

Vegetation Classification Manual for Western San Diego County

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Vegetation Classification Manual for Western San Diego County

First Edition

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AECOM

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CHAPTER 1.0
INTRODUCTION TO THE MANUAL OF
WESTERN SAN DIEGO COUNTY VEGETATION

1.1 Introduction

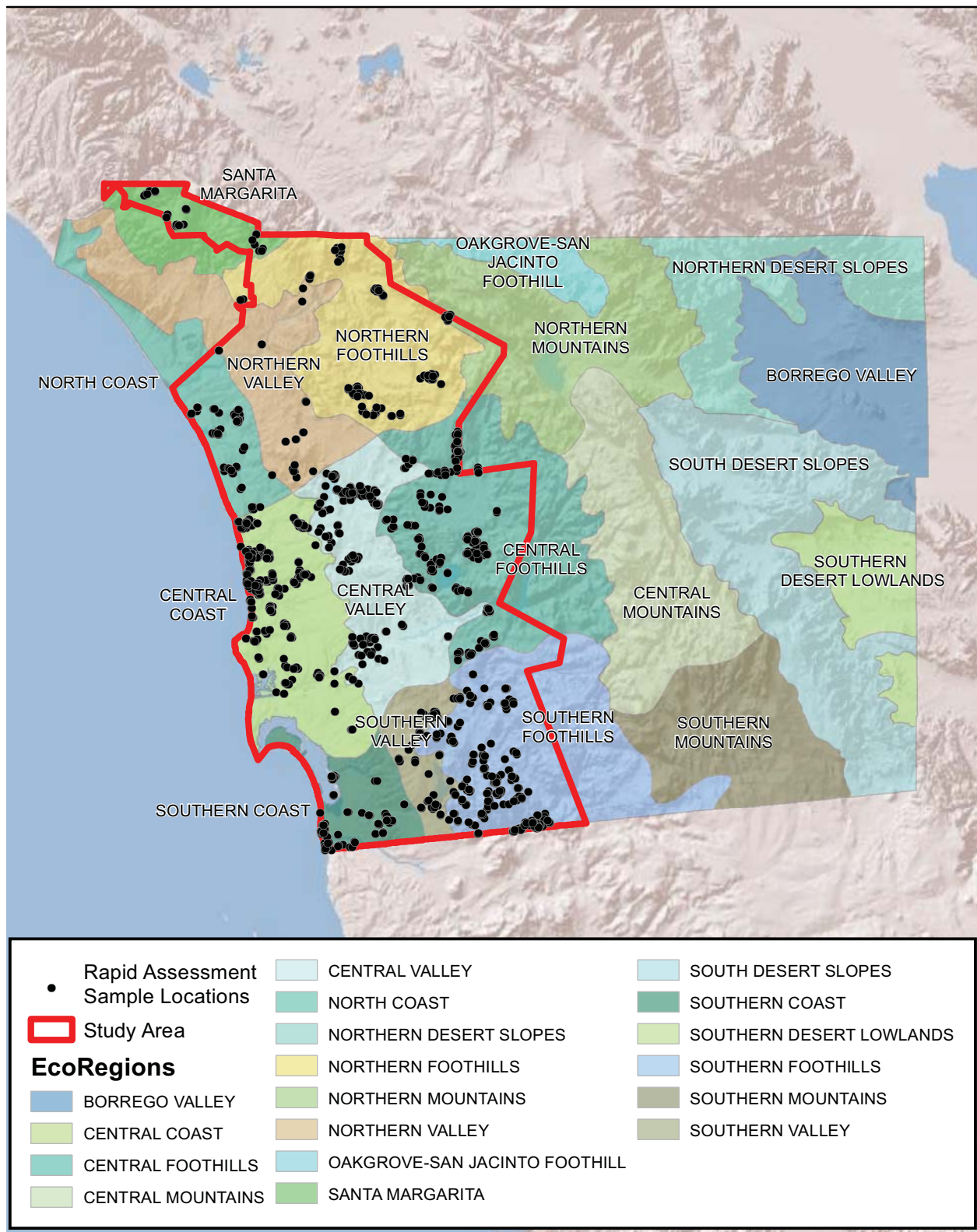
The purpose of this manual is to describe each of the native and naturalized vegetation types known to occur within western San Diego County and to provide the user a means to determine each type through direct observations of species composition. The intended users of this manual are biologists, vegetation ecologists, geographers, land managers, regional planners, and all others for whom applying standardized nomenclature to vegetation is useful.

The classification presented herein is the result of a detailed analysis of data collected throughout the western San Diego County study area (Figure 1). Under contract to the San Diego Association of Governments (SANDAG), Biologists from AECOM, Conservation Biology Institute, and the California Department of Fish and Game (CDFG) Vegetation Classification and Mapping Program (VegCAMP) collaborated on these analyses, the definition of the classifications, and preparation of this manual.

This classification study was conducted in a manner consistent with the recommendations for standardized data collection and analysis by CDFG VegCAMP (<http://www.dfg.ca.gov/biogeodata/vegcamp/>) and the methods used in the preparation of *A Manual of California Vegetation*, 2nd ed. (Sawyer; Keeler-Wolf; Evens 2009), published by the California Native Plant Society (CNPS). The classifications presented here are in accordance with this larger work. Where minor inconsistencies exist, an effort to explain these differences is provided. *A Manual of California Vegetation* (MCV) is intentionally consistent within the larger context of the National Vegetation Classification System (NVCS), which has been adopted by federal agencies and nongovernmental organizations such as the US Geological Survey, National Park Service, and NatureServe. Thus each of these classifications can be compared in context with the others nationwide.

The hierarchy of the NVCS is represented by eight primary levels, with the highest levels emphasizing physiognomic (structural and ecological) similarities and with floristic composition holding increasing emphasis toward the lower levels. The highest levels are far too broad for practical division of vegetation within the study area; therefore, this manual focuses on floristic variation that defines the differences at the lowest levels, known as *alliances* and *associations*.

Alliances are typically defined by the presence of diagnostic species within a range of cover values within a single plant stratum, whereas associations represent a subset of types within an alliance,



Source: SanGIS 2003; ESRI 2010

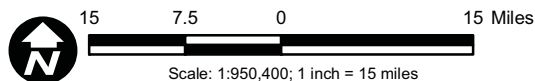


Figure 1
Sample Locations within the Study Area

which are further defined by additional diagnostic species that may be present in any stratum. For example, the *Arctostaphylos glandulosa* Alliance is defined by the relative dominance of *A. glandulosa* within a stand of vegetation. One of its subordinate associations, *Arctostaphylos glandulosa-Adenostoma fasciculatum-Chamaebatia australis* Association, which is further defined by the presence of *Adenostoma fasciculatum* and the subshrub, *Chamaebatia australis*.

In the methodology used for this classification (and as in the MCV), the basic physical unit of vegetation in the landscape is the *stand*. A stand of vegetation has two defining qualities: compositional and structural integrity. Compositional integrity is defined as similarities in species composition and relative cover. Structural integrity refers to a general regularity in the vertical and horizontal architecture of the vegetation as a result of edaphic and climatic conditions and site history of the stand. A stand also has a discernable boundary, though it may be abrupt or gradual.

The classification presented in this manual was derived from a study that collected species composition and cover and other environmental data for approximately 1,300 stands of vegetation throughout the western San Diego region (Figure 1). These data were analyzed using a number of statistical methods, chiefly an agglomerative hierarchical cluster analysis. The results of these analyses defined the number of distinct vegetation types sampled, and when compared to existing datasets maintained by VegCAMP, allowed the assignment of each stand to a known alliance and association from the MCV. In cases where no known vegetation types agreed with the current analyses, new alliances and associations are defined. A detailed description of the methods used are beyond the scope of this manual but can be found in *Classification of the Vegetation Alliances and Associations of Western San Diego County, California* (Keeler-Wolf, Sproul et al., not yet published).

The final classification for the western San Diego study area includes 72 alliances (including eight provisional alliances) and 102 associations (including 16 provisional associations). The prefixed term *provisional* is used to denote a class for which sufficient justification is present in the results to demonstrate its existence, although additional data may be necessary to define the range of conditions for this type. In addition to these alliances and associations, eight special stands, which are equivalent to alliances but dominated or most characterized by rare or special status taxa, and 15 semi-natural stands, which are equivalent to alliances but dominated or most characterized by the presence of nonnative plant species, are also included in the classification. The complete list of all types included in the classification is presented in

Appendix B. Vernal pool habitats are not currently considered in this classification, as a concurrent effort to further understand these habitats on a statewide basis, was not completed at this writing. Future revisions to this manual are expected to include these statewide results.

1.2 How to Use This Manual

Conventions

This manual is intended for use locally in western San Diego County. It is suitable for use from the immediate coast through the foothills but does not address desert and montane habitats. The floristic taxonomy used is per *Checklist of the Vascular Plants of San Diego County*, 4th Edition, as updated through January 4, 2010, published by the San Diego Natural History Museum. This taxonomy diverges somewhat from that used in *A Manual of California Vegetation*. To assist the user of this manual, where significant differences occur, such as in the naming of alliances and associations, the MCV taxonomy is presented in brackets (e.g., *Bahiopsis laciniata* Alliance [MCV Synonym: *Viguiera laciniata*]).

This manual presents vegetation types based on distinctions between plant growth forms, in that the classifications are based upon relative dominance of tree, shrub, and herbaceous species. For most species, these categories will seem quite obvious; *Pinus torreyana* is clearly a tree, and *Deinandra fasciculata* is clearly an herb. However, for many species these distinctions are less obvious. Is *Salix lasiolepis* a shrub or a tree? And is *Artemisia dracunculus* an herb or a shrub? For purposes of this manual, a favored category is identified, i.e. *Salix lasiolepis* is classified as a tree and *Artemisia dracunculus* is classified as a shrub. To assist the user, species that may elicit this type of confusion are presented in multiple keys (e.g., the *Salix lasiolepis* Alliance may be derived in either the key to vegetation dominated by trees or the key to vegetation dominated by shrubs). To minimize redundancy, the detailed descriptions are provided only in the favored category.

The Key

This manual provides a key in Chapter 2 to direct the user to each of the vegetation types within the classification. Detailed instructions are presented at the beginning of the key, as well as a glossary of terms. It is important that the user heed these instructions carefully, as the logic of the key requires the user to follow a specific order of decisions and pay strict attention to cover class definitions and species identification, in order to arrive at the correct association, alliance, or group level vegetation type.

The Descriptions

Descriptions are provided for each alliance and association in Chapters 3 through 5. As most alliances occurring in the study area also occur elsewhere in California, alliance level descriptions present a broader perspective of species composition relative to the range of the alliance. Descriptions for each association are specific to the study area and are based on the data used to define them. As in the use of a flora, it is important that the user read the description to confirm that the alliance or association derived through the use of the key is appropriate for the vegetation type.

The distribution of the stands sampled for each association is reported as their occurrence within the ecological subregions of San Diego County (ecoregions) (Figure 1). These ecoregions, developed by the San Diego County Department of Public Land Use in collaboration with a scientific advisory panel, provide a convenient means for parsing the San Diego County political boundary into ecological subunits based on climate, geology, and geography.

A summary of the environmental data collected for each association is presented in graphical form. The graphic provides information on slope aspect, topographic position, soil texture, and the number of stands sampled, as a gradient of shading, with darker shading indicating higher relative frequency. Figure 2 provides an example for a specific association. A total of 14 stands were sampled (n=14). By looking at the compass rose, this association was found to occur most frequently on southeast- and southwest-facing slopes, although also on northeastern and northwestern aspects. The association was most frequently found in a mid-slope position. This can be inferred because the darkest shading occurs at the midpoint of the bar and fades toward the top and bottom of the slope. The soil triangle is shaded for sandy loam and clay loam textures. While this information provides a useful snapshot of the data collected, the user is cautioned that alliance and association memberships are based on species composition and relative cover, not these environmental variables. In many cases, the sample size may be too low for broad generalization.

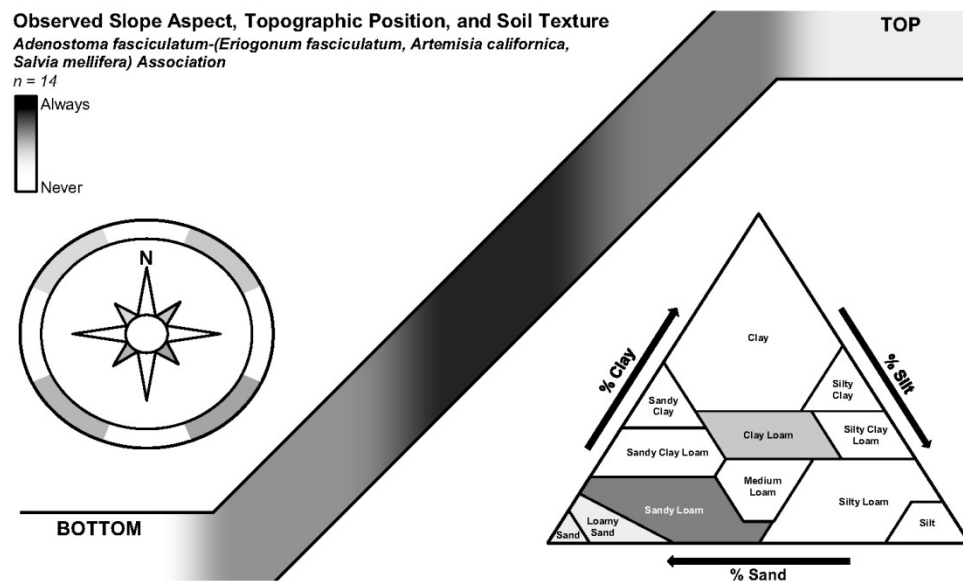


Figure 2. Example of environmental data summary graphic.

The Crosswalk

A number of classification systems have been developed for use in California. Perhaps most commonly used throughout the state is *Preliminary Descriptions of the Terrestrial Natural Communities of California* (Holland 1986). A modified form of this document, *Draft Vegetation Communities of San Diego County* (Oberbauer et al. 2008), is commonly used locally. To facilitate the use of this manual, two crosswalks are provided in Appendix C to cross-reference vegetation type between these different classification systems. In Tables C.1 through C.3, the vegetation alliances and associations described in this classification are mapped to the single most appropriate type within Oberbauer. In Table C.4, each of Oberbauer's vegetation communities is listed with all the alliances and associations that it contains, as the vegetation types in this classification are typically defined more narrowly than in either Holland or Oberbauer.

