation cover is 40-45%, mean 42.5%.

In this association, the shrub layer is characterized by *Malosma laurina* as a dominant with other coastal sage scrub shrubs such as *Eriogonum fasciculatum* and *Salvia mellifera* having lower cover. Other shrubs may include *Rhus integrifolia*, *Rhamnus crocea*, *Cneoridium dumosum* and *Cylindropuntia*.

***Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	MALA6	*Malosma laurina*	100	19.0	18	20
	RHIN2	*Rhus integrifolia*	100	7.5	7	8
	SAME3	*Salvia mellifera*	100	6.0	5	7
	RHCR	*Rhamnus crocea*	100	3.0	1	5
	CNDU	*Cneoridium dumosum*	100	2.0	1	3
	ERFA2	*Eriogonum fasciculatum*	100	1.6	0.2	3
	CYLIN2	*Cylindropuntia*	100	0.2	0.2	0.2
	CEVE2	*Ceanothus verrucosus*	50	5.0	5	5
	ENCA	*Encelia californica*	50	5.0	5	5
	ERCRC	*Eriodictyon crassifolium* var. *crassifolium*	50	1.0	1	1
	ISME5	*Isocoma menziesii*	50	0.2	0.2	0.2
	OPLI3	*Opuntia littoralis*	50	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	1 of 2	List 2.2	S2.2	G3

Non-native Species: none

Samples Used in Description: (n = 2)
CABR-0322, CABR-0323

Comments:
Stands are not well represented locally. This association has been described from south coastal California in Western Riverside County (Klein and Evens 2006) and San Dieguito River parkway (Evens and San 2005). A similar association called *M*. *laurina-Eriogonum fasciculatum* has been defined from the Santa Monica Mountains (Keeler-Wolf and Evens 2006).

COMMON NAME	Laurel Sumac-California Buckwheat-Black Sage Scrub
SYNONYM	**MCV (1995):** Sumac Series. **NVCS:** *Malosma laurina* Shrubland Alliance. **Calveg:** Alluvial Fan Sage Scrub, Sumac Shrub, California Sagebrush. **Holland:** Diegan Coastal Sage Scrub, Granitic Southern Mixed Chaparral, Mafic Southern Mixed Chaparral. **Munz:** Chaparral. **WHR:** Mixed Chaparral, Coastal Scrub.

CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG043.	California Chaparral
GROUP	Californian Maritime Chaparral
ALLIANCE	*Malosma laurina* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS Southern California Coast (261Bb, Bd-g, Bi-j) and Southern California Mountains and Valleys (M262Bf, Bj, Bn)

CONSERVATION STATUS RANK G4S4

Global Description

Distribution:
This alliance occupies the warm Mediterranean coastal areas of southern California and adjacent NW Baja California, Mexico. It is known as far north as western Santa Barbara County and as far inland as Western Riverside County (Klein and Evens 2006) where it is specifically noted in the Santa Ana Mountains. It is restricted to areas that do not receive regular winter frosts. The specific *Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Association has been described from several areas in southern coastal California and is probably the most widespread single association in the alliance. It is known from Ventura, Los Angeles, Western Riverside, and San Diego counties (Klein and Evens 2006, Evens and San 2005, Keeler-Wolf and Evens 2006). In the San Dieguito River drainage, Evens and San (2005) noted this association in the western portion of the drainage in the Coastal Hills subsection only.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Slopes often steep. Soils are shallow and fine textured. Elevation: 5-400 m.

Vegetation Description:
As defined in California (Sawyer et al. 2009), in this alliance *Malosma laurina* is dominant or co-dominant in the shrub canopy with a variety of shrubs characteristic of both chaparral and coastal sage scrub. Emergent trees of

Juglans californica, *Quercus agrifolia*, *Platanus racemosa*, or *Sambucus nigra* may occur with sparse cover in many stands. Shrubs of *Malosma* may be large accounting for shrub height of nearly 5 m; the canopy is open or continuous and often is comprised of a taller layer of *Malosma* with a shorter layer of coastal sage scrub species such as *Artemisia californica*, *Eriogonum fasciculatum*, and *Salvia* spp. The herbaceous layer is sparse or grassy.

In the *Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Association, all three shrubs are usually co-dominant. Other chaparral and coastal sage species that are characteristically present at low cover include *Heteromeles arbutifolia*, *Artemisia californica*, *Adenostoma fasciculatum*, and *Yucca whipplei* (Klein and Evens 2006). In the Santa Monica Mountains (Keeler-Wolf and Evens 2006), the tree layer is emergent and open and includes *Quercus agrifolia* at low cover. The herbaceous layer is diverse and may include *Brassica nigra*, *Centaurea melitensis*, *Bromus madritensis*, *Marah macrocarpus*, and *Bromus diandrus*. Locally, there are only a few stands of this type and they are situated away from the open windy coast. No native trees exist in these stands.

Comments:
Keeler-Wolf and Evens (2006) suggest that what they originally defined as the *Malosma laurina-Eriogonum fasciculatum* Association and the *Malosma laurina-Salvia mellifera* Association should be combined and considered synonymous with the *Malosma laurina-Eriogonum fasciculatum-Salvia mellifera* Association described from Western Riverside County by Klein and Evens (2006) and from San Diego County by Evens and San (2005), all three shrubs are usually co-dominant. This is the treatment that was given in Sawyer et al. (2009).

References:
Evens and San 2005, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Sawyer et al. 2009.

Figure 14. Laurel Sumac Scrub - California Buckwheat - Black Sage Scrub (Todd Keeler-Wolf).

Quercus dumosa Shrubland Association

Nuttall Scrub Oak Chaparral Association
Quercus dumosa Alliance
Nuttall Scrub Oak Chaparral Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, along middle to upper slopes that are gentle to steep. *Quercus dumosa* is dominant to co-dominant with *Ceanothus verrucosus* in the shrub canopy. The herb layer is sparse. Emergent trees are infrequent and may include a species of *Eucalyptus*.

Distribution:
Locally, stands only occur on slopes sheltered from coastal salty breezes. Stands are small and usually composed of several large spreading shrubs of *Q. dumosa*.

Environmental Description:
Aspect: variable
Slope: 5 to 25 degrees
Topography (micro; macro): flat, convex; middle to upper slopes

Vegetation Description:
Stands of *Quercus dumosa* Shrubland form an open to moderate shrub layer (27-45%, mean 35.3%), where *Quercus dumosa* is dominant to co-dominant with *Ceanothus verrucosus* in the shrub canopy. Shrubs may occur in two different strata, with heights ranging from 0.5-5m tall. The herbaceous layer is sparse (0.2-3%, mean 1.4%) at 0-0.5m tall. Non-native or planted trees are infrequent as emergents (0.2% cover, mean 0.2%). Total vegetation cover is 30-45%, mean 36.7%.

In this association, *Quercus dumosa* is dominant to co-dominant with *Ceanothus verrucosus* in the shrub canopy while *Salvia mellifera* and *Rhus integrifolia* are characteristically present as sub- to co-dominants. Other shrubs that are often present include *Eriogonum fasciculatum*, *Artemisia californica*, *Xylococcus bicolor*, and *Yucca schidigera*. Emergent trees are infrequent and may include a species of *Eucalyptus*. The sparse herbaceous layer may include *Deinandra fasciculata*, *Carpobrotus edulis*, and *Carpobrotus chilensis*.

***Quercus dumosa* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	33	0.2	0.2	0.2
Shrub						
	QUDU	*Quercus dumosa*	100	11.0	6	15
	CEVE2	*Ceanothus verrucosus*	100	7.7	1	12
	SAME3	*Salvia mellifera*	100	5.0	3	7
	RHIN2	*Rhus integrifolia*	100	3.0	2	5
	ERFA2	*Eriogonum fasciculatum*	100	2.0	2	2
	ARCA11	*Artemisia californica*	67	2.5	2	3
	XYBI	*Xylococcus bicolor*	67	2.1	0.2	4
	YUSC2	*Yucca schidigera*	67	0.2	0.2	0.2
	HEAR5	*Heteromeles arbutifolia*	33	5.0	5	5
	ADFA	*Adenostoma fasciculatum*	33	2.0	2	2
	CLPA2	*Clematis pauciflora*	33	1.0	1	1
	MALA6	*Malosma laurina*	33	1.0	1	1
	RHCR	*Rhamnus crocea*	33	1.0	1	1
	ACCY2	*Acacia cyclops*	33	0.2	0.2	0.2
	BAPI	*Baccharis pilularis*	33	0.2	0.2	0.2
Herb						
	HEFA	*Deinandra fasciculata*	33	2.0	2	2
	CAED3	*Carpobrotus edulis*	33	1.0	1	1
	CACH38	*Carpobrotus chilensis*	33	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	3 of 3	List 2.2	S2.2	G3
Quercus dumosa	3 of 3	List 1B.1	S1.1	G1G2

Non-native Species:
Eucalyptus sp., *Acacia cyclops*, *Carpobrotus edulis*, *Carpobrotus chilensis*

Samples Used in Description: (n = 3)
CABR-0212, CABR-0236, CABR-0245

Comments:
The largest stands locally occur on the Pt. Loma Naval Base.

COMMON NAME	Nuttall Scrub Oak Chaparral Association
SYNONYM	**MCV (1995):** Scrub Oak Series, Scrub Oak-Birchleaf Mountain Mahogany Series. **NVCS:** *Quercus*

berberidifolia Shrubland Alliance. **Calveg:** Scrub Oak. **Holland:** Granitic Southern Mixed Chaparral, Island Chaparral, Mafic Southern Mixed Chaparral, Northern Maritime Chaparral, Northern North Slope Chaparral, Scrub Oak Chaparral, Southern Maritime Chaparral, Southern North Slope Chaparral. **Munz:** Chaparral. **WHR:** Mixed Chaparral.

CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG043.	California Chaparral
GROUP	Californian Maritime Chaparral
ALLIANCE	*Quercus dumosa* Shrubland Provisional Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bi) and Coastal Hills (261Bj) subsections.

CONSERVATION STATUS RANK G2S2

Global Description

Distribution:
This alliance is found along California's southern coast, largely within the summer fog belt. It may also occur in the northern portion of Baja California, Mexico. Outside of the CABR study, stands have been sampled in the San Dieguito River drainage, Torrey Pines State Park, and on several other coastal terraces in San Diego County. In San Diego County, *Quercus dumosa* is largely restricted to within the fog belt, similar to the distribution of *Ceanothus verrucosus*, Some suspect occurrences range inland to the edge of the desert, but these may be hybrids with other scrub oak species (SDNHM Plant Atlas Project).

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Habitats: Slopes, ridges, coastal terraces. Elevation: 20-800 m. On sheltered mesic exposures close to the coast usually on sedimentary substrate protected from direct salt spray and ocean breezes.