CHAPTER 2.0
KEY TO WESTERN SAN DIEGO COUNTY
VEGETATION ALLIANCES AND ASSOCIATIONS

2.1 How to Use This Key

This key is first arranged by stratum class (i.e., tree, shrub, and herb). Following these stratum-level breaks are subsequent group-level keys based on macroscale biotic and abiotic relationships. The stratum- and group-level keys are dichotomous, while the keys within each group are multichotomous. The multichotomous keys have been deliberately ordered and are intended to be read from top to bottom (e.g., it is strongly recommended to exhaust Sections A through F before considering Section G).

Unless otherwise specified, nonnative species should not be thought of as diagnostic; this key focuses on native vegetation types and should be used with the understanding that nonnative species intergrade with native species at varying levels depending on direct disturbance level and/or indirect proximity to disturbance. When in doubt, refer to the detailed descriptions for each vegetation type for a discussion of relevant disturbance regimes and how disturbance may affect the appearance of a vegetation type. If nonnative species comprise the tallest stratum present and the vegetation is not fitting the key for that stratum, try working through the key again focusing on the next stratum down containing native species.

Dominance is used in several manners within this key. First, the term dominance is used with respect to species cover. This key relies on relative species cover, not absolute species cover. Unless otherwise specified, a dominant species meets the criterion for dominance stated in the glossary within a specific stratum (e.g., “shrub species X is dominant” is synonymous with “shrub species X is dominant within the shrub stratum”). Dominance can also be attributed to an entire stratum (e.g., “the shrub stratum is dominant”)—see the glossary of terms below for specific dominance thresholds.

Comparisons in this key are often shown as follows: Species X > Species Y. This comparative statement is always in reference to percent cover, not height or mass. Thus, the statement above indicates that Species X has a higher overall percent cover than Species Y, regardless of individual plant size or height.

Certain associations appear more than once in this key. In these instances, there is a parenthetical number indicating how many times each association appears in the key.

Finally, if a given stand of vegetation keys to a certain alliance but the given associations do not seem to fit, the next step should be to try working through the key again to verify the most appropriate alliance has been selected. After exhausting the key, if the associations under the given alliance simply do not fit, it is appropriate to name the vegetation to alliance level only.

Glossary of Terms

<i>Terms that apply to species cover</i>	
strongly dominant	Species with $\geq 75\%$ relative cover.
dominant	Species with $\geq 50\%$ and $< 75\%$ relative cover.
codominant	Species with $\geq 30\%$ and $< 50\%$ relative cover.
subdominant	Species with $< 30\%$ relative cover. A generic term encompassing “sparse” and “trace” (see below).
sparse	Species with $\geq 5\%$ and $< 30\%$ relative cover.
trace	Species with $< 5\%$ relative cover.
<i>Terms that apply to species frequency</i>	
diagnostic	Species with $> 80\%$ constancy within a vegetation type (i.e., there is a $>80\%$ probability of finding a diagnostic species with the associated vegetation type).
<i>Terms that apply to overall stratum cover</i>	
dominant	Stratum with the highest percent cover.
subdominant	All strata other than the dominant stratum.
continuous	Strata containing $\geq 66\%$ absolute cover.
Intermittent	Strata containing $\geq 33\%$ and $< 66\%$ absolute cover.
open	Strata containing $\geq 5\%$ and $< 33\%$ absolute cover.
<i>Abbreviations used in the key</i>	
exc	Except; Exception(s)
gen	Generally
incl	Including

Key to Stratum Classes

1.	Trees open to continuous, often dominant; if trees 5–10% absolute cover, shrubs gen < continuous	Stratum Class A (Forest and Woodland Vegetation)
1'	Trees absent or trace, <u>or</u> trees 5-10% absolute cover and shrubs \pm continuous	
2.	Shrubs open to continuous, often dominant; if shrubs 5–10% absolute cover, herbs gen < continuous	Stratum Class B (Shrubland Vegetation)
2'	Shrubs absent or trace, <u>or</u> shrubs 5-10% absolute cover and herbs \pm continuous	Stratum Class C (Herbaceous Vegetation)

STRATUM CLASS A: FOREST AND WOODLAND VEGETATION

Key to Groups

1.	Trees dominated by evergreen species (broad-leaved or coniferous); occurring on upland slopes or terraces; gen dominated by tree genera incl <i>Callitropsis</i> , <i>Quercus</i> , <i>Pinus</i> , and/or <i>Eucalyptus</i> ; winter-deciduous, broad-leaved trees absent	Group 1 (Upland Forests and Woodlands)
1'	Trees including winter-deciduous, broad-leaved species; occurring on bottomlands or adjacent to perennial or episodic streams; tree canopy gen continuous; gen dominated by tree genera incl <i>Platanus</i> , <i>Populus</i> , and/or <i>Salix</i> .	Group 2 (Riparian Forests and Woodlands)

Group 1: Upland Forests and Woodlands

A Trees dominated by conifers		
A.1	<i>Callitropsis forbesii</i> dominant	<u><i>Callitropsis forbesii</i> Provisional Association</u> <i>Callitropsis forbesii</i> Alliance (2)
A.2	<i>Pinus torreyana</i> dominant; trees gen ± open	<u><i>Pinus torreyana</i> Special Stands</u>
B Trees dominated by <i>Quercus cedrosensis</i>		<u><i>Quercus cedrosensis</i> Special Stands (2)*</u> <small>*This vegetation type is described in the shrub section of the report</small>
C Trees dominated by <i>Quercus agrifolia</i> ; <i>Quercus engelmannii</i> absent		<i>Quercus agrifolia</i> Alliance
C.1	<i>T. diversilobum</i> present; nonnative grass cover gen > sparse; if present, sclerophyllous shrub species < <i>T. diversilobum</i> ; if present, <i>A. californica</i> ≤ <i>T. diversilobum</i>	<u><i>Quercus agrifolia</i>/<i>Toxicodendron diversilobum</i>/Grass Association</u>
C.2	<i>Artemisia californica</i> diagnostically present, gen with other soft-leaved, succulent, microphyllous, or broad-leaved shrub species; if present, sclerophyllous shrub species < soft-leaved, succulent, microphyllous, or broad-leaved shrub species; if present, <i>Toxicodendron diversilobum</i> < <i>A. californica</i>	<u><i>Quercus agrifolia</i>/<i>Artemisia californica</i> Association</u>
C.3	Scrub oak (<i>Q. berberidifolia</i> , <i>Q. xacutidens</i>) diagnostically present, gen with other sclerophyllous shrub species; if present, soft-leaved, succulent, microphyllous, or broad-leaved shrub species ≤ sclerophyllous shrub species	<u><i>Quercus agrifolia</i>/<i>Quercus (berberidifolia, xacutidens)</i> Association</u>
D Trees include <i>Quercus engelmannii</i>		<i>Quercus engelmannii</i> Alliance
D.1	<i>Q. agrifolia</i> absent; <i>Salvia apiana</i> diagnostically present; gen with other soft-leaved, succulent, microphyllous, or sclerophyllous shrub species	<u><i>Quercus engelmannii</i>/<i>Salvia apiana</i> Association</u>
D.2	<i>Q. agrifolia</i> present	<u><i>Quercus engelmannii</i>-<i>Quercus agrifolia</i>/<i>Toxicodendron diversilobum</i>/Grass Association</u>
E Trees dominated by one or more species of <i>Eucalyptus</i>		<u><i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands</u>

Group 2: Riparian Forests and Woodlands

A	Trees include > trace winter-deciduous, broad-leaved tree genera incl <i>Platanus</i> , <i>Populus</i> , and/or <i>Salix</i>
A.1	<i>Callitropsis forbesii</i> present, > winter-deciduous, broad-leaved trees <u><i>Callitropsis forbesii</i> Provisional Association</u> <i>Callitropsis forbesii</i> Alliance (2)
A.2	<i>Platanus racemosa</i> > trace; if present, <i>Populus</i> spp. < <i>P. racemosa</i> <i>Platanus racemosa</i> Alliance A.2.a <i>Quercus agrifolia</i> > trace, often > <i>P. racemosa</i> ; <i>Toxicodendron diversilobum</i> diagnostically present <u><i>Platanus racemosa</i>-<i>Quercus agrifolia</i> Association</u> A.2.b <i>Quercus agrifolia</i> absent or trace; <i>Populus</i> spp. and/or <i>Salix</i> spp. diagnostically present <u><i>Platanus racemosa</i>-<i>Populus</i> spp./<i>Salix lasiolepis</i> Association</u> A.2.c <i>Quercus agrifolia</i> , <i>Populus</i> spp., and <i>Salix</i> spp. absent; <i>Baccharis salicifolia</i> diagnostically present <u><i>Platanus racemosa</i>/<i>Baccharis salicifolia</i> Association</u>
A.3	<i>Populus</i> spp. > trace; if present, <i>Platanus racemosa</i> < <i>Populus</i> spp. <i>Populus fremontii</i> Alliance A.3.a <i>S. gooddingii</i> present; <i>Baccharis salicifolia</i> diagnostically present <u><i>Populus fremontii</i>-<i>Salix gooddingii</i>/<i>Baccharis salicifolia</i> Association</u> A.3.b <i>S. gooddingii</i> absent; <i>Baccharis salicifolia</i> diagnostically present <u><i>Populus fremontii</i>/<i>Baccharis salicifolia</i> Association</u>
A.4	<i>S. gooddingii</i> > trace; if present, <i>P. racemosa</i> and <i>Populus</i> spp. both trace <u><i>Salix gooddingii</i> Association</u> <i>Salix gooddingii</i> Alliance
A.5	<i>S. laevigata</i> > trace; if present, <i>S. lasiolepis</i> ≤ <i>S. laevigata</i> <u>and</u> <i>P. racemosa</i> , <i>Populus</i> spp., and <i>S. gooddingii</i> all trace <u><i>Salix laevigata</i> Association</u> <i>Salix laevigata</i> Alliance (2)
A.6	<i>S. lucida</i> ssp. <i>lasiandra</i> present <u><i>Salix lucida</i> ssp. <i>lasiandra</i> Association</u> <i>Salix lucida</i> Alliance
A.7	<i>S. lasiolepis</i> > trace; if present, <i>S. laevigata</i> < <i>S. lasiolepis</i> <u>and</u> <i>P. racemosa</i> , <i>Populus</i> spp., and <i>S. gooddingii</i> all trace A.7.a <i>Q. agrifolia</i> absent or trace <u><i>Salix lasiolepis</i> Association</u> <i>Salix lasiolepis</i> Alliance (2) A.7.b <i>Q. agrifolia</i> > trace <u><i>Quercus agrifolia</i>/<i>Salix lasiolepis</i> Association</u> <i>Quercus agrifolia</i> Alliance (2)
B	Trees dominated or codominated by <i>Quercus agrifolia</i> ; <i>Salix lasiolepis</i> diagnostically present; if present, <i>Platanus racemosa</i> , <i>Populus</i> spp., and <i>Salix</i> spp. other than <i>S. lasiolepis</i> all trace <u><i>Quercus agrifolia</i>/<i>Salix lasiolepis</i> Association</u> <i>Quercus agrifolia</i> Alliance (2)
C	<i>Tamarix</i> spp. strongly dominant <u><i>Tamarix</i> spp. Semi-Natural Stands (2)</u>

CLASS B. SHRUBLAND VEGETATION

Key to Groups

1.	Shrubs dominated by nonhydrophytic species, gen occurring on upland slopes or terraces; can occur on bottomlands with arid conditions and/or ephemeral hydrologic regimes	
2.	Shrubs dominated by sclerophyllous genera incl <i>Adenostoma</i> , <i>Arctostaphylos</i> , <i>Ceanothus</i> , and/or <i>Quercus</i>	Group 1 (Sclerophyllous, Evergreen Shrublands)
2'	Shrubs dominated by microphyllous, succulent, or drought-deciduous, soft-leaved genera incl <i>Artemisia</i> , <i>Encelia</i> , <i>Eriogonum</i> , <i>Isocoma</i> , <i>Salvia</i> , and/or <i>Bahiopsis</i>	Group 2 (Soft-Leaved, Drought-Deciduous Shrublands)
1'	Shrubs dominated by hydrophytic species, gen occurring in bottomlands or areas adjacent to perennial or episodic streams	Group 3 (Riparian Shrublands)

Group 1: Sclerophyllous, Evergreen Shrublands

A	Shrubs dominated or codominated by <i>Cercocarpus</i> or <i>Fremontodendron</i>	
A.1	<i>Cercocarpus minutiflorus</i> dominant or codominant in the shrub stratum, gen >40% relative shrub cover; if present, scrub oak (<i>Quercus</i> spp.) subdominant (else see Section D below)	<u><i>Cercocarpus minutiflorus</i> Provisional Association</u> <i>Cercocarpus minutiflorus</i> Alliance
A.2	<i>Fremontodendron mexicanum</i> dominant or codominant; <i>Callitropsis forbesii</i> possibly occurring as an emergent tree	<u><i>Fremontodendron mexicanum</i> Special Stands</u>
B	Shrubs containing a higher cover of <i>Arctostaphylos</i> spp. than any other single shrub genus (exc <i>Adenostoma</i>), or <i>Arctostaphylos</i> spp. present on metavolcanic/gabbroic soils	
B.1	<i>A. glandulosa</i> is the dominant <i>Arctostaphylos</i> sp.; if <i>A. glandulosa</i> ssp. <i>crassifolia</i> present, see Section E.1.b below	<i>Arctostaphylos glandulosa</i> Alliance
B.1.a	<i>Chamaebatia australis</i> , <i>Pickeringia montana</i> var. <i>tomentosa</i> , <i>Lepechinia ganderi</i> , and/or <i>Ceanothus xotayensis</i> co-occur with <i>Arctostaphylos glandulosa</i> in various combinations on metavolcanic/gabbroic soils	<u><i>Arctostaphylos glandulosa</i>-<i>Adenostoma fasciculatum</i>/<i>Chamaebatia australis</i> Association</u>
B.1.b	Vegetation lacking the indicator species of metavolcanic/gabbroic soil conditions as in (B.1.a)	<u><i>Arctostaphylos glandulosa</i>-<i>Adenostoma fasciculatum</i> Association</u>
B.2	<i>A. glauca</i> is the dominant <i>Arctostaphylos</i> sp.	<u><i>Arctostaphylos glauca</i>-<i>Adenostoma fasciculatum</i> Association</u> <i>Arctostaphylos glauca</i> Alliance
C	Shrubs dominated or codominated by <i>Ceanothus</i> spp.	
C.1	<i>C. verrucosus</i> dominant; <i>Salvia mellifera</i> and <i>Malosma laurina</i> diagnostically present (gen with subdominant cover)	<u><i>Ceanothus verrucosus</i> Association</u> <i>Ceanothus verrucosus</i> Alliance
C.2	<i>C. crassifolius</i> dominant or codominant; trace <i>Xylococcus bicolor</i> diagnostically present; if <i>C. crassifolius</i> codominant with > trace <i>Adenostoma fasciculatum</i> and/or <i>X. bicolor</i> , see Sections K.1.b or K.2.b below	<u><i>Ceanothus crassifolius</i> Association</u> <i>Ceanothus crassifolius</i> Alliance
C.3	<i>C. cyaneus</i> dominant, or codominant within a dominant presence of <i>Ceanothus</i> spp.; if present, other shrubs (e.g., <i>Adenostoma fasciculatum</i> , <i>Malosma laurina</i> , and <i>Lotus scoparius</i>) gen with subdominant cover	<u><i>Ceanothus cyaneus</i> Special Stands</u>

C.4	<i>C. spinosus</i> dominant or codominant	<u><i>Ceanothus spinosus</i> Association</u> <i>Ceanothus spinosus</i> Alliance
C.5	<i>C. leucodermis</i> dominant or codominant	<u><i>Ceanothus leucodermis</i> Association</u> <i>Ceanothus leucodermis</i> Alliance (2)
C.6	<i>C. tomentosus</i> dominant or codominant; if present, combined cover of <i>Malosma laurina</i> , <i>Adenostoma fasciculatum</i> , and <i>Xylococcus bicolor</i> must be subdominant	<u><i>Ceanothus tomentosus</i> Association</u> <i>Ceanothus tomentosus</i> Alliance (2)
D	Shrubs dominated by scrub oak (<i>Quercus</i> spp.), <u>or</u> scrub oak accounts for more shrub cover than any other single shrub genus (exc <i>Adenostoma</i> , <i>Cercocarpus</i> , and <i>Ceanothus</i>)	
D.1	<i>Q. cedrosensis</i> is the dominant <i>Quercus</i> sp.	<u><i>Quercus cedrosensis</i> Special Stands (2)</u>
D.2	<i>Q. dumosa</i> is the dominant <i>Quercus</i> sp.; gen coastal	<u><i>Quercus dumosa</i> Association</u> <i>Quercus dumosa</i> Alliance
D.3	<i>Q. berberidifolia</i> / <i>Q. xacutidens</i> [<i>cornelius-mulleri</i> x <i>engelmannii</i>] is the dominant <i>Quercus</i> sp.	
D.3.a	<i>Adenostoma fasciculatum</i> absent or subdominant; if present, <i>Xylococcus bicolor</i> ≤ 1% absolute cover	
	<i>Quercus (berberidifolia, xacutidens) Alliance</i>	
D.3.a.(i)	<i>Ceanothus leucodermis</i> and <i>Cercocarpus</i> spp. absent	<u><i>Quercus (berberidifolia, xacutidens) Association</i></u>
D.3.a.(ii)	<i>Ceanothus leucodermis</i> present, often sub- to codominant; if present, <i>Cercocarpus</i> spp. ≤ <i>Ceanothus leucodermis</i>	<u><i>Quercus (berberidifolia, xacutidens)-Ceanothus leucodermis Association</i></u>
D.3.a.(iii)	<i>Cercocarpus</i> spp. present, often sub- to codominant; if present, <i>Ceanothus leucodermis</i> < <i>Cercocarpus</i> spp.	<u><i>Quercus (berberidifolia, xacutidens)-Cercocarpus minutiflorus Provisional Association</i></u>
D.3.b	<i>Adenostoma fasciculatum</i> codominant <u>or</u> <i>Xylococcus bicolor</i> > 1% absolute cover	
D.3.b.(i)	<i>X. bicolor</i> absent or ≤1% cover; gen inland	<u><i>Quercus (berberidifolia, xacutidens)-Adenostoma fasciculatum Association</i></u> <i>Quercus (berberidifolia, xacutidens)-Adenostoma fasciculatum Alliance</i>
D.3.b.(ii)	<i>X. bicolor</i> >1% absolute cover; coastal or inland	<u><i>Adenostoma fasciculatum-Xylococcus bicolor-Quercus (berberidifolia, xacutidens) Association</i></u> <i>Adenostoma fasciculatum-Xylococcus bicolor Alliance (2)</i>
E	Shrubs include > trace <i>Adenostoma fasciculatum</i> and/or <i>Xylococcus bicolor</i> (combined cover), <u>or</u> <i>X. bicolor</i> present on metavolcanic/gabbroic soils	
E.1	<i>X. bicolor</i> gen absent; if <i>X. bicolor</i> present, <i>A. fasciculatum</i> gen > 10x <i>X. bicolor</i>	
	<i>Adenostoma fasciculatum Alliance</i>	
E.1.a	<i>Ceanothus crassifolius</i> present	<u><i>Adenostoma fasciculatum-Ceanothus crassifolius Association</i></u>
E.1.b	Shrub stratum open to intermittent; <i>A. fasciculatum</i> dominant; occasionally, <i>Ceanothus verrucosus</i> or <i>Arctostaphylos glandulosa</i> ssp. <i>crassifolia</i> sub- to codominant; gen coastal	<u><i>Adenostoma fasciculatum Southern Maritime Association</i></u>
E.1.c	Microphyllous, succulent, or drought-deciduous, soft-leaved shrubs such as <i>Artemisia californica</i> , <i>Eriogonum fasciculatum</i> , <i>Salvia apiana</i> , <i>Salvia mellifera</i> , or <i>Bahiopsis laciniata</i> > trace	<u><i>Adenostoma fasciculatum-(Eriogonum fasciculatum, Artemisia californica, Salvia mellifera) Association</i></u>

E.2	E.1.d	<i>Lotus scoparius</i> , <i>Malosma laurina</i> , and/or <i>Helianthemum scoparium</i> > trace (combined cover); burned or disturbed stands <u>Adenostoma fasciculatum-Lotus scoparius Association</u>
	E.1.e	<i>Ceanothus tomentosus</i> present <u>Adenostoma fasciculatum-Ceanothus tomentosus Association</u>
		Adenostoma fasciculatum-Xylococcus bicolor Alliance
	E.2.a	<i>Pickeringia montana</i> and/or <i>Lepechinia ganderi</i> present on metavolcanic/gabbroic soils; <i>Callitropsis forbesii</i> may be present as an emergent tree <u>Adenostoma fasciculatum-Xylococcus bicolor-Pickeringia montana Association</u>
	E.2.b	<i>Ceanothus verrucosus</i> present <u>Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus verrucosus Association</u>
	E.2.c	<i>Ceanothus crassifolius</i> present <u>Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus crassifolius Association</u>
	E.2.d	<i>Quercus berberidifolia</i> /Q. <i>xacutidens</i> present <u>Adenostoma fasciculatum-Xylococcus bicolor-Quercus (berberidifolia, xacutidens) Association (2)</u>
	E.2.e	<i>Ceanothus tomentosus</i> present <u>Adenostoma fasciculatum-Xylococcus bicolor-Ceanothus tomentosus Association</u>
	E.2.f	Vegetation not as in E.2.a through E.2.e <u>Adenostoma fasciculatum-Xylococcus bicolor Association</u>
		Adenostoma fasciculatum-Xylococcus bicolor Alliance
F	Shrubs dominated by <i>Rhus integrifolia</i> , or <i>R. integrifolia</i> present with >2x cover of any other single species present; gen occurring on north-facing slopes of coastal canyons; if <i>R. integrifolia</i> codominant or subdominant, it can be a confounding species—in this case, attempt to key shrubs without considering <i>R. integrifolia</i> <u>Rhus integrifolia Association</u> Rhus integrifolia Alliance (2)	
G	Shrubs dominated or codominated by post-disturbance and/or fire-following species such as <i>Dendromecon rigida</i> , <i>Lotus scoparius</i> , <i>Malacothamnus fasciculatus</i> , <i>Malosma laurina</i> , <i>Rhamnus crocea</i> , and/or <i>Ceanothus tomentosus</i>	
	G.1	<i>Dendromecon rigida</i> dominant or codominant <u>Dendromecon rigida Association</u> Dendromecon rigida Alliance
	G.2	<i>Lotus scoparius</i> dominant; regenerating microphyllous, succulent, or drought-deciduous, soft-leaved shrubs such as <i>Artemisia californica</i> , <i>Eriogonum fasciculatum</i> , <i>Hazardia squarrosa</i> , and <i>Salvia apiana</i> gen present <u>Lotus scoparius Association</u> Lotus scoparius Alliance
	G.3	<i>Malosma laurina</i> dominant, or combined cover of <i>M. laurina</i> and <i>Lotus scoparius</i> accounts for more shrub cover than any other single shrub genus; if present, <i>L. scoparius</i> often > <i>M. laurina</i> <u>Malosma laurina-Lotus scoparius Association</u> Malosma laurina Alliance (2)
	G.4	<i>Malacothamnus fasciculatus</i> dominant or codominant; <i>Malosma laurina</i> and <i>Artemisia californica</i> diagnostically present <u>Malacothamnus fasciculatus Association</u> Malacothamnus fasciculatus Alliance (2)
	G.5	<i>Ceanothus leucodermis</i> dominant or codominant with <i>Malosma laurina</i> and <i>Lotus scoparius</i> <u>Ceanothus leucodermis Association</u> Ceanothus leucodermis Alliance (2)
	G.6	<i>Ceanothus tomentosus</i> dominant or codominant; if present, <i>Malosma laurina</i> , <i>Adenostoma fasciculatum</i> , and <i>Xylococcus bicolor</i> all subdominant <u>Ceanothus tomentosus Association</u> Ceanothus tomentosus Alliance (2)

- G.7 *Rhamnus crocea* dominant or codominant (with *Malosma laurina*); gen occurring in post-disturbance stands; shrub canopy ± open; *Salvia apiana* diagnostically present

[*Rhamnus crocea* Provisional Association](#)

Rhamnus crocea Provisional Alliance (2)

Group 2: Soft-Leaved, Drought-Deciduous Shrublands

A Shrubs include > trace <i>Adenostoma fasciculatum</i>	
<u><i>Adenostoma fasciculatum</i>-(<i>Eriogonum fasciculatum</i>, <i>Artemisia californica</i>, <i>Salvia mellifera</i>) Association</u>	
<i>Adenostoma fasciculatum</i> Alliance (2)	
B Shrubs include > trace <i>Bahiopsis laciniata</i> and/or <i>Simmondsia chinensis</i>	
B.1	<i>Simmondsia chinensis</i> present
<u><i>Simmondsia chinensis</i>-<i>Bahiopsis laciniata</i> Association</u>	
<i>Simmondsia chinensis</i> Alliance	
B.2	<i>Simmondsia chinensis</i> absent
<u><i>Bahiopsis laciniata</i>-<i>Artemisia californica</i>-<i>Eriogonum fasciculatum</i> Association</u>	
<i>Bahiopsis laciniata</i> Alliance	
C Shrubs dominated by the combined cover of <i>Artemisia californica</i> , <i>Eriogonum fasciculatum</i> , <i>Salvia apiana</i> , <i>S. mellifera</i> , and succulent species, <u>or</u> the combined cover of these species accounts for more shrub cover than any other single shrub species	
C.1	Two or more succulent species (e.g., <i>Dudleya</i> spp., <i>Ferocactus viridescens</i> , <i>Mammillaria</i> spp., <i>Opuntia</i> spp., and/or <i>Cylindropuntia</i> spp.) co-occur with <i>A. californica</i> and <i>E. fasciculatum</i> , <u>or</u> shrubs include > trace succulent species; gen coastal
<u><i>Artemisia californica</i>-<i>Eriogonum fasciculatum</i>-<i>Opuntia littoralis</i>/<i>Dudleya (edulis)</i> Association</u>	
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Alliance	
C.2	<i>Salvia apiana</i> and/or <i>S. mellifera</i> occurring with higher cover than any other species in the shrub stratum
C.2.a	<i>S. apiana</i> is the dominant <i>Salvia</i> sp.
<i>Salvia apiana</i> Alliance	
C.2.a.(i)	<i>S. apiana</i> dominant; if present, other microphyllous, succulent, or drought-deciduous, soft-leaved shrubs ± trace; shrub stratum open to intermittent
<u><i>Salvia apiana</i> Provisional Association</u>	
C.2.a.(ii)	<i>S. apiana</i> codominant or subdominant; <i>A. californica</i> diagnostically present, gen codominant; shrub stratum intermittent to continuous
<u><i>Salvia apiana</i>-<i>Artemisia californica</i> Association (2)</u>	
C.2.b	<i>S. mellifera</i> is the dominant <i>Salvia</i> sp.; <i>A. californica</i> absent or trace
<i>Salvia mellifera</i> Alliance	
C.2.b.(i)	<i>E. fasciculatum</i> present with ≥ 5% absolute cover
<u><i>Salvia mellifera</i>-<i>Eriogonum fasciculatum</i> Association</u>	
C.2.b.(ii)	<i>Malosma laurina</i> present; if present, <i>E. fasciculatum</i> with < 5% absolute cover
<u><i>Salvia mellifera</i>-<i>Malosma laurina</i> Association</u>	
C.2.c	<i>S. mellifera</i> is the dominant <i>Salvia</i> sp.; <i>A. californica</i> > trace
<u><i>Artemisia californica</i>-<i>Salvia mellifera</i> Association</u>	
<i>Artemisia californica</i> - <i>Salvia mellifera</i> Alliance (2)	
C.3	Combined cover of <i>A. californica</i> and a species other than <i>E. fasciculatum</i> dominant
C.3.a	<i>Mimulus aurantiacus</i> present; if present, <i>Encelia californica</i> , combined cover of <i>Keckiella antirrhinoides</i> / <i>Malosma laurina</i> , combined cover of <i>Salvia apiana</i> / <i>S. mellifera</i> , and <i>Toxicodendron diversilobum</i> must all be < <i>M. aurantiacus</i>
<u><i>Artemisia californica</i>-<i>Mimulus aurantiacus</i> Association</u>	
<i>Artemisia californica</i> Alliance (2)	