Vegetation Description:
As defined in California, this shrubland is characterized by an intermittent to continuous canopy of the diagnostic and dominant *Quercus dumosa*. Other shrubs in lower cover include *Adenostoma fasciculatum*, *Cneoridium dumosum*, *Eriogonum fasciculatum*, *Lotus scoparius*, *Malosma laurina*, *Rhus integrifolia*, *Salvia mellifera*, and *Xylococcus bicolor*. Shrubs <3 m. Herbaceous layer is variable.

Comments:
Quercus dumosa is restricted to San Diego, Orange and Los Angeles Counties and adjacent northwestern Baja California. It is a characteristic species of southern maritime chaparral (Hogan et al. 1996, Holland 1986). It is ecologically similar to *Quercus berberidifolia*, but hybrids are rare. (F. Roberts 1994 pers. comm.). *Quercus dumosa* forms small stands in sheltered locations such as ravines and north-facing slopes facing away from the sea. Stands occur adjacent to other stands of chaparral alliances including *Ceanothus verrucosus* and *Adenostoma fasciculatum-Xylococcus bicolor*. On adjacent, more exposed sites coastal scrub alliances including *Artemisia californica* and *Artemisia californica-Eriogonum fasciculatum* may occur. *Quercus dumosa* stands are of limited extent globally and are also limited locally to the leeward side of the Point Loma Peninsula. Other known sites are Soledad Mountain, Torrey Pines State Park, and the San Dieguito River canyon below the Lake Hodges Dam. In earlier concepts this vegetation was considered part of the southern maritime chaparral (Holland 1986). It is probably the most mesic of these related stands of chaparral found in the remaining fragments of this habitat along the south coast of California. It is presumed to occur in adjacent northern Baja California, Mexico.

The morphology and ecology of *Q. dumosa* is also similar to *Quercus pacifica* of the larger Channel Islands. Together *Q. dumosa*, *Q. berberidifolia*, and *Q. pacifica* form stands of varying composition in mesic chaparral settings throughout the entire south coastal portion of California, including the islands. Inland from these stands, along the margins of the Mojave and Sonoran deserts, are similar stands of scrub oaks dominated by *Q. john-tuckeri* and *Q. Cornelius-mulleri*. Together, all of these chaparral scrub oaks comprise a large portion of what is generally termed “mesic chaparral” throughout cismontane southern California. Many of these taxa are known to hybridize with each other and with other oaks such as *Quercus engelmannii* forming a confusing array of stands with questionable distinctiveness.
Conceptually, the Nuttall scrub oak stands appear to be comprised of a distinctive species, but ecologically resemble the much more widely distributed stands of *Quercus berberidifolia* Alliance. Recent studies of scrub oaks in Western San Diego County (SDNHM Plant Atlas Project) suggest that many of the stands of scrub oak inland from the immediate coast are often dominated by a relatively stable hybrid between *Q. engelmannii* and *Q. Cornelius-mulleri* called *Q.* x*acutidens*. The role of *Q. berberidifolia* and its putative hybrids with other

oaks, has not been clarified. In this regard, we are currently treating *Q*. *dumosa*, *Q*. *berberidifolia* as two individual alliances, but are also considering that they may be better thought of as a distinctive association of a more broadly defined California Scrub Oak Alliance (*Quercus berberidifolia*, *Q*. *dumosa*, *Q*. x*acutidens*).

References:
Hogan et al. 1996, Holland 1986, Sawyer et al. 2009, SDNHM Plant Atlas Project (http://www.sdnhm.org/plantatlas), AECOM and VegCAMP 2010 (unpublished report).

Figure 15. Nuttall Scrub Oak Association. View overlooking San Diego Harbor, Point Loma May 2008 (T. Keeler-Wolf).

***Rhus integrifolia* Shrubland Association**

Lemonade Berry Scrub Association
Rhus integrifolia Alliance
Lemonade Berry Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, along all topographic positions on gentle to steep slopes. Often found on swales and drainages. *Rhus integrifolia* is strongly dominant in the shrub canopy. The herb layer is sparse. Emergent trees are infrequent and may include planted or non-native trees such as *Eucalyptus* sp., *Pinus torreyana*, and *Washingtonia* sp.

Distribution:
Stands are widely distributed on the windward outer coast and common elsewhere on the Point Loma peninsula.

Environmental Description:
Aspect: variable
Slope: 1 to >25, degrees
Topography (micro; macro): variable; variable

Vegetation Description:
Stands of *Rhus integrifolia* Shrubland form an open to dense shrub layer (15-70%, mean 44.8%), where *Rhus integrifolia* is strongly dominant with at least 65% relative cover and usually >20% absolute cover. Shrubs may occur in two different strata, with heights ranging from 0.5-5m tall. The herbaceous layer is sparse (0.2-3%, mean 0.7%) at 0-2m tall. Non-native or planted trees are infrequent as emergents (0-3% cover, mean 0.2%) at 5-10m tall. Total vegetation cover is 21-70%, mean 45.3%.

In this association, the shrub layer is characterized by *Rhus integrifolia* as a clear dominant with at least 65% relative cover, usually >20% absolute cover - all other shrubs are sub-dominant. A variety of shrubs may be present, including *Artemisia californica*, *Eriogonum fasciculatum* and *Cneoridium dumosum*. Emergent trees are infrequent and may include planted or non-native trees such as *Eucalyptus* sp., *Pinus torreyana*, and *Washingtonia* sp. The herbaceous layer is variable, with *Marah macrocarpus* var. *macrocarpus*, *Melica imperfecta*, *Dudleya edulis*, *Carpobrotus*, and *Deinandra fasciculata* having the highest constancy values.

***Rhus integrifolia* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	RHIN2	*Rhus integrifolia*	100	37.9	10	65
	ARCA11	*Artemisia californica*	79	2.6	0.2	10
	ERFA2	*Eriogonum fasciculatum*	60	1.3	0.2	8
	CNDU	*Cneoridium dumosum*	52	0.9	0.2	5
	CLPA2	*Clematis pauciflora*	46	1.2	0.2	5
	SAME3	*Salvia mellifera*	45	1.6	0.2	8
	HEAR5	*Heteromeles arbutifolia*	37	3.2	0.2	10
	ENCA	*Encelia californica*	34	1.2	0.2	5
	EUMI4	*Euphorbia misera*	14	0.5	0.2	2
	CEVE2	*Ceanothus verrucosus*	12	1.1	0.2	3
	MALA6	*Malosma laurina*	10	2.2	0.2	7
	CLIS	*Cleome isomeris*	10	0.2	0.2	0.2
	XYBI	*Xylococcus bicolor*	8	2.5	0.2	8
	RHCR	*Rhamnus crocea*	8	0.3	0.2	1
	ADFA	*Adenostoma fasciculatum*	7	2.0	0.2	7
	ACACI	*Acacia*	7	1.6	0.2	6
	LYCA	*Lycium californicum*	7	0.3	0.2	1
Herb						
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	29	0.4	0.2	1
	MEIM	*Melica imperfecta*	9	0.2	0.2	0.2
	DUED	*Dudleya edulis*	7	0.2	0.2	0.2
	CARPO	*Carpobrotus*	5	0.9	0.2	2
	HEFA	*Deinandra fasciculata*	5	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Bergerocactus emoryi	1 of 91	List 2.2	S2.1	G2G3
Ceanothus verrucosus	11 of 91	List 2.2	S2.2	G3
Coreopsis maritima	1 of 91	List 2.2	S2.2	G3
Euphorbia misera	13 of 91	List 2.2	S3.2	G5
Lycium californicum	6 of 91	List 4.2	S3.2	G4
Viguiera laciniata	2 of 91	List 4.2	S3.2	G4

Non-native Species:
Eucalyptus sp., *Washingtonia*, *Acacia* sp., *Acacia cyclops*, *Acacia longifolia*, *Carpobrotus* sp., *Mesembryanthemum nodiflorum*, *Bromus diandrus*, *Bromus madritensis*, *Carpobrotus chilensis*, *Avena fatua*, *Mesembryanthemum* sp., *Carpobrotus edulis*, *Avena* sp.

Samples Used in Description: (n = 91)
CABR-0017, CABR-0024, CABR-0026, CABR-0030, CABR-0048, CABR-0065, CABR-0069, CABR-0080, CABR-0100, CABR-0103, CABR-0105, CABR-0107, CABR-0112, CABR-0115, CABR-0119, CABR-0126, CABR-0129, CABR-0133, CABR-0136, CABR-0144, CABR-0150, CABR-0157, CABR-0158, CABR-0162, CABR-0182, CABR-0184, CABR-0207, CABR-0229, CABR-0230, CABR-0256, CABR-0269, CABR-0284, CABR-0285, CABR-0297, CABR-0300, CABR-0301, CABR-0302, CABR-0303, CABR-0308, CABR-0315, CABR-0316, CABR-0319, CABR-0346, CABR-0366, CABR-0367, CABR-0369, CABR-0371, CABR-0381, CABR-0385, CABR-0387, CABR-0388, CABR-0393, CABR-0398, CABR-0403, CABR-0418, CABR-0421, CABR-0434, CABR-0440, CABR-0443, CABR-0448, CABR-0449, CABR-0450, CABR-0453, CABR-0459, CABR-0460, CABR-0462, CABR-0464, CABR-0477, CABR-0479, CABR-0481, CABR-0486, CABR-0487, CABR-0490, CABR-0494, CABR-0495, CABR-0496, CABR-0501, CABR-0502, CABR-0503, CABR-0507, CABR-0508, CABR-0520, CABR-0521, CABR-0528, CABR-0530, CABR-0532, CABR-0538, CABR-0539, CABR-0543, CABR-0544, CABR-0546

Comments:
"Rhus integrifolia is to PLECA as *Malosma laurina* is to the Santa Monica Mountains National Recreation Area". Such an esoteric analogy may fall flat to many non-botanists outside the south coast of California. The point is that these two species of large evergreen Anacardiacious shrubs are both extremely abundant and ubiquitous and they tend to have relatively low diagnostic value within their respective areas of major influence.

At PLECA, *Rhus integrifolia* occurred in 502 of 550 (91%) vegetation samples and averaged 12.34% cover, far greater than any other single species. What this implies for vegetation classification is that *R. integrifolia* is relatively useless as a diagnostic or differential species in the classification of vegetation within the study area. Thus, the definition of a *Rhus integrifolia* Association is made with careful reference to other related stands where *R. integrifolia* is also found in high cover and constancy. In this association, it is important to note that no other more diagnostic species are present at sufficient cover or sufficient constancy to distinguish any better circumscribed vegetation association. Stands are strongly dominated by *R. integrifolia*, which casts shade and creates heavy litter build-up, and as a result species diversity is relatively low.