C.3.b	<i>E. californica</i> present; if present, <i>M. aurantiacus</i> , combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i> , combined cover of <i>S. apiana</i> / <i>S. mellifera</i> , and <i>T. diversilobum</i> must all be < <i>E. californica</i> Encelia californica-Artemisia californica Association Encelia californica Alliance (2)
C.3.c	<i>K. antirrhinoides</i> present; if present, <i>M. aurantiacus</i> , <i>E. californica</i> , combined cover of <i>S. apiana</i> / <i>S. mellifera</i> , and <i>T. diversilobum</i> must all be < combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i> Keckiella antirrhinoides-Artemisia californica Association Keckiella antirrhinoides Alliance (2)
C.3.d	<i>S. apiana</i> and/or <i>S. mellifera</i> present; if present, <i>M. aurantiacus</i> , <i>E. californica</i> , combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i> , and <i>T. diversilobum</i> must all be < combined cover of <i>S. apiana</i> / <i>S. mellifera</i> C.3.e.(i) <i>S. apiana</i> is the dominant <i>Salvia</i> sp. Salvia apiana-Artemisia californica Association Salvia apiana Alliance (2)
	C.3.e.(ii) <i>S. mellifera</i> is the dominant <i>Salvia</i> sp. Artemisia californica-Salvia mellifera Association Artemisia californica-Salvia mellifera Alliance (2)
C.3.e	<i>T. diversilobum</i> present; if present, <i>E. californica</i> , <i>M. aurantiacus</i> , combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i> , and combined cover of <i>S. apiana</i> / <i>S. mellifera</i> must all be < <i>T. diversilobum</i> ; <i>A. palmeri</i> and <i>Leymus condensatus</i> diagnostically present Toxicodendron diversilobum-Artemisia californica/Leymus condensatus Association Toxicodendron diversilobum Alliance (2)
C.4	<i>A. californica</i> is the sole dominant; <i>E. fasciculatum</i> absent or trace; vegetation does not meet criteria in C.3 Artemisia californica Association Artemisia californica Alliance
C.5	Combined cover of <i>E. fasciculatum</i> and a species other than <i>A. californica</i> dominant Eriogonum fasciculatum Alliance
C.5.a	<i>Bebbia juncea</i> present Eriogonum fasciculatum-Bebbia juncea Association
C.5.b	<i>S. apiana</i> present Eriogonum fasciculatum-Salvia apiana Association
C.5.c	<i>S. columbariae</i> and/or <i>Mirabilis laevis</i> present; shrub stratum ± open Eriogonum fasciculatum/Salvia columbariae-Mirabilis laevis Provisional Association
C.6	Combined cover of <i>E. fasciculatum</i> and <i>S. mellifera</i> accounts for more shrub cover than any other single shrub species Salvia mellifera -Eriogonum fasciculatum Association Salvia mellifera Alliance (2)
C.7	<i>E. fasciculatum</i> is the sole dominant; <i>A. californica</i> absent or trace; vegetation does not meet criteria in C.5 or C.6 Eriogonum fasciculatum Association Eriogonum fasciculatum Alliance
C.8	Combined cover of <i>A. californica</i> , <i>E. fasciculatum</i> , and <i>M. laurina</i> (if present) dominant; vegetation does not meet criteria in C.1 through C7 Artemisia californica-Eriogonum fasciculatum-Malosma laurina Association Artemisia californica-Eriogonum fasciculatum Alliance
D	Shrubs <u>not</u> dominated by the combined cover of <i>Artemisia californica</i> , <i>Eriogonum fasciculatum</i> , <i>Salvia apiana</i> , <i>S. mellifera</i> , and succulent species
D.1	<i>Ambrosia monogyra</i> dominant; gen occurring on alluvial substrate Ambrosia monogyra Provisional Association Ambrosia monogyra Provisional Alliance (2)

D.2	<i>Artemisia dracunculus</i> dominant or codominant	<u>Artemisia dracunculus Association</u> Artemisia dracunculus Alliance (2)
D.3	<i>Isocoma menziesii</i> dominant or codominant	Isocoma menziesii Alliance (2)
D.3.a	<i>Distichlis spicata</i> present; often in or near salt marshes or other alkaline habitats	<u>Isocoma menziesii/Distichlis spicata Association</u> (2)
D.3.b	<i>Distichlis spicata</i> absent	<u>Isocoma menziesii Provisional Association</u> (2)
D.4	<i>Gutierrezia</i> spp. dominant	<u>Gutierrezia (californica, sarothrae) Provisional Alliance</u>
D.5	<i>Baccharis</i> spp. dominant, or <i>Baccharis</i> spp. account(s) for more shrub cover than any other single shrub genus	
D.5.a	<i>B. pilularis</i> is the dominant <i>Baccharis</i> sp.	<u>Baccharis pilularis/Herbaceous Association</u> Baccharis pilularis Alliance
D.5.b	<i>B. sarothroides</i> is the dominant <i>Baccharis</i> sp.	<u>Baccharis sarothroides Association</u> Baccharis sarothroides Provisional Alliance (2)
D.6	<i>Encelia californica</i> dominant or codominant; if present, <i>M. aurantiacus</i> , combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i> , combined cover of <i>S. apiana</i> / <i>S. mellifera</i> , and <i>T. diversilobum</i> must all be < <i>E. californica</i>	<u>Encelia californica-Artemisia californica Association</u> Encelia californica Alliance (2)
D.7	<i>Lycium californicum</i> > trace	<u>Lycium californicum Provisional Association</u> Lycium californicum Provisional Alliance
D.8	<i>Mimulus aurantiacus</i> dominant or codominant; <i>A. californica</i> present; if present, <i>Encelia californica</i> , combined cover of <i>Keckiella antirrhinoides</i> / <i>Malosma laurina</i> , combined cover of <i>Salvia apiana</i> / <i>S. mellifera</i> , and <i>Toxicodendron diversilobum</i> must all be < <i>M. aurantiacus</i>	<u>Artemisia californica-Mimulus aurantiacus Association</u> Artemisia californica Alliance (2)
D.9	<i>Keckiella antirrhinoides</i> dominant or codominant; if present, <i>M. aurantiacus</i> , <i>E. californica</i> , combined cover of <i>S. apiana</i> / <i>S. mellifera</i> , and <i>T. diversilobum</i> must all be < combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i>	<u>Keckiella antirrhinoides-Artemisia californica Association</u> Keckiella antirrhinoides Alliance (2)
D.10	<i>Toxicodendron diversilobum</i> dominant; if present, <i>E. californica</i> , <i>M. aurantiacus</i> , combined cover of <i>K. antirrhinoides</i> / <i>M. laurina</i> , and combined cover of <i>S. apiana</i> / <i>S. mellifera</i> must all be < <i>T. diversilobum</i> ; <i>A. palmeri</i> and <i>Leymus condensatus</i> diagnostically present	<u>Toxicodendron diversilobum-Artemisia californica/Leymus condensatus Association</u> Toxicodendron diversilobum Alliance (2)
D.11	Shrubs dominated by <i>Rhus integrifolia</i> , or <i>R. integrifolia</i> present with >2x cover of any other single species present; gen occurring on north-facing slopes of coastal canyons; if <i>R. integrifolia</i> codominant or subdominant, it can be a confounding species—in this case, attempt to key shrubs without considering <i>R. integrifolia</i>	<u>Rhus integrifolia Association</u> Rhus integrifolia Alliance (2)
D.12	Vegetation dominated or codominated by post-disturbance and/or fire-following species such as <i>Lotus scoparius</i> , <i>Malacothamnus fasciculatus</i> , <i>Malosma laurina</i> , and/or <i>Rhamnus crocea</i>	
D.12.a	<i>Lotus scoparius</i> dominant; regenerating microphyllous, succulent, or drought-deciduous soft-leaved shrubs such as <i>Eriogonum fasciculatum</i> , <i>Hazardia squarrosa</i> , <i>Artemisia californica</i> , and <i>Salvia apiana</i> gen present	<u>Lotus scoparius Association</u> Lotus scoparius Alliance (2)

D.12.b	<i>Malosma laurina</i> dominant, <u>or</u> combined cover of <i>M. laurina</i> and <i>Lotus scoparius</i> accounts for more shrub cover than any other single shrub genus; if present, <i>L. scoparius</i> often > <i>M. laurina</i>	<u>Malosma laurina-Lotus scoparius Association</u> Malosma laurina Alliance (2)
D.12.c	<i>Malacothamnus fasciculatus</i> dominant or codominant; <i>Artemisia californica</i> and <i>Malosma laurina</i> diagnostically present	<u>Malacothamnus fasciculatus Association</u> Malacothamnus fasciculatus Alliance (2)
D.12.d	<i>Rhamnus crocea</i> dominant or codominant (with <i>Malosma laurina</i>); gen occurring in post-disturbance stands (gen not fire-related); shrub canopy ± open; <i>Salvia apiana</i> diagnostically present	<u>Rhamnus crocea Provisional Association</u> Rhamnus crocea Provisional Alliance (2)

Group 3: Riparian Shrublands

A	<i>Ambrosia monogyra</i> dominant; gen occurring on alluvial substrate	<u>Ambrosia monogyra Provisional Association</u> Ambrosia monogyra Provisional Alliance (2)
B	<i>Artemisia dracunculus</i> dominant or codominant	<u>Artemisia dracunculus Association</u> Artemisia dracunculus Alliance (2)
C	<i>Iva hayesiana</i> dominant or codominant; gen occurring in bottomlands on alluvial or sedimentary substrate	<u>Iva hayesiana Special Stands (2)</u>
D	<i>Frankenia</i> spp. dominant or codominant	
D.1	<i>Frankenia palmeri</i> dominant or codominant within a dominant presence of <i>Frankenia</i> spp.	<u>Frankenia palmeri Special Stands (2)</u>
D.2	<i>Frankenia salina</i> present; <i>Distichlis spicata</i> diagnostically present	<u>Frankenia salina-Distichlis spicata Association</u> Frankenia salina Alliance (2)
E	<i>Isocoma menziesii</i> dominant or codominant	Isocoma menziesii Alliance (2)
E.1	<i>Distichlis spicata</i> present; often in or near salt marshes or other alkaline habitats	<u>Isocoma menziesii/Distichlis spicata Association (2)</u>
E.2	<i>Distichlis spicata</i> absent	<u>Isocoma menziesii Provisional Association (2)</u>
F	Shrublands found along or adjacent to riparian corridors or seasonally flooded flats; dominated by <i>Baccharis</i> , <i>Pluchea</i> , <i>Salix</i> , and/or <i>Tamarix</i> spp.	
F.1	<i>Pluchea sericea</i> strongly dominant	<u>Pluchea sericea Association</u> Pluchea sericea Alliance
F.2	Shrubby <i>Salix</i> spp. > trace	
F.2.a	<i>S. laevigata</i> > trace; if present, <i>S. lasiolepis</i> ≤ <i>S. laevigata</i>	<u>Salix laevigata Association</u> Salix laevigata Alliance (2)*

*This vegetation type is described in the tree section of the report

F.2.b	<i>S. lasiolepis</i> > trace; if present, <i>S. laevigata</i> < <i>S. lasiolepis</i>	<u><i>Salix lasiolepis</i> Association</u> <i>Salix lasiolepis</i> Alliance (2)* <small>*This vegetation type is described in the tree section of the report</small>
F.2.c	<i>S. exigua</i> dominant	<i>Salix exigua</i> Alliance
F.3	<i>Baccharis</i> spp. dominant, or <i>Baccharis</i> spp. account(s) for more shrub cover than any other single shrub genus	
F.3.a	<i>B. salicifolia</i> dominant or codominant	<u><i>Baccharis salicifolia</i> Association</u> <i>Baccharis salicifolia</i> Alliance
F.3.b	The dominant <i>Baccharis</i> sp. is <i>B. sarothroides</i> ; if present, <i>B. salicifolia</i> subdominant	<u><i>Baccharis sarothroides</i> Association</u> <i>Baccharis sarothroides</i> Provisional Alliance (2)
F.4	<i>Tamarix</i> spp. strongly dominant	<u><i>Tamarix</i> spp. Semi-Natural Stands (2)*</u> <small>*This vegetation type is described in the tree section of the report</small>

CLASS C: HERBACEOUS VEGETATION

Key to Groups

1.	Vegetation dominated by nonhydrophytic herbaceous species, gen occurring on upland slopes and terraces	Group 1 (Upland Herbaceous Vegetation)
1'	Vegetation dominated by hydrophytic herbaceous species; gen occurring in bottomlands, streams and channels, intertidal zones, or other areas with perennial or episodic soil saturation	Group 2 (Hydrophytic Herbaceous Vegetation)