It is important to note that the extent of *R. integrifolia* Association as depicted in the mapping of PLECA is somewhat inflated. In some cases it is certain that cuing-in on closely spaced Lemonade Berry shrubs biased the inclusion of portions of stands characterized and named by smaller drought-deciduous shrubs. At PLECA the patterns of *R. integrifolia* spacing have much to do with local topographic position. Dense stands of often interlocking stems of *R. integrifolia* occupy the concave slope positions contrast with more widely spaced

R. *integrifolia* interspersed with smaller coastal scrub shrubs on the adjacent mid and upper slope positions. Delineation in many cases included adjacent up-slope individuals of *R*. *integrifolia*, which ecologically are better considered part of, but not diagnostic of, adjacent upland stands *of Artemisia californica*, *Eriogonum fasciculatum*, *Encelia californica* or other alliance stands.

The classification process clearly showed the core association of the *R*. *integrifolia* Alliance was limited to lower, often concave slope positions, yet the map would suggest that *R*. *integrifolia* Association regularly ascends into surrounding uplands. The shrubs were never intermixed, but rather were present in the gaps between the lemonade berry plants.

Observations suggest that this type is increasing and encroaching into CSS at CABR and elsewhere in coastal San Diego County (Taylor 2004).

COMMON NAME	Lemonade Berry Scrub Association
SYNONYM	**MCV (1995):** Sumac Series. **NVCS:** *Rhus integrifolia* Shrubland Alliance. **Calveg:** Sumac Shrub, Southern Mixed Chaparral. **Holland:** Diegan Coastal Sage Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG043.	California Chaparral
GROUP	California Maritime Chaparral
ALLIANCE	*Rhus integrifolia* Shrubland Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS Southern California Coastal Terraces (261Bi) and Coastal Hills (261Bj) subsections.

CONSERVATION STATUS RANK G3S3

Global Description

Distribution:
Stands are known from the Southern California Coast (261B) and adjacent Baja California, Mexico. Stands inventoried and mapped from the Santa Monica Mountains (Keeler-Wolf and Evens 2006), San Diego County (Evens and San 2005, AECOM and VegCAMP 2010), and Santa Cruz Island (AIS 2007) contain many coastal sage scrub species. Stands at Torrey Pines State Reserve are

adjacent to both coastal scrub alliances such as *Artemisia californica* and *Encelia californica* and chaparral in the *Adenostoma fasciculatum-Xylococcus bicolor* Alliance.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Gentle to abrupt slopes and coastal bluffs of variable aspect. Soils are loams and clays. Elevation: 5-750 m. Locally extremely common and abundant along the immediate coast. Frost sensitive.

Vegetation Description:
As defined in California (Sawyer et al. 2009), *Rhus integrifolia* is dominant or co-dominant in the shrub canopy with an array of associated sclerophyll or drought-deciduous scrub associates including *Adenostoma fasciculatum*, *Artemisia californica*, *Diplacus aurantiacus*, *Encelia californica*, *Eriogonum cinereum*, *E*. *fasciculatum*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Malacothamnus fasciculatus*, *Malosma laurina*, *Opuntia* spp., *Rhamnus crocea*, *Salvia leucophylla*, *S*. *mellifera Sambucus nigra*, and *Xylococcus bicolor*. Emergent *Juglans californica*, *Quercus agrifolia*, *Pinus torreyana*, and *Schinus molle* trees may be present. Shrubs are generally <5 m; the canopy is mostly intermittent to continuous and may be two-tiered. The herbaceous layer is open due to the usually dense shrub overstory. Stands locally are strongly dominated by *R*. *integrifolia*. Only those stands with higher than about 20% absolute cover of *R*. *integrifolia* are considered as members of this alliance.

Comments:
This species is a consummate survivor and appears to be very well adapted to current ecological conditions. This is perhaps why several studies (e.g., Taylor 2004) have noted its apparent increase relative to *Artemisia californica* and other coastal scrub alliances in southern coastal California. Photo monitoring would be an effective and valuable tool to assess the dynamics of this alliance at CABR.

References: Evens and San 2005, Keeler-Wolf and Evens 2006, Sawyer et al. 2009, Taylor 2004, AIS 2007, AECOM and VegCAMP 2010 (unpublished report).

Figure 16. Lemonade-berry Association. Pt. Loma NM, May 2008 (T. Keeler-Wolf).

Salvia mellifera-Eriogonum fasciculatum **Shrubland Association**

Black Sage - California Buckwheat Scrub Association
Salvia mellifera Alliance
Black Sage Scrub Alliance

Local Description

Summary:
This shrubland association occurs on variable aspects, along lower to upper slopes and ridge tops, on gentle to steep slopes. Open mixed stands of *Salvia mellifera* and *Eriogonum fasciculatum* characterize the shrub layer with significant combined cover. Emergent trees are infrequent and may include escaped *Eucalyptus*.

Distribution:
Stands occur on upper slopes on coarse fractured sandstone throughout the study area.

Environmental Description:
Aspect: variable
Slope: 1 to >25 degrees
Topography (micro; macro): variable; lower to upper slopes and ridge tops

Vegetation Description:
Stands of *Salvia mellifera-Eriogonum fasciculatum* Shrubland form an open to moderate shrub layer (10-65%, mean 29.5%), where *Salvia mellifera* and *Eriogonum fasciculatum* characterize the shrub layer with significant combined cover (either species may be sub-dominant to dominant). Shrubs may occur in two different strata, with heights ranging from 0-10m tall. The herbaceous layer is sparse (0.2-4%, mean 0.9%) at 0-0.5m tall. Emergent, non-native *Eucalyptus* are infrequent (0.2-1% cover, mean 0.2%). Total vegetation cover is 10-65%, mean 29.8%.

In this association, the shrub layer is characterized by *Salvia mellifera* and *Eriogonum fasciculatum* having significant combined cover and either species being sub-dominant to dominant. *Artemisia californica* is either absent or sub-dominant. Other shrubs that are often present include *Rhus integrifolia*, *Cneoridium dumosum*, and *Encelia californica*. *Euphorbia misera and Rhamnus crocea* are present in close to half of the stands, sometimes with nearly 10% cover. Emergent trees are infrequent and may include *Eucalyptus*. The herbaceous layer is variable, with *Dudleya edulis*, *Deinandra fasciculata*, *Calochortus weedii* var. *weedii*, *Melica imperfecta*, *Nassella lepida*, and *Bromus madritensis* having the highest constancy values.

***Salvia mellifera-Eriogonum fasciculatum* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	5	0.5	0.2	1
Shrub						
	SAME3	*Salvia mellifera*	100	8.8	1	20
	RHIN2	*Rhus integrifolia*	96	8.7	0.2	26
	ERFA2	*Eriogonum fasciculatum*	95	3.9	0.2	12
	ARCA11	*Artemisia californica*	75	1.5	0.2	5
	CNDU	*Cneoridium dumosum*	58	2.6	0.2	7
	ENCA	*Encelia californica*	55	1.0	0.2	5
	RHCR	*Rhamnus crocea*	49	0.9	0.2	7
	EUMI4	*Euphorbia misera*	44	2.9	0.2	12
	CEVE2	*Ceanothus verrucosus*	36	3.4	0.2	14
	YUSC2	*Yucca schidigera*	35	0.2	0.2	0.2
	HEAR5	*Heteromeles arbutifolia*	33	1.3	0.2	10
	CLPA2	*Clematis pauciflora*	27	0.5	0.2	2
	XYBI	*Xylococcus bicolor*	25	1.6	0.2	10
	LOSCS2	*Lotus scoparius* var. *scoparius*	22	0.2	0.2	0.2
	MALA6	*Malosma laurina*	20	2.7	0.2	8
	CLIS	*Cleome isomeris*	16	0.2	0.2	0.2
	ACACI	*Acacia*	13	1.3	0.2	5
	FEVI2	*Ferocactus viridescens* var. *viridescens*	13	0.2	0.2	0.2
	ADFA	*Adenostoma fasciculatum*	11	1.9	0.2	5
	OPLI3	*Opuntia littoralis*	11	0.3	0.2	1
	CYLIN2	*Cylindropuntia*	11	0.2	0.2	0.2
	ISME5	*Isocoma menziesii*	11	0.2	0.2	0.2
	MADI3	*Mammillaria dioica*	9	0.2	0.2	0.2
	ERCRC	*Eriodictyon crassifolium* var. *crassifolium*	7	2.1	0.2	5
	BAPI	*Baccharis pilularis*	7	0.2	0.2	0.2
	ERCO25	*Eriophyllum confertiflorum*	7	0.2	0.2	0.2
	LYCA	*Lycium californicum*	5	0.2	0.2	0.2
Herb						
	DUED	*Dudleya edulis*	33	0.2	0.2	1
	HEFA	*Deinandra fasciculata*	25	0.5	0.2	2
	CAWEW	*Calochortus weedii* var. *weedii*	24	0.2	0.2	0.2
	MEIM	*Melica imperfecta*	20	0.2	0.2	0.2
	NALE2	*Nassella lepida*	15	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	13	0.2	0.2	0.2
	STEPH	*Stephanomeria*	11	0.2	0.2	0.2

***Salvia mellifera-Eriogonum fasciculatum* Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	CHFIF	*Chorizanthe fimbriata* var. *fimbriata*	9	0.2	0.2	0.2
	CARPO	*Carpobrotus*	7	3.3	0.2	8
	CAED3	*Carpobrotus edulis*	7	0.9	0.2	3
	AMPU3	*Amblyopappus pusillus*	7	0.2	0.2	0.2
	CRYPT	*Cryptantha*	7	0.2	0.2	0.2
	DULA	*Dudleya lanceolata*	7	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	7	0.2	0.2	0.2
	MAMAM4	*Marah macrocarpus* var. *macrocarpus*	7	0.2	0.2	0.2
	MECR3	*Mesembryanthemum crystallinum*	7	0.2	0.2	0.2
	MILAC4	*Mirabilis laevis* var. *crassifolia*	7	0.2	0.2	0.2
	SANU6	*Sairocarpus nuttallianus*	5	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	20 of 55	List 2.2	S2.2	G3
Coreopsis maritima	1 of 55	List 2.2	S2.2	G3
Euphorbia misera	24 of 55	List 2.2	S3.2	G5
Ferocactus viridescens	7 of 55	List 2.1	S3.1	G4
Lycium californicum	3 of 55	List 4.2	S3.2	G4
Mucronea californica	1 of 55	List 4.2	S3	G3
Quercus dumosa	1 of 55	List 1B.1	S1.1	G1G2
Selaginella cinerascens	1 of 55	List 4.1	S3S4	G3G4
Viguiera laciniata	1 of 55	List 4.2	S3.2	G4

Non-native Species:
Eucalyptus sp., *Acacia* sp., *Acacia cyclops*, *Ricinus communis*, *Bromus madritensis*, *Carpobrotus* sp., *Carpobrotus edulis*, *Mesembryanthemum crystallinum*, *Erodium cicutarium*, *Hypericum canariense*, *Mesembryanthemum nodiflorum*, *Salsola tragus*, *Schismus barbatus*, *Sonchus oleraceus*, *Vulpia myuros*

Samples Used in Description: (n = 55)
CABR-0001, CABR-0013, CABR-0019, CABR-0020, CABR-0025, CABR-0028, CABR-0031, CABR-0037, CABR-0038, CABR-0040, CABR-0044, CABR-0046, CABR-0056, CABR-0062, CABR-0075, CABR-0079, CABR-0084, CABR-0086, CABR-0092, CABR-0093, CABR-0097, CABR-0098, CABR-0111, CABR-0114,

CABR-0120, CABR-0121, CABR-0122, CABR-0125, CABR-0135, CABR-0153, CABR-0156, CABR-0161, CABR-0178, CABR-0185, CABR-0198, CABR-0202, CABR-0209, CABR-0223, CABR-0227, CABR-0242, CABR-0293, CABR-0325, CABR-0331, CABR-0333, CABR-0334, CABR-0336, CABR-0345, CABR-0350, CABR-0351, CABR-0359, CABR-0379, CABR-0425, CABR-0476, CABR-0514, CABR-0515

Comments:
This association is well represented in PLECA compared to much of adjacent Western San Diego County (AECOM and VegCAMP 2010). A small proportion of stands at PLECA have a relatively high diversity of succulents, but these species are not constantly represented in the majority of stands. As with many other stands, *R*. *integrifolia* has high constancy and may be high in cover, but is not diagnostic.

COMMON NAME	Black Sage-California Buckwheat Shrubland Association
SYNONYM	**MCV (1995):** Black Sage Series. **NVCS:** *Salvia mellifera* Shrubland Alliance. **Calveg:** Sage. **Holland:** Central Lucian Coastal Scrub, Diablan Sage Scrub, Riversidean Upland Sage Scrub, Southern Coastal Bluff Scrub, Venturan Coastal Sage Scrub. **Munz:** Coastal Sage Scrub. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.1.	Mediterranean Scrub
DIVISION 2.B.1.a.	California Scrub
MACROGROUP MG044.	California Coastal Scrub
GROUP	Central and South Coastal Californian Coastal Sage Scrub
ALLIANCE	*Salvia mellifera* Alliance

CLASSIFICATION CONFIDENCE LEVEL 1

ECOLOGICAL REGIONS The alliance ranges through the Central California Coastal Ranges (M262A), Southern California Coast (261B), and Southern California Mountains and Valleys (M262B). The range of the *Salvia mellifera-Eriogonum fasciculatum* Association is almost as broad.

CONSERVATION STATUS RANK G4S4

Global Description

Distribution:
This alliance is found along California's outer north coast, outer central coast, and along the montane Transverse and Peninsular ranges. It may also occur in the northern portion of Baja California, Mexico. *Salvia mellifera* has the widest range of any of the shrubby *Salvia* Alliances of the coastal sage scrub. In the northern portion of its range, stands usually appear on relatively xeric, well-drained exposures, whereas, in the south, stands tend to be on more mesic slopes with shallow soils.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
This association occurs on upper slopes underlain by usually well-drained and indurated sandstone and other sedimentary rock. It tends to have a drier aspect than *Artemisia californica* dominated, or *Encelia californica*-dominated stands. It is transitional in species composition and in environmental variables between coastal sage and chaparral stands. It shares species from both alliance macrogroups. Slopes are generally steep and slope positions tend to be on upper rather than mid or lower slopes. Stands tend to be less directly exposed to the sea than stands of the *Artemisia californica* or *Encelia californica* Alliances.

Vegetation Description:
As defined in California (Sawyer et al. 2009), this alliance is characterized by *Salvia mellifera* being dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Artemisia californica*, *Baccharis pilularis*, *Diplacus aurantiacus*, *Encelia californica*, *Eriogonum cinereum*, *E*. *fasciculatum*, *Hesperoyucca whipplei*, *Lotus scoparius*, *Malacothamnus fasciculatus*, *Malosma laurina*, *Opuntia littoralis*, and *Salvia apiana*. Emergent trees may be present at low cover. Shrubs <2 m; canopy is continuous or intermittent. Herbaceous layer is variable; grasses and herbs are seasonal.

Locally, the *S*. *mellifera*-*E*. *fasciculatum* Association may have co-dominant *Rhus integrifolia*, which is ubiquitous in the CABR study area. *Artemisia californica* and *Encelia californica* occur in more than half of the samples as sub-dominants. The presence of some chaparral species such as *Ceanothus verrucosus*, *Heteromeles arbutifolia*, *Xylococcus bicolor*, and *Adenostoma fasciculatum* suggest local relationships of this association of coastal sage scrub to chaparral of the *Adenostoma fasciculatum*-*Xylococcus bicolor* and *Ceanothus verrucosus* Alliances.

Comments:
Some confusion exists about the relationship of several similar associations within the *Salvia mellifera* Alliance. Keeler-Wolf and Evens (2006) discuss a *Salvia mellifera-Malosma laurina* Association with similar qualities to this association except that has higher cover of the related *Eriogonum cinereum* instead of *E. fasciculatum*. Likewise Evens and San (2005) describe a *Salvia mellifera* Alliance (no associations) where *Eriogonum fasciculatum* has 80% constancy (although lower cover than *S. mellifera*). Klein and Evens (2006) describe a *Salvia mellifera* Association and several seral associations that also bear some resemblance to the *Salvia mellifera-Eriogonum fasciculatum* Association. Kirkpatrick and Hutchinson (1977) were the first to define this association from the alluvial scrubs of inland Los Angeles Basin. NatureServe (2007) also identified this association from the Pinnacles National Monument in San Benito County. Recent classification work in Western San Diego County (AECOM and VegCAMP 2010) has identified this association in other places besides the Cabrillo NM-Pt. Loma area.

References:
Evens and San 2005, Keeler-Wolf and Evens 2006, Kirkpatrick and Hutchinson 1977, Klein and Evens 2006, NatureServe 2007, Sawyer et al. 2009, AECOM and VegCAMP 2010 (unpublished report).

Figure 17. Black sage-California Buckwheat scrub. A dense stand at Point Loma NM. *Cneoridium dumosum* is a common associate. May 2008 (T. Keeler-Wolf).

Ambrosia chamissonis-Abronia maritima-Cakile maritima Herbaceous Association

Beach Bursage - Sand Verbena - Sea Rocket Herbaceous Association
Abronia latifolia-Ambrosia chamissonis Alliance
Sand Mat Alliance

Local Description

Summary:
This herbaceous association occurs on sand flats, adjacent to the ocean. It is characterized by *Abronia maritima*, *Ambrosia chamissonis*, *Cakile edentula* and a variety of other coastal species. Shrubs such as *Atriplex lentiformis*, *Isocoma menziesii*, and *Suaeda taxifolia* may intermix with sparse cover.

Distribution:
The only location of this association is along the protected coastal strand near the submarine base on Point Loma Naval Base.

Environmental Description:
Aspect: flat
Slope: 0 degrees
Topography (micro; macro): flat; bottom

Vegetation Description:
One stand of the *Ambrosia chamissonis-Abronia maritima-Cakile maritima* Association forms an open herb layer (1%) characterized by *Ambrosia chamissonis*, *Abronia maritima*, and *Cakile edentula* under a sparse shrub layer. In this single stand, shrubs have low cover (9%) and trees are absent. Total vegetation cover is 10%.

In one stand of this association, the herbaceous layer is characterized by *Abronia maritima*, *Ambrosia chamissonis*, *Cakile edentula*, and other coastal species along an isolated coastal strand. Shrubs such as *Atriplex lentiformis*, *Isocoma menziesii*, and *Suaeda taxifolia* may intermix with sparse cover.

***Ambrosia chamissonis-Abronia maritima-Cakile maritima* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	ATLE	*Atriplex lentiformis*	100	1.0	1	1
	ISME5	*Isocoma menziesii*	100	0.2	0.2	0.2
	SUTA2	*Suaeda taxifolia*	100	0.2	0.2	0.2
Herb						
	AMCH4	*Ambrosia chamissonis*	100	3.0	3	3
	ABMA2	*Abronia maritima*	100	2.0	2	2

***Ambrosia chamissonis-Abronia maritima-Cakile maritima* Association cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	DISP	*Distichlis spicata*	100	2.0	2	2
	PHRA2	*Phacelia ramosissima*	100	1.0	1	1
	CAMA	*Cakile edentula*	100	0.2	0.2	0.2
	CACHS	*Camissonia cheiranthifolia* ssp. *suffruticosa*	100	0.2	0.2	0.2
	CARPO	*Carpobrotus*	100	0.2	0.2	0.2
	HEGR7	*Heterotheca grandiflora*	100	0.2	0.2	0.2
	LONU4	*Lotus nuttallianus*	100	0.2	0.2	0.2
	NEDED	*Nemacaulis denudata* var. *denudata*	100	0.2	0.2	0.2
	STDI6	*Stephanomeria diegensis*	100	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Abronia maritima	1 of 1	List 4.2	S3?	G4?
Lotus nuttallianus	1 of 1	List 1B.1	S1.1	G1
Nemacaulis denudata var. denudata	1 of 1	List 1B.2	S2.2	G3G4T3?
Suaeda taxifolia	1 of 1	List 4.2	S2S3	G3?

Non-native Species:
Cakile edentula, *Carpobrotus* sp.

Samples Used in Description: (n = 1)
CABR-0328

Comments:
Several interesting species such as *Nemacaulis denudata* and *Suaeda taxifolia* have their only known occurrences in the PLECA study area in these stands.

COMMON NAME	Beach Bursage-Sand Verbena-Sea Rocket Herbaceous Association
SYNONYM	**MCV:** Sand Verbena-Beach Bursage Series. **NVCS:** *Ambrosia chamissonis* Herbaceous Alliance. **Calveg:** Coastal or Interior Dune. **Holland:** Active Coastal Dunes, Northern Foredunes, Southern Foredunes. **Munz:** Coastal Strand. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.C.	Temperate and Boreal Shrubland and Grassland

FORMATION 2.C.3.	Temperate and Boreal Scrub and Herb Coastal Vegetation
DIVISION 2.C.3.b.	Pacific Coast Scrub and Herb Littoral Vegetation
MACROGROUP MG058.	Vancouverian Coastal Dune and Bluff
GROUP	Vancouverian/Pacific Dune Mat
ALLIANCE	*Abronia latifolia-Ambrosia chamissonis* Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS The range of this alliance includes the Central California Coast (261B), Northern California Coast (263A), and Southern California Coast (261B). It may range further north to Washington and south to Baja California.

CONSERVATION STATUS RANK G3S3

Global Description

Distribution:
Although the alliance is widespread up and down the Pacific Coast of North America, locally this alliance is very poorly represented because the necessary sandy strands are only present in the inshore part of the Point Loma Naval Base inside of San Diego Bay.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Sand dunes of coastal bars, river mouths, spits along the immediate coastline. Soils are coarse to fine-textured sands. The local habitat for this alliance is restricted to a few hundred meters of sand spit near the submarine base.