Group 1: Upland Herbaceous Vegetation

A	Herbs include <i>Ambrosia chamissonis</i> , often with <i>Abronia maritima</i> or <i>A. umbellata</i> ; occurs on sand dunes	<u><i>Ambrosia chamissonis</i>-<i>Abronia maritima</i>-<i>Cakile maritima</i> Association</u> <i>Abronia maritima</i> - <i>Ambrosia chamissonis</i> Alliance
B	Herbs include native, perennial grass species	
B.1	<i>Leymus</i> spp. dominant	
B.1.a	<i>Leymus condensatus</i> dominant	<u><i>Leymus condensatus</i> Association</u> <i>Leymus condensatus</i> Alliance
B.1.b	<i>Leymus triticoides</i> dominant	<u><i>Leymus triticoides</i> Association</u> <i>Leymus triticoides</i> Alliance (2)
B.2	<i>Nassella</i> spp. present	
B.2.a	The dominant <i>Nassella</i> sp. is <i>N. lepida</i> , with > trace cover	<u><i>Nassella lepida</i> Association</u> <i>Nassella lepida</i> Alliance
B.2.b	The dominant <i>Nassella</i> sp. is <i>N. pulchra</i> , with > 1% absolute cover	<u><i>Nassella pulchra</i> Association</u> <i>Nassella pulchra</i> Alliance
B.3	<i>Distichlis spicata</i> > trace; gen dominated by nonnative grasses (<i>Avena</i> spp., <i>Bromus</i> spp., and/or <i>Hordeum</i> spp.)	<u><i>Distichlis spicata</i> Annual Grasses Association</u> <i>Distichlis spicata</i> Alliance (2)
B.4	<i>Muhlenbergia rigens</i> > trace	<u><i>Muhlenbergia rigens</i> Association</u> <i>Muhlenbergia rigens</i> Alliance (2)
C	Herbs include native forb species; vegetation does not meet criteria listed above in A and B	
C.1	<i>Corethrogyne filaginifolia</i> > trace	<u><i>Corethrogyne filaginifolia</i> Association</u> <i>Corethrogyne filaginifolia</i> Provisional Alliance
C.2	<i>Deinandra fasciculata</i> > trace, or <i>D. fasciculata</i> trace in association with at least one of the following indicators: clay soils, cryptogamic crust, <i>Selaginella cinerascens</i> , and/or bulbiferous native species (e.g., <i>Allium</i> , <i>Brodiaea</i> , <i>Calochortus</i> , <i>Chlorogalum</i> , <i>Dodecatheon</i> , etc.); nonnative grasses such as <i>Avena</i> spp. often dominant	<u><i>Deinandra fasciculata</i> Association</u> <i>Deinandra fasciculata</i> Provisional Alliance
C.3	<i>Selaginella bigelovii</i> dominant; other species gen ± trace; gen occurring on rocky soils	<u><i>Selaginella bigelovii</i> Alliance</u>

D Herbs dominated by nonnative grass species; vegetation does not meet criteria listed above in A through C	
D.1	<i>Pennisetum setaceum</i> dominant or codominant Pennisetum setaceum Semi-Natural Stands
D.2	<i>Avena</i> spp. dominant or codominant; <i>Bromus</i> spp. and <i>Brachypodium distachyon</i> < <i>Avena</i> Avena (barbata, fatua) Semi-Natural Stands
D.3	Combined cover of <i>Bromus</i> spp. and <i>Brachypodium distachyon</i> dominant; if <i>Avena</i> spp. present, <i>Avena</i> spp. < <i>Bromus</i> spp. and <i>Brachypodium distachyon</i> <i>Bromus (diandrus, hordeaceus)-Brachypodium distachyon</i> Semi-Natural Stands
D.3.a	<i>Brachypodium distachyon</i> with the highest percent cover of nonnative grasses present, gen dominant Brachypodium distachyon Semi-Natural Stand Type
D.3.b	<i>Bromus diandrus</i> with the highest percent cover of nonnative grasses present, gen dominant Bromus diandrus Semi-Natural Stand Type
D.3.c	<i>Bromus rubens</i> (<i>B. madritensis</i> ssp. <i>r.</i>) with the highest percent cover of nonnative grasses present, gen dominant Bromus rubens Semi-Natural Stand Type <i>Bromus rubens-Schismus (arabicus, barbatus)</i> Semi-Natural Stands
D.4	<i>Lolium perenne</i> (<i>L. multiflorum</i>) dominant or codominant <i>Lolium perenne</i> Semi-Natural Stand Type Lolium perenne Semi-Natural Stands (2)
E Herbs dominated by nonnative forb species; vegetation does not meet criteria listed above in A through D	
E.1	Taxa within the family Brassicaceae dominant <i>Brassica (nigra)</i> and Other Mustards Semi-Natural Stands
E.1.a	<i>Brassica nigra</i> dominant Brassica nigra Semi-Natural Stand Type
E.2	Combined cover of <i>Conium maculatum</i> and <i>Foeniculum vulgare</i> dominant; gen in seasonally inundated and/or shaded areas <i>Conium maculatum-Foeniculum vulgare</i> Semi-Natural Stands
E.2.a	<i>C. maculatum</i> ≥ <i>F. vulgare</i> Conium maculatum Semi-Natural Stand Type
E.2.b	<i>F. vulgare</i> > <i>C. maculatum</i> Foeniculum vulgare Semi-Natural Stand Type
E.3	<i>Glebionis coronaria</i> dominant or codominant Glebionis coronaria Semi-Natural Stands
F Vegetation does not meet criteria listed above in A through E Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	

Group 2: Hydrophytic Herbaceous Vegetation

A Herbs dominated by halophytic species, occurring either in tidal/intertidal aquatic environments or nontidal brackish conditions	
A.1	<i>Suaeda esteroa</i> dominant, or codominant within a dominant presence of <i>Suaeda</i> spp. Suaeda esteroa Special Stands
A.2	<i>Spartina foliosa</i> dominant <u>or</u> subdominant with ≥ 10% absolute cover Spartina foliosa Association <i>Spartina foliosa</i> Alliance

A.3	<i>Distichlis spicata</i> dominant; <i>Frankenia salina</i> diagnostically present; <i>Arthrocnemum</i> spp., <i>Salicornia</i> spp., and <i>Sarcocornia</i> spp. each absent or trace	<u>Distichlis spicata-Annual Grasses Association</u> <u>Distichlis spicata Alliance (2)</u>
A.4	<i>Frankenia</i> spp. dominant or codominant	
A.4.a	<i>Frankenia palmeri</i> dominant	<u>Frankenia palmeri Special Stands (2)*</u> <small>*This vegetation type is described in the shrub section of the report</small>
A.4.b	<i>Frankenia salina</i> present; <i>Distichlis spicata</i> diagnostically present	<u>Frankenia salina-Distichlis spicata Association</u> <u>Frankenia salina Alliance (2)*</u> <small>*This vegetation type is described in the shrub section of the report</small>
A.5	<i>Monanthochloe littoralis</i> dominant; <i>Sarcocornia pacifica</i> diagnostically present	<u>Sarcocornia pacifica-Monanthochloe littoralis Special Stands</u>
A.6	<i>Bolboschoenus maritimus</i> dominant	<u>Bolboschoenus maritimus Association</u> <u>Bolboschoenus maritimus-Sarcocornia pacifica Alliance</u>
A.7	<i>Juncus acutus</i> dominant or codominant, <u>or</u> combined cover of <i>Juncus acutus</i> and <i>Jaumea carnosa</i> dominant	<u>Juncus acutus Provisional Alliance</u>
A.7.a	<i>Jaumea carnosa</i> absent	<u>Juncus acutus Provisional Association</u>
A.7.b	<i>Jaumea carnosa</i> present	<u>Juncus acutus-Jaumea carnosa Provisional Association</u>
A.8	<i>Arthrocnemum subterminale</i> > trace; gen occurring with grass species such as <i>Monanthochloe littoralis</i> , <i>Parapholis incurva</i> , and <i>Distichlis spicata</i> ; if present, <i>Frankenia</i> spp. subdominant	<u>Arthrocnemum subterminale Alliance</u>
A.8.a	<i>Sarcocornia pacifica</i> absent or trace	<u>Arthrocnemum subterminale Association</u>
A.8.b	<i>Sarcocornia pacifica</i> > trace; <i>Sarcocornia pacifica</i> often > <i>Arthrocnemum subterminale</i>	<u>Arthrocnemum subterminale-Sarcocornia pacifica Association</u>
A.9	<i>Salicornia</i> spp. and/or <i>Sarcocornia</i> spp. > trace; <i>Arthrocnemum subterminale</i> absent or trace; if present, <i>Frankenia</i> spp. subdominant and other species gen trace (exc <i>Lolium</i> spp.)	<u>Sarcocornia pacifica (Salicornia depressa) Alliance</u>
A.9.a	<i>Salicornia bigelovii</i> > trace	<u>Salicornia bigelovii Provisional Association</u>
A.9.b	<i>Frankenia salina</i> present; <i>Jaumea carnosa</i> absent or trace	<u>Sarcocornia pacifica-Frankenia salina Association</u>
A.9.c	<i>Jaumea carnosa</i> > trace; <i>Batis maritima</i> absent	<u>Sarcocornia pacifica-Jaumea carnosa Association</u>
A.9.d	<i>Jaumea carnosa</i> > trace; <i>Batis maritima</i> present	<u>Sarcocornia pacifica-Jaumea carnosa-Batis maritima Association</u>
A.9.e	<i>Sarcocornia pacifica</i> is the sole dominant; <i>Frankenia salina</i> and <i>Jaumea carnosa</i> absent; <i>Salicornia bigelovii</i> absent or trace	<u>Sarcocornia pacifica Association</u>
A.10	<i>Cressa truxillensis</i> > trace	<u>Cressa truxillensis Association</u> <u>Cressa truxillensis-Distichlis spicata Alliance</u>

A.11	<i>Anemopsis californica</i> dominant, <u>or</u> <i>A. californica</i> present and vegetation does not meet criteria listed above in A.1 through A.10		<u><i>Anemopsis californica</i>-<i>Juncus arcticus</i> Association</u> <i>Anemopsis californica</i> Alliance
B	Herbs occurring in freshwater aquatic environments		
B.1	Herbs dominated by native species		
B.1.a	<i>Iva hayesiana</i> dominant or codominant		<u><i>Iva hayesiana</i> Special Stands (2)*</u> *This vegetation type is described in the shrub section of the report
B.1.b	Muhlenbergia rigens > trace		<u><i>Muhlenbergia rigens</i> Association</u> <i>Muhlenbergia rigens</i> Alliance (2)
B.1.c	<i>Leymus triticoides</i> strongly dominant		<u><i>Leymus triticoides</i> Association</u> <i>Leymus triticoides</i> Alliance (2)
B.1.d	<i>Schoenoplectus</i> spp. dominant, or <i>Schoenoplectus</i> spp. account(s) for more herb cover than any other single herb genus		
B.1.d.(i)	The dominant <i>Schoenoplectus</i> sp. is <i>S. acutus</i>		<u><i>Schoenoplectus acutus</i> Association</u> <i>Schoenoplectus acutus</i> Alliance
B.1.d.(ii)	The dominant <i>Schoenoplectus</i> sp. is <i>S. americanus</i>		<u><i>Schoenoplectus americanus</i> Association</u> <i>Schoenoplectus americanus</i> Alliance
B.1.d.(iii)	The dominant <i>Schoenoplectus</i> sp. is <i>S. californicus</i>		<u><i>Schoenoplectus californicus</i> Association</u> <i>Schoenoplectus californicus</i> Alliance
B.1.e	<i>Typha</i> spp. dominant, or <i>Typha</i> spp. account(s) for more herb cover than any other single herb genus		
	<i>Typha (angustifolia, domingensis, latifolia)</i> Alliance		
B.1.e.(i)	The dominant <i>Typha</i> sp. is <i>T. domingensis</i>		<u><i>Typha domingensis</i> Association</u>
B.1.e.(ii)	The dominant <i>Typha</i> sp. is <i>T. latifolia</i>		<u><i>Typha latifolia</i> Association</u>
B.2	Herbs dominated by nonnative species		
B.2.a	<i>Arundo donax</i> strongly dominant, gen occurring as a monoculture		<u><i>Arundo donax</i> Semi-Natural Stands</u>
B.2.b	<i>Lepidium latifolium</i> strongly dominant, gen occurring as a monoculture		<u><i>Lepidium latifolium</i> Semi-Natural Stands</u>
B.2.c	<i>Lolium perenne</i> (<i>L. multiflorum</i>) dominant or codominant		<i>Lolium perenne</i> Semi-Natural Stand Type <u><i>Lolium perenne</i> Semi-Natural Stands (2)</u>
C	Vegetation does not meet criteria listed above in A and B		
	<u>Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands</u>		

CHAPTER 3.0
VEGETATION DOMINATED BY TREES

3.1 *Callitropsis forbesii* Alliance

Callitropsis forbesii (*Cupressus f.*) populations exist in the Santa Ana Mountains, on Sierra Peak and in Gypsum Canyon in Orange County, and in the California portion of the Peninsular Ranges on Guatay Mountain, Otay Mountain, and Tecate Peak in San Diego County. Stands are more numerous in Baja California south to the foothills of the Sierra San Pedro Martir.

In general, the characteristics of the alliance include *Callitropsis forbesii* as the dominant in the tree layer or emergent above a shrub canopy within a matrix of chaparral shrubs. Trees may be multi-stemmed and are still typically < 10 m. The canopy can be open to intermittent depending upon stand age and substrate development. The shrub layer can range from intermittent to continuous and the herbaceous layer is sparse to intermittent.

C. forbesii stands can occur on dry, exposed hillsides and ridgetops, along intermittent stream banks, and arroyos. Soils are deep or shallow over alkaline clay, sandstone, granitic, mafic, and ultramafic substrates. In the study area stands only occur on Otay Mountain and are on metavolcanic soils. Most of the Otay Mountain stands in the study area have experienced fire twice over a ten year period. The 2003 Otay/Mine fire footprint completely covered the known distribution of *C. forbesii* in the Otay Mountain area followed by the 2007 Harris fire that burned a substantial portion of this area again. Thorne's hairstreak, a butterfly under consideration for federal endangered species listing, is endemic to Otay Mountain. It is dependent on its larval host plant, *C. forbesii*. A single provisional *C. forbesii* association has been identified in the area.

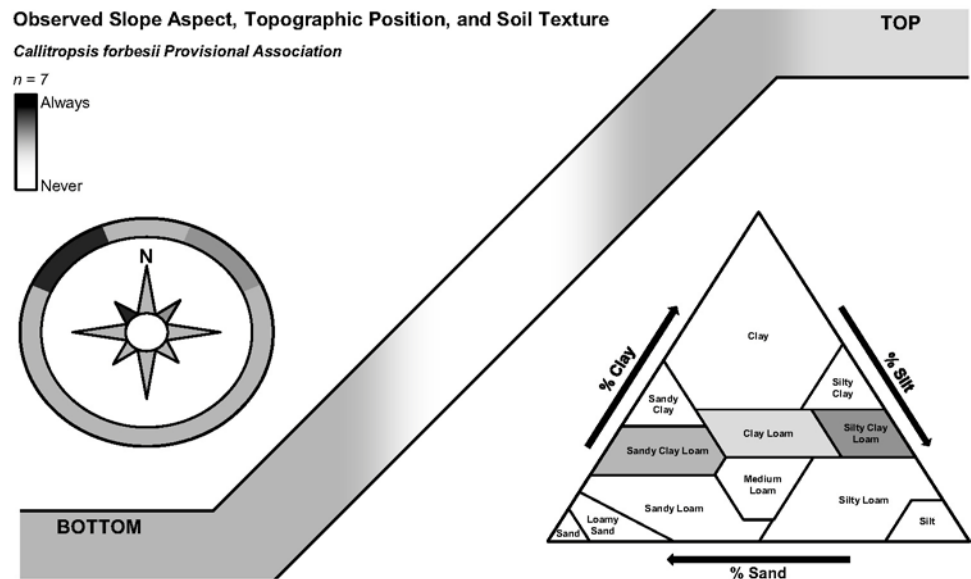
3.1.1 *Callitropsis forbesii* Provisional Association

Callitropsis forbesii (*Cupressus f.*) is typically dominant on upland slopes or terraces, and is often codominant in bottomlands with a mixture of winter-deciduous, broad-leaved trees such as *Platanus racemosa* and *Salix* spp. On upland slopes and terraces, this association generally occurs with open to intermittent shrub canopy, including *Adenostoma fasciculatum*, *Arctostaphylos* spp., *Ceanothus* spp., *Chamaebatia australis*, *Dendromecon rigida*, *Helianthemum scoparium*, *Lepechinia ganderi*, *Malosma laurina*, *Pickeringia montana*, *Quercus xacutidens*, *Salvia munzii*, and/or *Xylococcus bicolor*. In post-burn stands, *C. forbesii* seedlings may remain shorter than the more aggressively resprouting shrub canopy for many years; in these cases, the seedlings should still be included in the tree stratum.

Distribution in the Study Area

Ecoregions

Central Foothills (CF)
Central Valley (CV)
Santa Margarita (MA)



Membership Rules

There are two possible ways to key to this association. The rule given first applies to both options:

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).

Option One:

- If winter-deciduous, broad-leaved trees are absent, *Callitropsis forbesii* must account for at least 50 percent relative cover in the tree canopy.

Option Two:

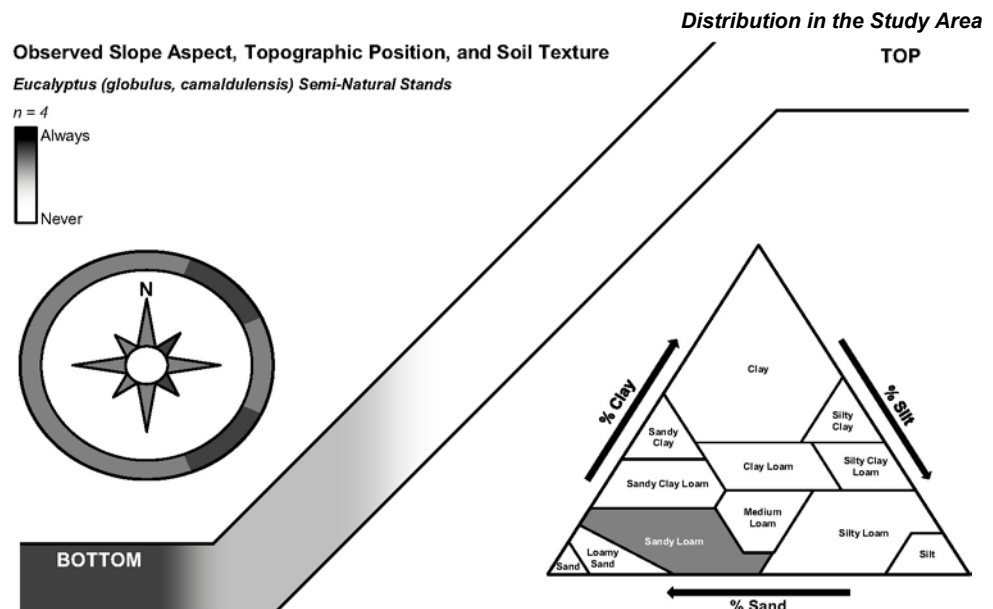
- If winter-deciduous, broad-leaved trees are present, *Callitropsis forbesii* must account for the highest percent relative cover in the tree canopy versus any other single tree genus.

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

Over 50 species of *Eucalyptus* have been introduced to California from Australia. However, only a few are known to form self-perpetuating stands and have the qualities of semi-natural stands. The two most common species that form semi-natural stands are listed in parentheses in the name of this type. *E. camaldulensis* is one of the most common species found in naturalized stands in San Diego County, but there are at least 6 other species that are listed in the most recent San Diego County Plant checklist (Rebman and Simpson 2006). No stands were sampled of this vegetation in this study, but several *E. camaldulensis* stands were sampled in the San Dieguito River Vegetation study (Evens and San 2005). That species is one of the few that appears to invade riparian channels.

Ecoregions

Central Valley (CV)



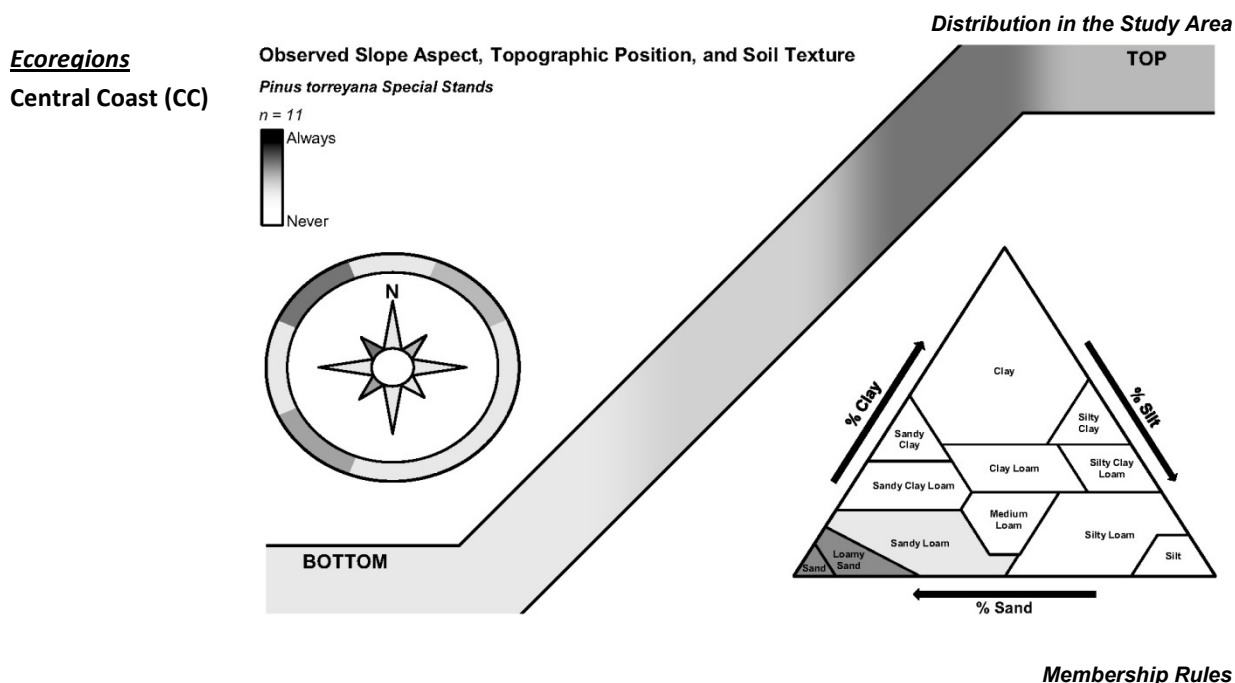
Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Eucalyptus* spp. must account for at least 50 percent relative cover in the tree canopy.

3.3 *Pinus torreyana* Special Stands

Pinus torreyana is one of the most distinctive rare plants of California, forming iconic stands along the bluffs of Torrey Pine State Reserve and adjacent areas of the San Diego coast. Less well known are the stands on Santa Rosa Island. Despite their prominence, their role as a diagnostic vegetative component is less well understood. Stand understories may be dominated by mesic or xeric chaparral species and/or coastal bluff or coastal scrub species; stand identification may be all the more confusing because pine crowns may be equally dispersed across the landscape with little regard to patterns of the associated understory shrubs. This situation suggests that the pines, albeit visually stunning, are not particularly diagnostic of stand-based environmental variables. Instead, they are diagnostic of relict maritime settings in south coastal California. For this reason, we treat these Torrey pines as “special stands” instead of members of alliances or associations with pines as a floristic diagnostic species.

Pinus torreyana is dominant in the tree canopy. Dominant and codominant shrubs include *Quercus dumosa*, *Cneoridium dumosum*, and *Eriogonum fasciculatum*. Many other shrubs of chaparral and coastal sage scrub are subdominant including *Adenostoma fasciculatum*, *Xylococcus bicolor*, *Ceanothus verrucosus*, *Cercocarpus minutiflorus*, *Rhus integrifolia*, *Artemisia californica*, *Salvia mellifera*, and *Malosma laurina*. Trees < 15 m; canopy is open. The shrub and herb layer are subdominant; cover and diversity are low although enhanced following fire. Torrey pine regeneration, though not dependent upon fire, may be enhanced with infrequent fire.



- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Pinus torreyana* must account for at least 50 percent relative cover in the tree canopy.

3.4 *Platanus racemosa* Alliance

Platanus racemosa is one of the most distinctive trees of riparian vegetation along episodic stream channels in the warmer and drier portions of California. The tree is long-lived with strong well-developed stump-sprouting capabilities. Sexual regeneration is episodic based on high flooding events associated with seed dispersal in the spring. *Platanus racemosa* is an obligate phreatophyte that tracks the draw-down of the water table through the drying summer months. Under altered hydrological regimes, *Platanus* stands are less likely to thrive relative to tree willow stands and cottonwood stands. For example, runoff from agriculture or suburban irrigation increases density and cover of more hydrophytic willows and cottonwoods, and tends to reduce vigor of *Platanus* stands.

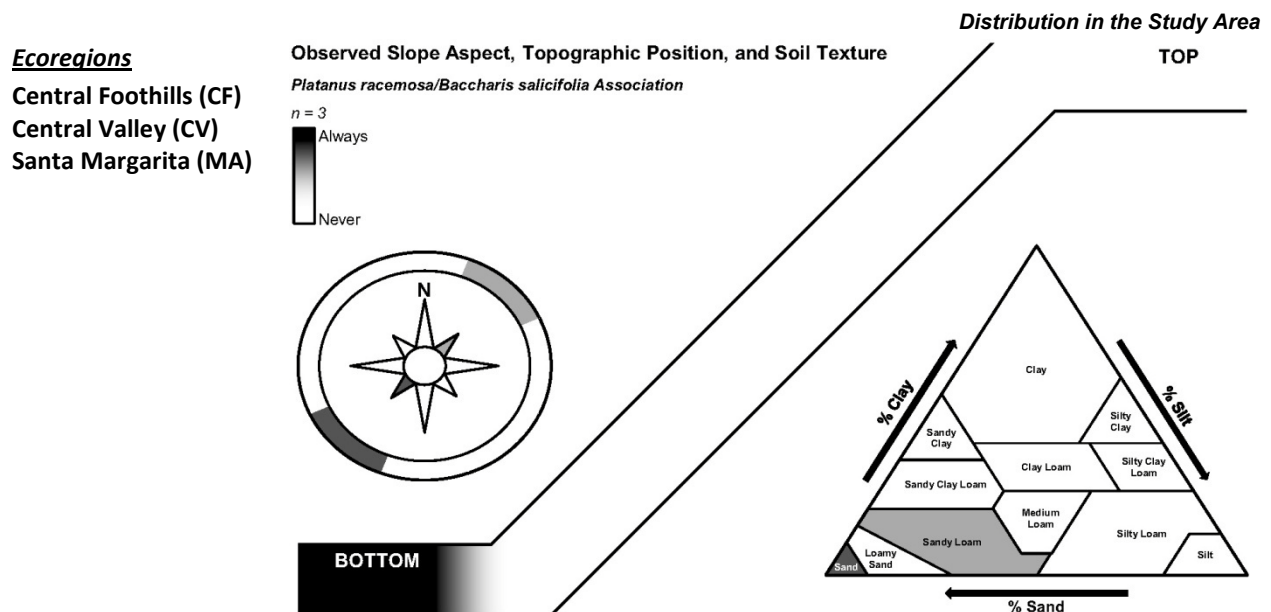
Nevertheless, *Platanus* stands are still common along many streams in the study area. Stands may include *Quercus agrifolia* and other trees but are characterized by the presence of regularly spaced *Platanus*. In general, *Platanus racemosa* is dominant or codominant in the tree canopy; additional tree species may include *Alnus rhombifolia*, *Juglans californica*, *Populus fremontii*, *Quercus agrifolia*, *Q. lobata*, *Salix exigua*, *S. gooddingii*, *S. laevigata*, *S. lasiolepis*, *S. lutea*, and *Umbellularia californica*. Trees are generally < 35 m with open canopy. The shrub and herb canopies are open with sparse cover.

Stands in the study area are represented by three associations. The most widespread association is the *Platanus racemosa*-*Quercus agrifolia* Association, which is represented by 33 samples and distinguished by the codominance of *Quercus agrifolia* in the tree layer. These stands are typically narrow and restricted to v-shaped canyons or terraces adjacent to active channels.

The *Platanus racemosa*/*Baccharis salicifolia* Association is characteristic of active episodic channels with cobbles and sand and poorly developed organic horizons. The *Platanus racemosa*-*Populus fremontii*/*Salix lasiolepis* Association is characteristic of perennial streamcourses; in some cases these may represent stands that have seen increased summer flow due to upstream runoff from irrigation.