Vegetation Description:
As described in California (Sawyer et al. 2009), this alliance is defined by *Abronia latifolia* and/or *Ambrosia chamissonis* mixing with other perennial herbs, grasses, and low shrubs to form a low canopy with *Abronia maritima*, *A. umbellata*, *Achillea millefolium*, *Artemisia pycnocephala*, *Atriplex* spp., *Calystegia macrostegia*, *C. soldanella*, *Camissonia cheiranthifolia*, *Cakile maritima*, *Cardionema ramosissimum*, *Carpobrotus* spp., *Croton californicus*, *Eriogonum latifolium*, *E. parvifolium*, *Erigeron glaucus*, *Eriophyllum staechadifolium*, *Erysimum* spp., *Fragaria chiloensis*, *Grindelia stricta*, *Lathyrus littoralis*, *Malacothrix incana*, and *Poa douglasii*. Emergent shrubs of *Baccharis pilularis*,

Lupinus arboreus, *L*. *chamissonis*, or *Ericameria ericoides* may be present at low cover. Herbaceous layer <50 cm; canopy is sparse to continuous.

Comments:
Ambrosia chamissonis-Abronia maritima-Cakile maritima was defined on the Channel islands (Junak et al. 2007). It is probably not significant that the local *Cakile* species is *C. edentula* and not *C. maritima* (see Sawyer et al. 2009). Locally several species suggest a variation in this association, but insufficient sampling has been done to determine if the difference is significant enough to define a new association. Species such as *Stephanomeria diegensis*, *Lotus nuttallianus*, and *Nemacaulis denudata* are not known north of the southern California Bight.

References:
Junak et al. 2007, Sawyer et al. 2009

Figure 18. Beach Bursage - Sand Verbena - Sea Rocket Herbaceous Association. Beach at Naval Base Pt. Loma, May 2008 (T. Keeler-Wolf).

Carpobrotus edulis **or Other Ice Plants Semi-Natural Herbaceous Stands**

Ice Plant Mats Semi-Natural Stands
Carpobrotus edulis or Other Ice Plants Semi-Natural Stands
Ice Plant Mats Semi-Natural Stands

Local Description

Summary:
This herbaceous association occurs on all aspects along all topographic and slope positions. It is characterized by *Carpobrotus edulis*, *C. chilensis*, *Malephora crocea*, *Mesembryanthemum crystallinum*, *M. nodiflorum*, and/or other ice plant species having the highest relative cover of any species. A variety of trees and shrubs such as *Eucalyptus*, *Atriplex* spp., and *Rhus integrifolia* may be present.

Distribution:
Occurs on sea bluff clearings around the “tank farm” at Point Loma, and scattered on upper slopes near roads and eroded bluffs throughout the study area.

Environmental Description:
Aspect: variable
Slope: 0 to >25 degrees
Topography (micro; macro): variable; found along all topographic positions, from bottoms to ridge tops

Vegetation Description:
Stands of *Carpobrotus edulis* or Other Ice Plants Semi-Natural Stands form an open to moderate herbaceous layer (9-50%, mean 26.3%), where *Carpobrotus edulis*, *C. chilensis*, *Malephora crocea*, *Mesembryanthemum crystallinum*, *M. nodiflorum*, and/or other ice plant species have higher relative cover than most species (woody species such as *Eucalyptus*, *Rhus integrifolia* and *Acacia* spp. may have similar or slightly higher species than ice plant species). The shrub layer is open (1-30%, mean 9.4%) and ranges in height from 2-5m tall. The tree layer (including only non-native or planted species) is absent to open. Total vegetation cover is 10-65%, mean 37.4%.

In this stand type, the herbaceous layer is characterized by *Carpobrotus edulis*, *C. chilensis*, *Malephora crocea*, *Mesembryanthemum crystallinum*, *M. nodiflorum*, and/or other ice plant species. The shrub and tree cover may be >10% (*Eucalyptus*, non-native *Acacia* species, and *Rhus integrifolia* may be present), but ice plants have similar or higher relative cover of any other species. A variety of other herbs may be present, with *Dudleya edulis*, *Dudleya pulverulenta*, *Deinandra fasciculata*, *Amblyopappus pusillus*, and *Piperia cooperi*, having the highest constancy values.

Carpobrotus edulis or Other Ice Plants Semi-Natural Stands

Layer	Code	Species Name	Con	Avg	Min	Max
Tree						
	EUCAL	*Eucalyptus*	8	20.0	20	20
Shrub						
	RHIN2	*Rhus integrifolia*	92	3.8	0.2	20
	ACLO	*Acacia longifolia*	42	5.4	0.2	10
	ENCA	*Encelia californica*	42	0.9	0.2	2
	ACACI	*Acacia*	25	4.7	2	10
	HEAR5	*Heteromeles arbutifolia*	25	1.1	0.2	3
	MALA6	*Malosma laurina*	25	1.1	0.2	2
	ARCA11	*Artemisia californica*	25	0.8	0.2	2
	CEVE2	*Ceanothus verrucosus*	17	2.5	2	3
	ERFA2	*Eriogonum fasciculatum*	17	1.1	0.2	2
	BAPI	*Baccharis pilularis*	17	0.6	0.2	1
	CNDU	*Cneoridium dumosum*	17	0.2	0.2	0.2
	ERCRC	*Eriodictyon crassifolium* var. *crassifolium*	17	0.2	0.2	0.2
	LOSCS2	*Lotus scoparius* var. *scoparius*	17	0.2	0.2	0.2
	YUSC2	*Yucca schidigera*	17	0.2	0.2	0.2
	ACCY2	*Acacia cyclops*	8	4.0	4	4
	ERGIG	*Eriogonum giganteum* var. *giganteum*	8	2.0	2	2
	ATLE	*Atriplex lentiformis*	8	0.2	0.2	0.2
	CYLIN2	*Cylindropuntia*	8	0.2	0.2	0.2
	ERFAF3	*Eriogonum fasciculatum* var. *fasciculatum*	8	0.2	0.2	0.2
	EUMI4	*Euphorbia misera*	8	0.2	0.2	0.2
	LYCA	*Lycium californicum*	8	0.2	0.2	0.2
	OPLI3	*Opuntia littoralis*	8	0.2	0.2	0.2
	RHCR	*Rhamnus crocea*	8	0.2	0.2	0.2
Herb						
	CARPO	*Carpobrotus*	42	25.0	15	37
	CACH38	*Carpobrotus chilensis*	33	28.8	15	50
	DUED	*Dudleya edulis*	25	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	25	0.2	0.2	0.2
	MECR3	*Mesembryanthemum crystallinum*	17	5.5	5	6
	HEFA	*Deinandra fasciculata*	17	3.0	2	4
	AMPU3	*Amblyopappus pusillus*	17	0.2	0.2	0.2
	PICO9	*Piperia cooperi*	17	0.2	0.2	0.2
	CAED3	*Carpobrotus edulis*	8	50.0	50	50
	MESEM	*Mesembryanthemum*	8	6.0	6	6

***Carpobrotus edulis* or Other Ice Plants Semi-Natural Stands cont.**

Layer	Code	Species Name	Con	Avg	Min	Max
Herb						
	AVFA	*Avena fatua*	8	1.0	1	1
	BRDI3	*Bromus diandrus*	8	1.0	1	1
	SATR12	*Salsola tragus*	8	1.0	1	1
	ATSE	*Atriplex semibaccata*	8	0.2	0.2	0.2
	BRMA3	*Bromus madritensis*	8	0.2	0.2	0.2
	CAWEW	*Calochortus weedii* var. *weedii*	8	0.2	0.2	0.2
	CEME2	*Centaurea melitensis*	8	0.2	0.2	0.2
	CHMU2	*Chenopodium murale*	8	0.2	0.2	0.2
	DULA	*Dudleya lanceolata*	8	0.2	0.2	0.2
	LAAU	*Lamarckia aurea*	8	0.2	0.2	0.2
	MACR3	*Malephora crocea*	8	0.2	0.2	0.2
	MEIM	*Melica imperfecta*	8	0.2	0.2	0.2
	MELIL	*Melilotus*	8	0.2	0.2	0.2
	MENO2	*Mesembryanthemum nodiflorum*	8	0.2	0.2	0.2
	STEPH	*Stephanomeria*	8	0.2	0.2	0.2
	STDI6	*Stephanomeria diegensis*	8	0.2	0.2	0.2
	UNKNO	*Unknown*	8	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Ceanothus verrucosus	2 of 12	List 2.2	S2.2	G3
Euphorbia misera	1 of 12	List 2.2	S3.2	G5
Lycium californicum	1 of 12	List 4.2	S3.2	G4
Piperia cooperi	2 of 12	List 4.2	S3.2	G4

Non-native Species:
Eucalyptus sp., *Acacia longifolia*, *Acacia* sp., *Acacia cyclops*, *Carpobrotus* sp., *Carpobrotus chilensis*, *Mesembryanthemum crystallinum*, *Carpobrotus edulis*, *Mesembryanthemum* sp., *Avena fatua*, *Bromus diandrus*, *Salsola tragus*, *Atriplex semibaccata*, *Bromus madritensis*, *Centaurea melitensis*, *Chenopodium murale*, *Lamarckia aurea*, *Malephora crocea*, *Melilotus* sp., *Mesembryanthemum nodiflorum*, *Avena* spp.

Samples Used in Description: (n = 12)
CABR-0002, CABR-0218, CABR-0226, CABR-0444, CABR-0446, CABR-0471, CABR-0497, CABR-0498, CABR-0509, CABR-0510, CABR-0511, CABR-0522

Comments:
Piperia cooperi is a rare plant that has two occurrences of multiple individuals in the stands of *Carpobrotus edulis* sampled at Point Loma Navy Base. The structure of the ice plant mat may actually foster favorable conditions for the species, since it provides cover but also allows for flowering inflorescences and basal leaves to emerge above the mat of iceplant.

COMMON NAME	*Carpobrotus edulis* or Other Ice Plants Semi-Natural Stands
SYNONYM	**MCV (1995):** Ice Plant Series. **NVCS:** *Mesembryanthemum* spp.-*Carpobrotus* spp. Semi-Natural Stands. **Calveg:** Coastal Bluff Scrub, Coastal Lupine, Coastal or Interior Dune. **Holland:** Northern Foredunes, Southern Coastal Bluff Scrub, Southern Foredunes. **Munz:** Coastal Sage Scrub, Coastal Strand. **WHR:** Coastal Scrub.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation (Shrubland and Grassland)
SUBCLASS 2.C.	Temperate and Boreal Shrubland and Grassland
FORMATION 2.C.3.	Temperate and Boreal Scrub and Herb Coastal Vegetation
DIVISION 2.C.3.b.	Pacific Coast Scrub and Herb Littoral Vegetation
MACROGROUP MG058.	Vancouverian Coastal Dune and Bluff
GROUP	California-Vancouverian Semi-Natural Littoral Scrub and Herb Vegetation
ALLIANCE	[no alliance; *Carpobrotus edulis* and Other Iceplants Semi-Natural Stands]

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS The range of Semi-Natural Iceplant Stands includes Central California Coast (261A), Great Valley (262A), Northern California Coast (263A), Southern California Coast (261B), and Southern California Mountains and Valleys (M262B).

CONSERVATION STATUS RANK Non-Native; **Invasive species ranking:** Cal-IPC: High.

Global Description

Distribution:
Iceplant stands locally range from tops of mesas at the highest elevations in the study areas to just a few meters above the sea and San Diego Bay waters. Stands have been started by plantings in some parts of the study area. One

notable dense Carpobrotus stand covers the largest population of the rare and local orchid *Piperia cooperi*.

Nations:
United States, Mexico

States or Provinces:
Oregon, California, Baja California Norte Mexico

Environmental Description:
Found on bluffs, disturbed land, sand dunes of immediate coastline, and coastal and alkaline terraces. Elevation ranges from 0-100 m.

Vegetation Description:
As defined in California (Sawyer et al. 2009), *Carpobrotus edulis*, *C*. *chilensis*, or other ice plant taxa are dominant in the herbaceous canopy. Emergent trees and shrubs may be present at low cover. Herbs <50 cm; canopy is intermittent to continuous. Locally, the most common taxa are *Carpobrotus chilensis*, *C*. *edulis*, *Mesembryanthemum nodiflorum*, *Malephora crocea*, and *Mesembryanthemum crystallinum*. Many stands were sampled with only genus level identification of *Carpobrotus*.

Comments:
At least five of the eight invasive ice plant taxa in California are represented locally and these all can form stands: *Carpobrotus edulis*, *C*. *chilensis*, *Malephora crocea*, *Mesembryanthemum crystallinum*, and *M*. *nodiflorum* (Bossard et al. 2000, DiTomaso and Healy 2007). They are particularly troublesome in locally rich shrublands along the immediate coast. Local removal of iceplant mats has been funded in some parts of CABR over the past several years. Their removal is sometimes tricky, because once removed, other non-native invasive herbaceous species can gain a hold before native shrubs can colonize, and locally at least two stands harbor sensitive species which may be negatively affected by iceplant removal.

References:
Bossard et al. 2000, DiTomaso and Healy 2007, Sawyer et al. 2009.

Figure 19. Carpobrotus edulis mat. An unusual stand of ice plant with the rare Piperia cooperi emergent, Pt. Loma Naval Station, May 2008 (T. Keeler-Wolf).

Deinandra fasciculata Herbaceous Association

Clustered Tarplant Herbaceous Association
Deinandra fasciculata Alliance
Clustered Tarplant Herbaceous Alliance

Local Description

Summary:
This herbaceous association may occur on southwest or other aspects, on coastal terraces and openings in shrublands. It is characterized by the native summer annual *Deinandra fasciculata*, often with many other native and non-native herbs. A variety of shrubs such as *Lycium californicum*, *Rhus integrifolia*, and *Cylindropuntia* spp. may be present.

Distribution: There was only one representative of this association in the project area. It was found at CABR on a marine terrace. Stands tend to occur on flats and bottomlands with a variety of other native and non-native herbs or in the understory of coastal sage scrub.

Environmental Description:
Aspect: southwest
Slope: 1 to 5 degrees
Topography (micro; macro): flat; bottom

Vegetation Description:
One stand of the *Deinandra fasciculata* Herbaceous Association forms an open herb layer (24%), characterized by the native summer annual *Deinandra fasciculata*, often with many other native and non-native herbs. The herbaceous layer is open at 0-0.5m tall. In the single stand sampled, shrubs have low cover (6%) and range in height from 0.5-1m tall while trees are absent. Total vegetation cover is 10%.

In this association, the herbaceous layer is characterized by the native summer annual *Deinandra fasciculata*, on coastal terraces and openings in shrublands. A variety of shrubs and herbs such as *Lycium californicum*, *Rhus integrifolia*, *Cylindropuntia* sp., *Bromus madritensis*, and *Distichlis spicata* may be present with lower relative cover.

***Deinandra fasciculata* Association**

Layer	Code	Species Name	Con	Avg	Min	Max
Shrub						
	LYCA	*Lycium californicum*	100	4.0	4	4
	RHIN2	*Rhus integrifolia*	100	2.0	2	2
	CYLIN2	*Cylindropuntia*	100	1.0	1	1
	AGSH	*Agave shawii* var. *shawii*	100	0.2	0.2	0.2
	ARCA11	*Artemisia californica*	100	0.2	0.2	0.2
	ENCA	*Encelia californica*	100	0.2	0.2	0.2
	ISME5	*Isocoma menziesii*	100	0.2	0.2	0.2
	OPLI3	*Opuntia littoralis*	100	0.2	0.2	0.2
Herb						
	HEFA	*Deinandra fasciculata*	100	15.0	15	15
	BRMA3	*Bromus madritensis*	100	3.0	3	3
	DISP	*Distichlis spicata*	100	1.0	1	1
	ATSE	*Atriplex semibaccata*	100	0.2	0.2	0.2
	BRDI3	*Bromus diandrus*	100	0.2	0.2	0.2
	BRHO2	*Bromus hordeaceus*	100	0.2	0.2	0.2
	DUPU	*Dudleya pulverulenta*	100	0.2	0.2	0.2
	HOIN2	*Hordeum intercedens*	100	0.2	0.2	0.2
	MENO2	*Mesembryanthemum nodiflorum*	100	0.2	0.2	0.2
	STEPH	*Stephanomeria*	100	0.2	0.2	0.2

Other Noteworthy Species:
*Scientific names in this section are consistent with the CNPS Rare Plant Inventory.

Scientific Name	# of Surveys	CNPS	Global Rank	State Rank
Agave shawii	1 of 1	List 2.1	S1.2	G2G3
Hordeum intercedens	1 of 1	List 3.2	S3S4	G3G4
Lycium californicum	1 of 1	List 4.2	S3.2	G4

Non-native Species:
Bromus madritensis, *Atriplex semibaccata*, *Bromus diandrus*, *Bromus hordeaceus*, *Hordeum* sp., *Mesembryanthemum nodiflorum*

Samples Used in Description: (n = 1)
CABR-0042

Comments:
Hordeum intercedens, a CNPS List 3.2 species, was collected from this stand.

COMMON NAME Clustered Tarplant Herbaceous Association

SYNONYM	**MCV (1995):** California Annual Grassland Series, San Jacinto Valley Vernal Pools. **NVCS:** South Coastal California Vernal Pool. **Calveg:** Annual Grass/Herbs, Wet Grass/Herbs. **Holland:** Non-native Grassland, Southern Claypan Vernal Pool, Wildflower Field. **Munz:** Valley Grassland. **WHR:** Annual Grassland.
CLASS 2.	Mesomorphic Shrub and Herb Vegetation
SUBCLASS 2.B.	Mediterranean Scrub and Grassland
FORMATION 2.B.2.	Mediterranean Grassland and Forb Meadow
DIVISION 2.B.2.a.	California Grassland and Meadow
MACROGROUP MG045.	California Annual and Perennial Grassland
GROUP	California Annual Forb/Grass Vegetation
ALLIANCE	*Deinandra fasciculata* Herbaceous Alliance

CLASSIFICATION CONFIDENCE LEVEL 2

ECOLOGICAL REGIONS The range of *Deinandra fasciculata* Alliance includes the Southern California Coast (261B) and the Southern California Mountains and Valleys (M262Bf, Bk-l)

CONSERVATION STATUS RANK G3S3

Global Description

Distribution:
Prior to this study and recent ongoing work in Western San Diego County, the alliance was best known from Western Riverside County. There, an association containing *Hordeum depressum* and *Atriplex coronata* var. *notatior* occurs at low to moderate cover typically on vernal alkali plains or surrounding clayrich vernal pools (Klein and Evens 2006). Another association containing an assortment of natives and non-natives occupies clay flats. *D. fasciculata* also occurs as an understory plant in many upland coastal scrub types. It may also occur in the northern portion of Baja California, Mexico. Other than the stands sampled at CABR, this association is also known from coastal San Diego County at Torrey Pines State Reserve and the margins of Soledad Lagoon.

Nations:
United States, Mexico

States or Provinces:
California, Baja California Norte Mexico

Environmental Description:
Found on clay flats and bottomlands, edges of vernal pools, shallow pools, saline or alkaline flats. Soils are subjected to periodic or intermittent inundation, are fine textured alluvium, and may be underlain by claypan or other impervious layer. They are poorly drained and derived from volcanic or sedimentary substrates. Elevation ranges from 0-900 m (locally <100 m). Locally, the stands occupy herbaceous openings in coastal sage scrub stands near the coast on relatively fine textured soils. Recent sampling and classification in Western San Diego County (AECOM and VegCAMP 2010) demonstrates the widespread occurrence of the *D*. *fasciculata* Alliance.

Vegetation Description:
As described in California (Sawyer et al. 2009), this alliance is defined by *Deinandra fasciculata* as co-dominant or conspicuous in the herbaceous layer with a number of native and non native herbaceous associates including *Amsinckia menziesii*, *Atriplex spp*, *Centaurea spp*., *Cressa truxillensis*, *Deschampsia danthonioides*, *Erodium cicutarium*, *Hirschfeldia incana*, *Hordeum spp*., *Lasthenia spp*., *Lessingia filaginifolia*, *Marrubium vulgare*, *Mesembryanthemum nodiflorum*, *Plagiobothrys* spp., and *Trifolium* spp. Emergent shrubs, such as *Artemisia californica*, *Eriogonum fasciculatum*, *Frankenia salina*, *Gutierrezia* spp., *Hazardia squarrosa*, and *Suaeda moquinii*, may be present at low cover. Herbs <1 m; cover is open to continuous. The expression of this alliance changes seasonally, particularly since the indicator species, *D*. *fasciculata* is a summer-flowering annual and not obvious until late spring in most years.

Comments:
This association is characterized by relatively high cover of *Deinandra fasciculata* and often occupies disturbed grassy sites near the coast. These include clearings, roadcuts, trail margins, and convex interfluves. It may be mistaken for relatively low value annual non-native grassland because of prevailingly dominant non-native species, particularly in the early spring. However, native species diversity is often exceptionally high, belying the species composition from the single stand sampled for this study. Adjacent stands are shrubby and include the *Encelia californica*, *Artemisia californica*, *Artemisia californica-Eriogonum fasciculatum*, and *Artemisia californica-Salvia mellifera* Alliances. These herbaceous stands should be sampled more locally. Of particular note are those between the Pt. Loma hilltop (old lighthouse) and the trail head for the Bayside Trail. This association appears to be restricted to slopes near the immediate coast that are perhaps naturally resistant to shrub colonization due to their exposed locations and shallow soils.

References:
Klein and Evens 2006, Sawyer et al. 2009, AECOM and VegCAMP 2010 (unpublished report).

Figure 20. A diverse *Deinandra fasciculata* stand with C*horizanthe fimbriata*, *Dudlea edulis* and *Ferocactus viridescens*. Point Loma May 2008 (Todd Keeler-Wolf).

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Appendix A. Vegetation sampling field form, observation form, and example of aerial photograph with polygon overlay.

Field Form, front

VEGETATION RAPID ASSESSMENT / RELEVE FIELD FORM

(Revised May 29, 2008--CABR)

For Office Use:	Final database #:	Final vegetation type name:	Alliance Association

LOCATIONAL/ENVIRONMENTAL DESCRIPTION

Polygon/Stand #:	Air photo #:	Date:	Name(s) of surveyors:	Initial Code	FieldCrewCode

GPS waypoint #: _________ GPS name: _______________ GPS datum: (NAD 27) ________ Is GPS within stand? Yes / No

UTM field reading: UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___ GPS Error: ±_____ ft / m

If No cite: distance _______ m, secant/100 + / - ______, bearing _______. If RELEVE, center of plot? Yes / No

Geology code: ____________ Soil Texture code: _____________ | Upland or Wetland/Riparian Soil Crust? Yes / No

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave undulating

% Surface cover (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: ____ BA Stems____ Litter: ____ Bedrock____ Boulder____ Stone____ Cobble: _____ Gravel: ____ Fines: _____ = 100%

Exposure, Actual °: ______ NE NW SE SW Flat Variable /All | Steepness, Actual °: ______ 0° 1-5° 5-25° > 25°

Stand Size: <1 acre, 1-5 acres, >5 acres Plot Size: 10m² / 100m² / 400m² / 1000 m² / Plot Shape ___ x___ ft / m. or Circle ___

Site history, stand age, and comments: ____

____

____

Type / level of disturbance (use codes): ____

VEGETATION DESCRIPTION

Field-assessed vegetation alliance name: ____

Field-assessed association name (optional): ____

Tree: T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

If Tree, list 1-3 dominant overstory spp.: ____

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)

% Overstory Conifer/Hardwood Tree cover: _____/_____ Shrub cover: _____ Herbaceous cover: _____ Total Veg cover:______

Modal Conifer/Hardwood height: _____/_____ Tall Shrub/Low Shrub height: _____/_____ Herbaceous height: _____

Species (List up to 12 major species), Stratum, and Approximate % cover: (Jepson Manual nomenclature please)

Strata categories: T=tall, M=medium, L=low; % cover intervals for reference: <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Strata	Species	% cover		Strata	Species	% cover

Major non-native species (with % cover): ____

Unusual species: ____

PROBLEMS WITH INTERPRETATION — Bino Assessed Only? Yes / No

Confidence in identification: (L, M, H) ID problems: ____

Polygon is more than one type: (Yes, No) _______ Other types: ______________________________

Has the vegetation changed since air photo taken? (Yes, No) _____ If Yes, how? What has changed (write N/A if so)? _______

____

RELEVE INFO | Plot Length (m) _______ Plot Width ________ If circle, diam _________ Plot Permanent? Y / N

Representativeness of plot in stand: ____

____

____

____

Field Form, back

Releve Polygon/Stand # ____________ *Air Photo* ____________ Species List Page_____ of _____

VEGETATION MAPPING SPECIES INFORMATION

Cover Class Intervals: 1 (<1%), 2 (1-5%), 3 (>5-25%), 4 (>25-50%), 5 (>50-75%), 6 (>75%)

L	M	T	Vascular plant name or moss/lichen cryptogamic crust cover	DBH of all trees > 10 cm.	Cover Class	%

Height Scale:	**IMPACTS**	13 Other	26 Degrading water quality
01 <0.5 m	01 Development	14 Surface water diversion	27 Wood cutting
02 0.5-1 m	02 ORV activity	15 Road/trail construction/maint.	28 Military operations
03 1-2 m	03 Agriculture	16 Biocides	29 Recreational use (non ORV)
04 2-5 m	04 Grazing	17 Pollution	30 Nest parasitism
05 5-10 m	05 Competition from exotics	18 Unknown	31 Non-native predators
06 10-15 m	06 Logging	19 Vandalism/dumping/litter	32 Rip-rap, bank protection
07 15-20 m	07 Insufficient population/stand size	20 Foot traffic/trampling	33 Channelization (human caused)
08 20-35 m	08 Altered flood/tidal regime	21 Improper burning regime	34 Feral pigs
09 35-50 m	09 Mining	22 Over collecting/poaching	35 Burros
10 >50 m	10 Hybridization	23 Erosion/runoff	36 Rills
	11 Groundwater pumping	24 Altered thermal regime	37 Phytogenic mounding
	12 Dam/inundation	25 Landfill	

Total Vegetation Cover (Class/%): ____/_____ Total Non-Native (Class/%) _____/______

Observation Form

Observation Form—SAMO

Air Photo__________ Date(s)____________________ Surveyors_____________

Polygon/Stand #:	InitialAISCode	FieldCrewCode	Confidence in identification: (L, M, H)
			Problems:

Topography: flat__ concave__ convex__ undulating__ | bottom__ lower__ mid__ upper__ top__

Slope exposure: Actual______ Flat___ Variable__ Slope steepness : 0°__ 1-5°____ 5-25°____ > 25°____

Bino Assessed Only? Yes/No Site comments: ____________________

Field-assessed alliance/association: ____________________

% Overstory Conifer/Hardwood Tree cover: ____/____ Shrub cover: ____ Herbaceous cover: ____ Total Veg cover:_____

Strata	Species	% cover		Strata	Species	% cover

Polygon/Stand #:	InitialAISCode	FieldCrewCode	Confidence in identification: (L, M, H) _____
			Problems:

Topography: flat__ concave__ convex__ undulating__ | bottom__ lower__ mid__ upper__ top__

Slope exposure: Actual______ Flat___ Variable__ Slope steepness : 0°__ 1-5°____ 5-25°____ > 25°____

Bino Assessed Only? Yes/No Site comments: ____________________

Field-assessed alliance/association: ____________________

% Overstory Conifer/Hardwood Tree cover: ____/____ Shrub cover: ____ Herbaceous cover: ____ Total Veg cover:_____

Strata	Species	% cover		Strata	Species	% cover

Polygon/Stand #:	InitialAISCode	FieldCrewCode	Confidence in identification: (L, M, H) _____
			Problems:

Topography: flat__ concave__ convex__ undulating__ | bottom__ lower__ mid__ upper__ top__

Slope exposure: Actual______ Flat___ Variable__ Slope steepness : 0°__ 1-5°____ 5-25°____ > 25°____

Bino Assessed Only? Yes/No Site comments: ____________________

Field-assessed alliance/association: ____________________

% Overstory Conifer/Hardwood Tree cover: ____/____ Shrub cover: ____ Herbaceous cover: ____ Total Veg cover:_____

Strata	Species	% cover		Strata	Species	% cover

Other Notes:____________________

Example Aerial Photograph with Polygon Overlay

Appendix B. List of scientific names for species occurring in vegetation surveys, as per the USDA Plants Database, July 2008.

Code	Scientific Name	Native
ABMA2	Abronia maritima Nutt. ex S. Watson	Yes
ACCY2	Acacia cyclops A. Cunn. ex G. Don	No
ACLO	Acacia longifolia (Andrews) Willd.	No
ACACI	Acacia Mill.	No
ACDI10	Achnatherum diegoense (Swallen) Barkworth	Yes
ADFA	Adenostoma fasciculatum Hook. & Arn.	Yes
AGAVE	Agave L.	Yes
AGSH	Agave shawii Engelm.	Yes
ALLIU	Allium L.	Yes
AMPU3	Amblyopappus pusillus Hook. & Arn.	Yes
AMCH4	Ambrosia chamissonis (Less.) Greene	Yes
APBL	Aphanisma blitoides Nutt. ex Moq.	Yes
ARCA11	Artemisia californica Less.	Yes
ARDO3	Artemisia douglasiana Besser	Yes
ASTERXX	Asteraceae	Yes
ASTR6	Astragalus trichopodus (Nutt.) A. Gray	Yes
ASTRL	Astragalus trichopodus (Nutt.) A. Gray var. lonchus (M.E. Jones) Barneby	Yes
ATCA	Atriplex californica Moq.	Yes
ATCAC	Atriplex canescens (Pursh) Nutt. var. canescens	Yes
ATRIP	Atriplex L.	Yes
ATLE	Atriplex lentiformis (Torr.) S. Watson	Yes
ATSE	Atriplex semibaccata R. Br.	No
ATSES	Atriplex serenana A. Nelson var. serenana	Yes
ATWA	Atriplex watsonii A. Nelson	Yes
AVBA	Avena barbata Pott ex Link	No
AVFA	Avena fatua L.	No
AVENA	Avena L.	No
AVSA	Avena sativa L.	No
BACCH	Baccharis L.	Yes
BAPI	Baccharis pilularis DC.	Yes
BASA4	Baccharis salicifolia (Ruiz & Pav.) Pers.	Yes
BASA2	Baccharis sarothroides A. Gray	Yes
BEEM	Bergerocactus emoryi (Engelm.) Britton & Rose	Yes
BOBA3	Bothriochloa barbinodis (Lag.) Herter	Yes
BRNI	Brassica nigra (L.) W.D.J. Koch	No
BRDI3	Bromus diandrus Roth	No
BRHO2	Bromus hordeaceus L.	No
BROMU	Bromus L.	No

Code	Scientific Name	Native
BRMA3	Bromus madritensis L.	No
CAMA	Cakile maritima Scop.	No
CABR3	Calandrinia breweri S. Watson	Yes
CASP	Calochortus splendens Douglas ex Benth.	Yes
CAWEW	Calochortus weedii Alph. Wood var. weedii	Yes
CAMA24	Calystegia macrostegia (Greene) Brummitt	Yes
CABI12	Camissonia bistorta (Nutt. ex Torr. & A. Gray) P.H. Raven	Yes
CACA32	Camissonia californica (Nutt. ex Torr. & A. Gray) P.H. Raven	Yes
CACHS	Camissonia cheiranthifolia (Hornem. ex Spreng.) Raimann ssp. suffruticosa (S. Watson) P.H. Raven	Yes
CALE26	Camissonia lewisii P.H. Raven	Yes
CAMIS	Camissonia Link	Yes
CARA3	Cardionema ramosissimum (Weinm.) A. Nelson & J.F. Macbr.	Yes
CAPY2	Carduus pycnocephalus L.	No
CAMA37	Carissa macrocarpa (Eckl.) A. DC.	No
CACH38	Carpobrotus chilensis (Molina) N.E. Br.	No
CAED3	Carpobrotus edulis (L.) L. Bolus	No
CARPO	Carpobrotus N.E. Br.	No
CAFO2	Castilleja foliolosa Hook. & Arn.	Yes
CAHEH4	Caulanthus heterophyllus (Nutt.) Payson var. heterophyllus	Yes
CEVE2	Ceanothus verrucosus Nutt.	Yes
CEME2	Centaurea melitensis L.	No
CHGLG2	Chaenactis glabriuscula DC. var. glabriuscula	Yes
CHPO12	Chamaesyce polycarpa (Benth.) Millsp. ex Parish	Yes
CHENO	Chenopodium L.	Yes
CHMU2	Chenopodium murale L.	No
CHFIF	Chorizanthe fimbriata Nutt. var. fimbriata	Yes
CHPR4	Chorizanthe procumbens Nutt.	Yes
CHORI2	Chorizanthe R. Br. ex Benth.	Yes
CHST4	Chorizanthe staticoides Benth.	Yes
CIMA4	Cistanthe maritima (Nutt.) Hershkovitz	Yes
CLPA2	Clematis pauciflora Nutt.	Yes
CLIS	Cleome isomeris Greene	Yes
CNDU	Cneoridium dumosum (Nutt.) Hook. f. ex Baill.	Yes
COMA10	Coreopsis maritima (Nutt.) Hook. f.	Yes
COSE4	Cortaderia selloana (Schult. & Schult. f.) Asch. & Graebn.	No
CRCO34	Crassula connata (Ruiz & Pav.) A. Berger	Yes
CRCA5	Croton californicus Müll. Arg.	Yes
CRIN8	Cryptantha intermedia (A. Gray) Greene	Yes
CRYPT	Cryptantha Lehm. ex G. Don	Yes
CRMU2	Cryptantha muricata (Hook. & Arn.) A. Nelson & J.F. Macbr.	Yes
CUSCU	Cuscuta L.	Yes
CYLIN2	Cylindropuntia (Engelm.) Kreuzinger	Yes

Code	Scientific Name	Native
CYDA	Cynodon dactylon (L.) Pers.	No
CYIN6	Cyperus involucratus Rottb.	No
DAWR2	Datura wrightii Regel	Yes
DAPU3	Daucus pusillus Michx.	Yes
HEFA	Deinandra fasciculata (DC.) Greene	Yes
DEPIM	Descurainia pinnata (Walter) Britton ssp. menziesii (DC.) Detling	Yes
DICAC5	Dichelostemma capitatum (Benth.) Alph. Wood ssp. capitatum	Yes
DIAUA	Diplacus aurantiacus (W. Curtis) Jeps. ssp. aurantiacus	Yes
DISP	Distichlis spicata (L.) Greene	Yes
DRCA5	Draba californica (Jeps.) Rollins & R.A. Price	Yes
DUCA4	Dudleya caespitosa (Haw.) Britton & Rose	Yes
DUED	Dudleya edulis (Nutt.) Moran	Yes
DULA	Dudleya lanceolata (Nutt.) Britton & Rose	Yes
DUPU	Dudleya pulverulenta (Nutt.) Britton & Rose	Yes
ECCA5	Echium candicans L. f.	No
ENCA	Encelia californica Nutt.	Yes
ENFA	Encelia farinosa A. Gray ex Torr.	Yes
EPCA2	Ephedra californica S. Watson	Yes
ERCRC	Eriodictyon crassifolium Benth. var. crassifolium	Yes
ERFA2	Eriogonum fasciculatum Benth.	Yes
ERFAF3	Eriogonum fasciculatum Benth. var. fasciculatum	Yes
ERGIG	Eriogonum giganteum S. Watson var. giganteum	Yes
ERCO25	Eriophyllum confertiflorum (DC.) A. Gray	Yes
ERCI6	Erodium cicutarium (L.) L'Hér. ex Aiton	No
EUCAL	Eucalyptus L'Hér.	No
EUCH	Eucrypta chrysanthemifolia (Benth.) Greene	Yes
EUMI4	Euphorbia misera Benth.	Yes
FEVI2	Ferocactus viridescens (Torr. & A. Gray) Britton & Rose	Yes
GANUN	Galium nuttallii A. Gray ssp. nuttallii	Yes
GILIA	Gilia Ruiz & Pav.	Yes
GLCO6	Glebionis coronarium (L.) Tzvelev	No
GNAPH	Gnaphalium L.	Yes
HEAR5	Heteromeles arbutifolia (Lindl.) M. Roem.	Yes
HEGR7	Heterotheca grandiflora Nutt.	Yes
HORDE	Hordeum L.	No
HOMU	Hordeum murinum L.	No
HYCA11	Hypericum canariense L.	No
ISME5	Isocoma menziesii (Hook. & Arn.) G.L. Nesom	Yes
LAAU	Lamarckia aurea (L.) Moench	No
LACO4	Lastarriaea coriacea (Goodman) Hoover	Yes
LEPID	Lepidium L.	Yes

Code	Scientific Name	Native
LENIN	Lepidium nitidum Nutt. var. nitidum	Yes
LECO12	Leymus condensatus (J. Presl) A. Löve	Yes
LIPE	Limonium perezii (Stapf) F.T. Hubbard	No
LONU4	Lotus nuttallianus Greene	Yes
LOSCS2	Lotus scoparius (Nutt.) Ottley var. scoparius	Yes
LUPIN	Lupinus L.	Yes
LUSP2	Lupinus sparsiflorus Benth.	Yes
LYCA	Lycium californicum Nutt. ex A. Gray	Yes
MAFA	Malacothamnus fasciculatus (Nutt. ex Torr. & A. Gray) Greene	Yes
MACR3	Malephora crocea (Jacq.) Schwant.	No
MALEP	Malephora N.E. Br.	No
MALA6	Malosma laurina (Nutt.) Nutt. ex Abrams	Yes
MADI3	Mammillaria dioica K. Brandegee	Yes
MAMAM4	Marah macrocarpus (Greene) Greene var. macrocarpus	Yes
MEIM	Melica imperfecta Trin.	Yes
MEIN2	Melilotus indicus (L.) All.	No
MELIL	Melilotus Mill.	No
MECR3	Mesembryanthemum crystallinum L.	No
MESEM	Mesembryanthemum L.	No
MENO2	Mesembryanthemum nodiflorum L.	No
MILI5	Microseris lindleyi (DC.) A. Gray	Yes
MILAC4	Mirabilis laevis (Benth.) Curran var. crassifolia (Choisy) Spellenb.	Yes
MUCA3	Mucronea californica Benth.	Yes
MYLA5	Myoporum laetum G. Forst.	No
NASSE	Nassella (Trin.) Desv.	Yes
NALE2	Nassella lepida (Hitchc.) Barkworth	Yes
NAHA2	Navarretia hamata Greene	Yes
NAHAL	Navarretia hamata Greene ssp. leptantha (Greene) H. Mason	Yes
NAVAR	Navarretia Ruiz & Pav.	Yes
NEDED	Nemacaulis denudata Nutt. var. denudata	Yes
NICL	Nicotiana clevelandii A. Gray	Yes
NIGL	Nicotiana glauca Graham	No
OLLI	Oligomeris linifolia (Vahl) J.F. Macbr.	Yes
OPLI3	Opuntia littoralis (Engelm.) Cockerell	Yes
PAIN	Parapholis incurva (L.) C.E. Hubbard	No
PHRA2	Phacelia ramosissima Douglas ex Lehm.	Yes
PHMI3	Phalaris minor Retz.	No
PINUS	Pinus L.	No
PITO	Pinus torreyana Parry ex Carrière	Yes
PICO9	Piperia cooperi (S. Watson) Rydb.	Yes
PLER3	Plantago erecta Morris	Yes

Code	Scientific Name	Native
POSE	Poa secunda J. Presl	Yes
POACXX	Poaceae	No
POCA7	Polygonum californicum Meisn.	Yes
PSCA13	Pseudognaphalium californicum (DC.) Anderb.	Yes
PSCA11	Pseudognaphalium canescens (DC.) W.A. Weber	Yes
PSEUD43	Pseudognaphalium Kirp.	Yes
PSST7	Pseudognaphalium stramineum (Kunth) Anderb.	Yes
PTDR	Pterostegia drymarioides Fisch. & C.A. Mey.	Yes
QUDU	Quercus dumosa Nutt.	Yes
RACA	Rafinesquia californica Nutt.	Yes
RHCR	Rhamnus crocea Nutt.	Yes
RHIN2	Rhus integrifolia (Nutt.) W.H. Brewer & S. Watson	Yes
RICO3	Ricinus communis L.	No
SANU6	Sairocarpus nuttallianus (Benth. ex A. DC.) D.A. Sutton	Yes
SAEX	Salix exigua Nutt.	Yes
SATR12	Salsola tragus L.	No
SAME3	Salvia mellifera Greene	Yes
SANIC4	Sambucus nigra L. ssp. canadensis (L.) R. Bolli	Yes
SCMO	Schinus molle L.	No
SCBA	Schismus barbatus (Loefl. ex L.) Thell.	No
SECI	Selaginella cinerascens A.A. Eaton	Yes
SECA	Senecio californicus DC.	Yes
SIGA	Silene gallica L.	No
SILA2	Silene laciniata Cav.	Yes
SICH	Simmondsia chinensis (Link) C.K. Schneid.	Yes
SIIR	Sisymbrium irio L.	No
SOLAN	Solanum L.	Yes
SOPA	Solanum parishii A. Heller	Yes
SOOL	Sonchus oleraceus L.	No
STDI6	Stephanomeria diegensis Gottlieb	Yes
STEPH	Stephanomeria Nutt.	Yes
STVIP	Stephanomeria virgata Benth. ssp. pleurocarpa (Greene) Gottlieb	Yes
SUES	Suaeda esteroa Ferren & Whitmore	Yes
SUTA2	Suaeda taxifolia (Standl.) Standl.	Yes
UNKNO	Unknown	No
VECA	Venegasia carpesioides DC.	Yes
VILA3	Viguiera laciniata A. Gray	Yes
VULPI	Vulpia C.C. Gmel.	No
VUMY	Vulpia myuros (L.) C.C. Gmel.	No
VUOCH	Vulpia octoflora (Walter) Rydb. var. hirtella (Piper) Henr.	Yes
WASHI	Washingtonia H. Wendl.	No
XYBI	Xylococcus bicolor Nutt.	Yes

Code	Scientific Name	Native
YUBR	Yucca brevifolia Engelm.	No
YUSC2	Yucca schidigera Roezl ex Ortgies	Yes
ZIFR	Zigadenus fremontii (Torr.) Torr. ex S. Watson	Yes