3.4.1 *Platanus racemosa/Baccharis salicifolia* Association

Platanus racemosa is dominant or codominant in an open tree canopy with *Baccharis salicifolia* dominant in an open shrub canopy. Associated subdominant riparian shrubs include *Toxicodendron diversilobum*, *Sambucus nigra* ssp. *caerulea*, *Baccharis sarothroides*, *Vitis girdiana*, and *Rosa californica*. Many upland shrubs may also occur in this association. The herbaceous diversity is low and cover is sparse; characteristic species include *Artemisia douglasiana*, *Ambrosia psilostachya*, and *Carex spissa*.

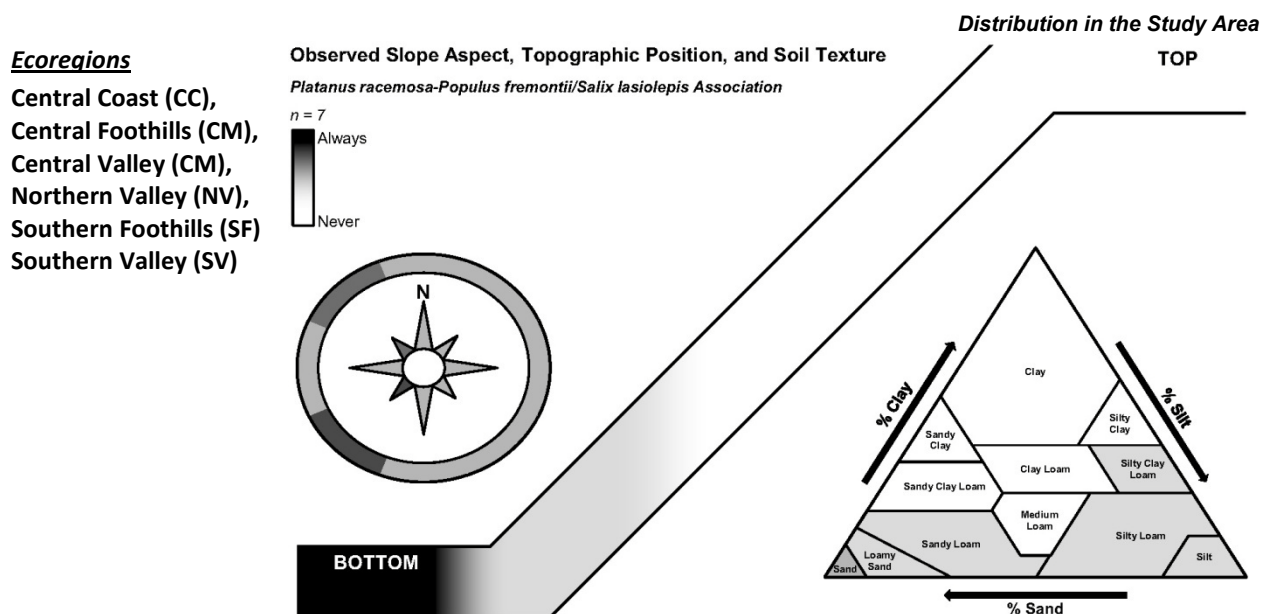


Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Platanus racemosa* must account for at least 5 percent relative cover in the tree canopy.
- *Quercus agrifolia*, *Populus* spp., and *Salix* spp. must be absent.
- *Baccharis salicifolia* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).

3.4.2 *Platanus racemosa*-*Populus fremontii*/*Salix lasiolepis* Association

Platanus racemosa occurs in an open to intermittent tree canopy with *Populus fremontii*, *Salix lasiolepis*, and/or other *Salix* spp. Associated subdominant riparian shrubs include *Toxicodendron diversilobum*, *Baccharis sarothroides*, *B. salicifolia*, *Vitis girdiana*, and *Rosa californica*. The herbaceous diversity is moderate and cover is open, including *Artemisia douglasiana*, *Ambrosia psilostachya*, *Carex spissa*, *Cyperus* spp., *Anemopsis californica*, *Juncus* spp., *Typha* spp., and many ruderal species.



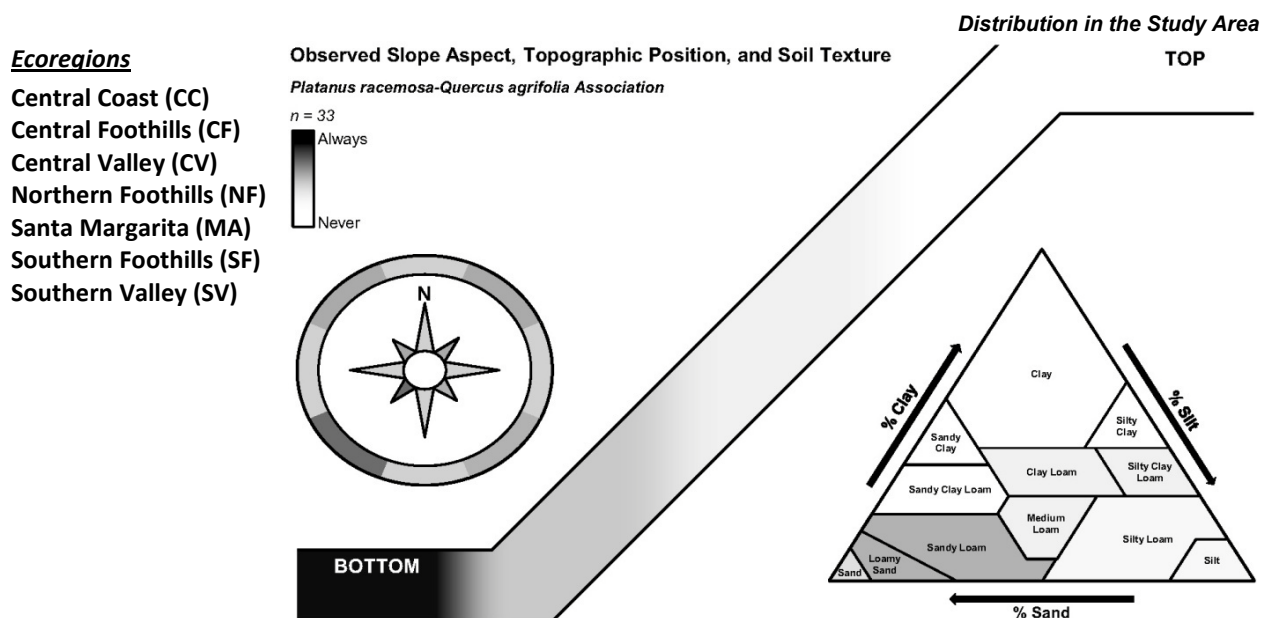
Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Platanus racemosa* must account for at least 5 percent relative cover in the tree canopy.
- *Populus* spp. and/or *Salix* spp. must be present.
- If present, *Populus* spp. must be present with lower percent cover than *Platanus racemosa* (otherwise see *Populus fremontii* Alliance).
- If present, *Quercus agrifolia* must account for less than 5 percent relative cover in the tree canopy (otherwise see *Platanus racemosa*-*Quercus agrifolia* Association).

- *Salix lasiolepis* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).

3.4.3 *Platanus racemosa*-*Quercus agrifolia* Association

Platanus racemosa and *Quercus agrifolia* together are codominant in a continuous to open tree canopy; subdominants may include *Populus* spp. and *Salix* spp. Associated subdominant riparian shrubs include *Sambucus nigra* ssp. *caerulea*, *Toxicodendron diversilobum*, *Vitis girdiana*, *Rosa californica*, and *Rubus ursinus*. Many associated upland shrubs may also be present including *Rhus integrifolia*, *R. ovata*, *Rhamnus* spp., *Heteromeles arbutifolia*, and *Baccharis salicifolia*. The herbaceous diversity is high and cover is continuous to open, including *Artemisia douglasiana*, *A. palmeri*, *Ambrosia psilostachya*, *Carex spissa*, *Cyperus* spp., *Anemopsis californica*, *Juncus* spp., *Typha* spp., and many ruderal species.



Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Platanus racemosa* and *Quercus agrifolia* together must account for at least 5 percent relative cover each in the tree canopy. The cover of *Q. agrifolia* is typically greater than the cover of *P. racemosa* in this association.
- *Populus* spp. must be absent.
- If the criteria above are met, the presence/abundance of *Salix* spp. is irrelevant.

3.5 *Populus fremontii* Alliance

Populus fremontii is a widespread riparian alliance in the American Southwest. Compared to the *Platanus racemosa* Alliance, the *Populus fremontii* Alliance requires a more persistent water source with either regular subterranean availability or surface water for much of the growing season. Stand development is dependent on episodic floods that create sandy or gravelly alluvium as suitable substrate for seedling germination. Trees are relatively short lived (generally < 100 years) and thus stand-replacing fluvial processes are important for long-term persistence.

In general, stands throughout the state are characterized by: *Populus fremontii* as the dominant or codominant in the tree canopy with *Acer negundo*, *Fraxinus latifolia*, *Juglans hindsii* (and hybrids), *Platanus racemosa*, *Quercus agrifolia*, *Salix exigua*, *S. gooddingii*, *S. laevigata*, *S. lasiolepis*, *S. lucida* ssp. *lasiandra*, and *S. lutea*. Trees average < 25 m; canopy is open. The shrub and herbaceous canopies are typically open.

Two associations are represented in the study area based on samples taken for this and related projects. The *Populus fremontii/Baccharis salicifolia* Association is representative of more episodic flooding, while the *Populus fremontii-Salix gooddingii/Baccharis salicifolia* Association suggests more permanently available water throughout the growing season.

3.5.1 *Populus fremontii*/Baccharis salicifolia Association

Populus fremontii and *Baccharis salicifolia* together occur as codominants. Associated subdominant riparian shrubs include *Sambucus nigra* ssp. *caerulea*, *Isocoma menziesii*, and *Salix* spp. The herbaceous diversity is low and cover is mostly continuous in openings, including *Distichlis spicata*, *Ambrosia psilostachya*, *Anemopsis californica*, and many ruderal species.

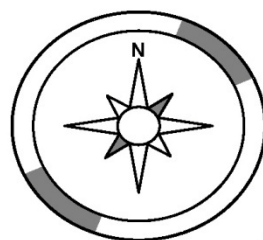
Ecoregions

Central Valley (CV)
Northern Valley (NV)
Southern Foothills (SF)
Southern Valley (SV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Populus fremontii/Baccharis salicifolia Association

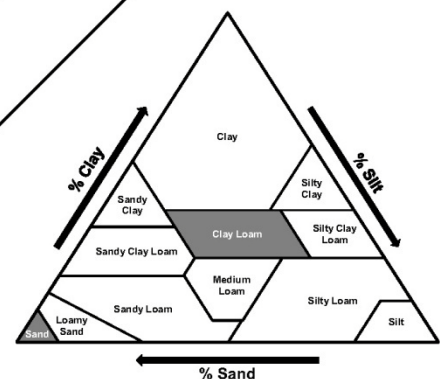
$n = 2$
Always
Never



BOTTOM

Distribution in the Study Area

TOP

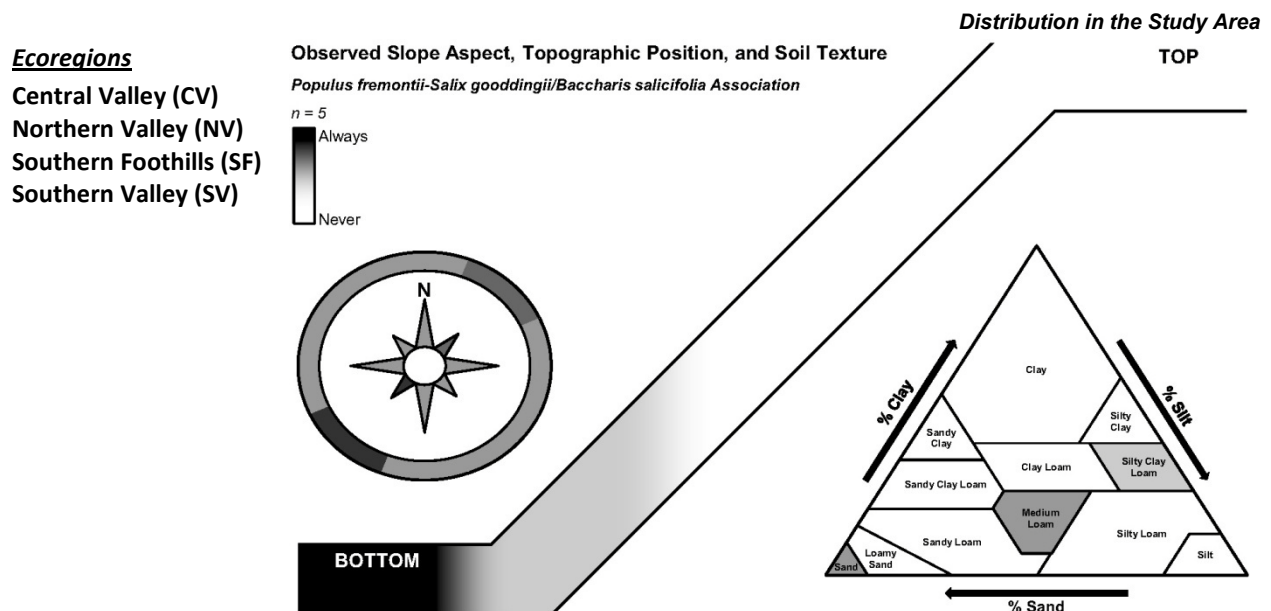


Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Populus* spp. must account for at least 5 percent relative cover in the tree canopy.
- If present, *Platanus racemosa* must be present with lower percent cover than *Populus* spp. (otherwise see *Platanus racemosa* Alliance).
- *Salix gooddingii* must be absent.
- *Baccharis salicifolia* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).
- If the criteria above are met, the presence/abundance of other tree species (*Quercus agrifolia*, other *Salix* spp.) is irrelevant.

3.5.2 *Populus fremontii*-*Salix gooddingii*/*Baccharis salicifolia* Association

Populus fremontii and *Salix gooddingii* together occur as codominant in an open tree canopy with *Baccharis salicifolia* subdominant in the shrub canopy. Subdominant tree species include *Salix laevigata*, *S. lasiolepis*, *S. exigua*, *Sambucus mexicana*, *Quercus agrifolia*, and *Platanus racemosa*. Associated shrubs include *Baccharis sarothroides*, *Toxicodendron diversilobum*, *Iva hayesiana*, and *Rosa californica*. Herbaceous vegetation occurs in openings, often in flood scour or depositional areas including a diverse assemblage of native and nonnative wetland plants such as *Artemisia douglasiana*, *Heliotropium curassavicum*, *Stachys ajugoides*, *Schoenoplectus* spp., *Typha* spp., *Xanthium strumarium*, and *Piptatherum miliaceum*.



Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Populus* spp. must account for at least 5 percent relative cover in the tree canopy.
- If present, *Platanus racemosa* must have a lower percent cover than *Populus* spp. (otherwise see *Platanus racemosa* Alliance).
- *Salix gooddingii* must be present.
- *Baccharis salicifolia* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).

- If the criteria above are met, the presence/abundance of other tree species (*Quercus agrifolia*, other *Salix* spp.) is irrelevant.

3.6 *Quercus agrifolia* Alliance

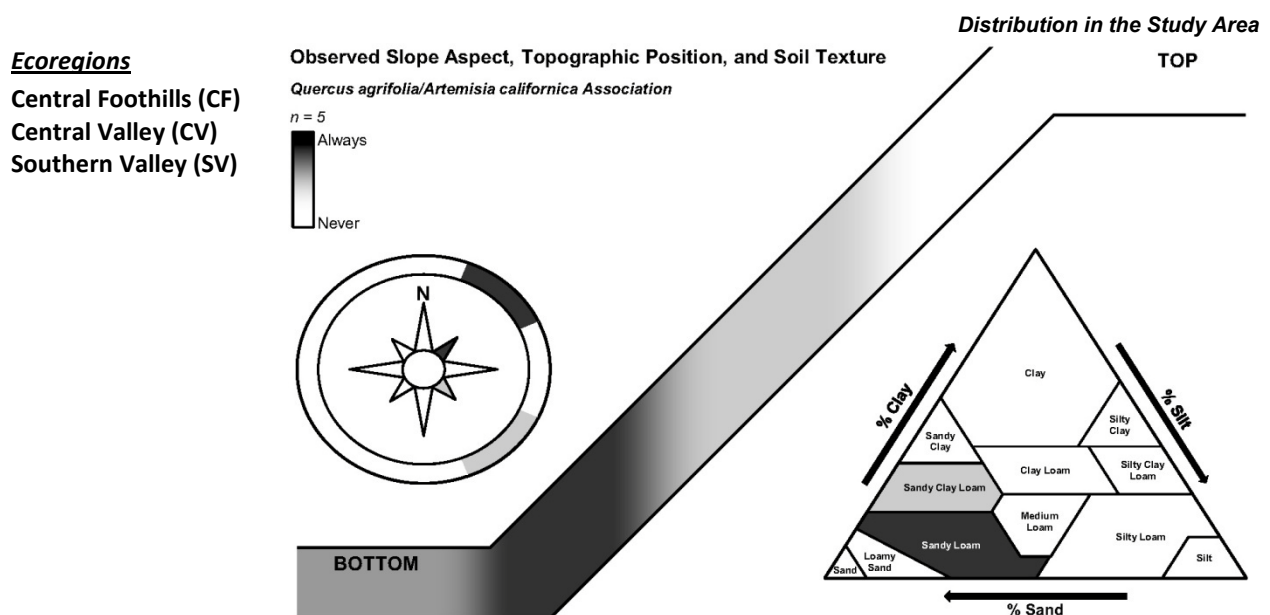
Quercus agrifolia is the primary tree alliance in the study area. *Quercus agrifolia* is diagnostic of California broad-leaved woodlands in the warm-temperate portions of the state. In the study area, stands may either be found in mesic uplands or riparian or semi-riparian settings where fluvial processes affect regeneration. Fire is the main natural process affecting upland stands. Both processes may be actively present in the riparian stands. Regeneration from seed is episodic, but trees live for >200–300 years. Stands can be eliminated by repeated fires at short intervals.

Statewide, general alliance characteristics include *Quercus agrifolia* as the dominant or codominant species in the tree canopy. Associated tree species may include *Acer macrophyllum*, *A. negundo*, *Arbutus menziesii*, *Juglans californica*, *Platanus racemosa*, *Populus fremontii*, *Quercus douglasii*, *Q. lobata*, *Q. engelmannii*, *Q. kelloggii*, *Salix lasiolepis*, and/or *Umbellularia californica*. Trees are generally < 30 m tall and the canopy is open to continuous. The shrub and herbaceous canopies are variable.

Four different associations of this alliance were identified in the study area. The *Quercus agrifolia*/*Artemisia californica* Association is generally found in drier, upland settings, where it occurs adjacent to stands of coastal scrub. The *Quercus agrifolia*/*Quercus (berberidifolia, xacutidens)* Association generally occurs on lower, mesic slopes adjacent to chaparral stands. The most widespread association in the study area—*Quercus agrifolia*/*Toxicodendron diversilobum*/Grass Association—occupies lower slopes and terraces, but is not subjected to fluvial processes. Finally, the *Quercus agrifolia*/*Salix lasiolepis* Association occurs adjacent to streams; the presence of both arroyo willow and *Quercus agrifolia* suggests higher than ambient moisture and associated fluvial processes.

3.6.1 *Quercus agrifolia*/Artemisia californica Association

Quercus agrifolia is the dominant species in an open tree canopy, while *Artemisia californica* is dominant in an open shrub canopy. Subdominant shrubs include a variety of chaparral and coastal sage species, such as *Ceanothus tomentosus*, *Adenostoma fasciculatum*, *Mimulus aurantiacus*, *Malosma laurina*, *Sambucus nigra* ssp. *caerulea*, *Rhamnus ilicifolia*, *Artemisia californica*, *Eriogonum fasciculatum*, and *Heteromeles arbutifolia*. Herbaceous cover occurs in openings and includes *Marah macrocarpus*, *Nassella pulchra*, *Phacelia* spp., *Sidalcea malviflora*, *Grindelia hirsutula*, and many shrubs, and often includes a high cover of ruderal species.



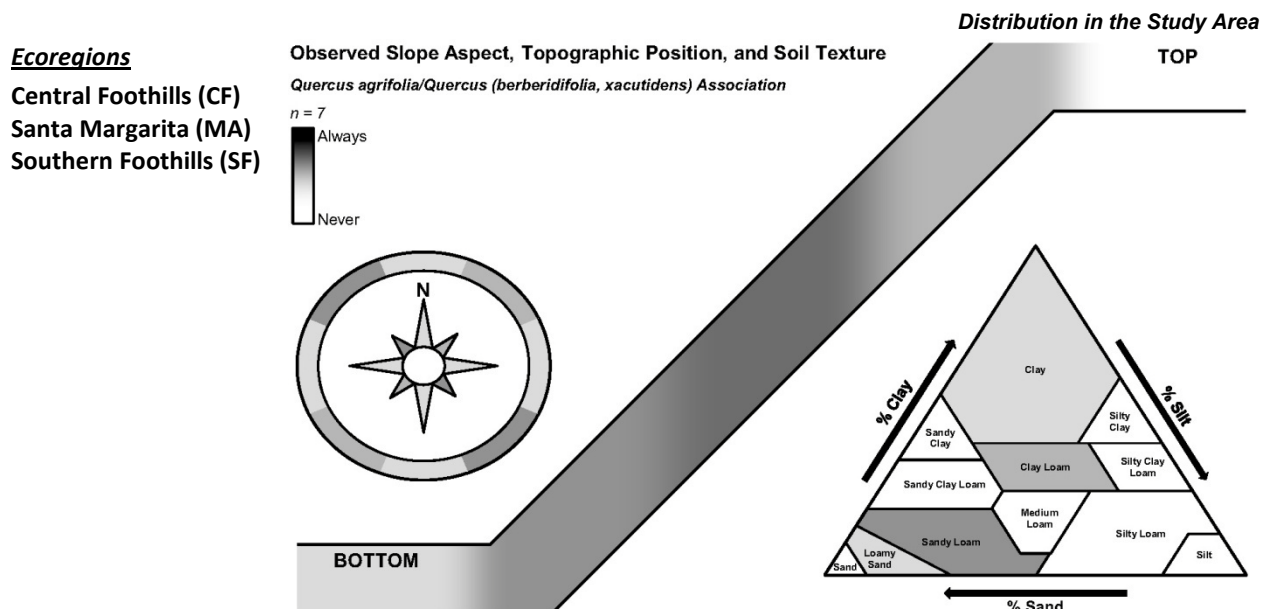
Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Quercus agrifolia* must account for at least 50 percent relative cover in the tree canopy.
- *Q. engelmannii* must be absent (otherwise see *Quercus engelmannii* Alliance).
- *Artemisia californica* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).

- Note: If *A. californica* is absent but other soft-leaved, succulent, microphyllous, or broad-leaved shrub species are present, this association still applies.
- Scrub oak (*Q. berberidifolia*, *Q. ×acutidens*) and other sclerophyllous shrub species are generally absent. If sclerophyllous shrub species are present, the percent cover of soft-leaved, succulent, microphyllous, or broad-leaved shrub species should be higher than the percent cover of sclerophyllous shrub species (otherwise see *Quercus agrifolia*/*Quercus (berberidifolia, ×acutidens)* Association).
- *Toxicodendron diversilobum* is generally absent. If *T. diversilobum* is present, the percent cover of other soft-leaved, succulent, microphyllous, or broad-leaved shrub species should be higher than the percent cover of *T. diversilobum* (otherwise see *Quercus agrifolia*/*Toxicodendron diversilobum*/Grass Association).

3.6.2 *Quercus agrifolia*/*Quercus (berberidifolia, xacutidens)* Association

Quercus agrifolia is dominant in an open tree canopy with *Quercus (berberidifolia, xacutidens)* diagnostically present in the shrub canopy. Subdominant shrubs include *Ceanothus tomentosus*, *C. oliganthus*, *Heteromeles arbutifolia*, *Cercocarpus minutiflorus*, *Mimulus aurantiacus*, *Rhus trilobata*, *Artemisia californica*, *Malosma laurina*, *Eriodictyon trichocalyx*, *Keckiella cordifolia*, *Hazardia squarrosa*, and many other chaparral species. Herbaceous cover occurs in openings including *Marah macrocarpus*, *Phacelia* spp. and a high diversity of chaparral-associated plants. This association is typical of mesic slopes where *Quercus agrifolia* is not associated with riparian vegetation types.



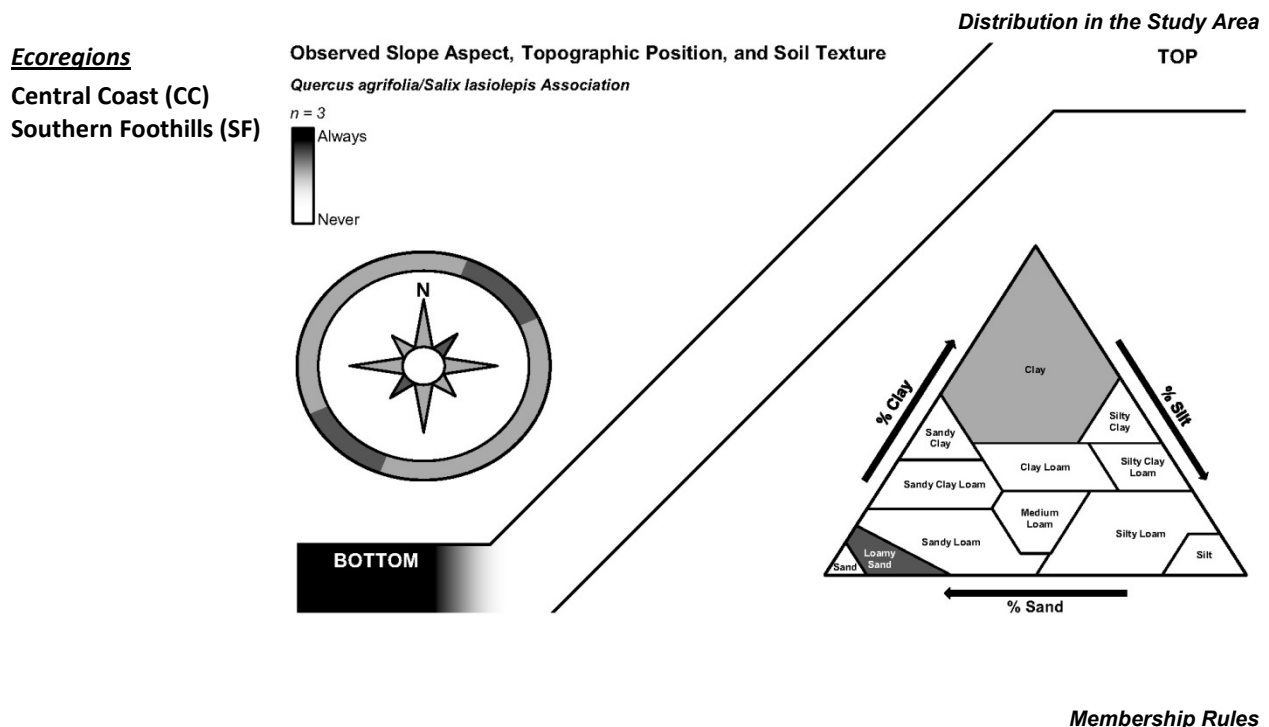
Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Quercus agrifolia* must account for at least 50 percent relative cover in the tree canopy.
- *Q. engelmannii* must be absent (otherwise see *Quercus engelmannii* Alliance).
- Scrub oak (*Q. berberidifolia*, *Q. xacutidens*) is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).

- Note: If scrub oak is absent but other sclerophyllous shrub species are present, this association still applies.
- Soft-leaved, succulent, microphyllous, or broad-leaved shrub species are generally absent (e.g., *Artemisia californica* and *Toxicodendron diversilobum*). If soft-leaved, succulent, microphyllous, or broad-leaved shrub species are present, the percent cover of sclerophyllous shrub species should be higher than the percent cover of soft-leaved, succulent, microphyllous, or broad-leaved shrub species (otherwise see *Quercus agrifolia*/*Artemisia californica* Association or *Quercus agrifolia*/*Toxicodendron diversilobum*/Grass Association).

3.6.3 *Quercus agrifolia*/Salix lasiolepis Association

Quercus agrifolia is dominant in an open to closed tree canopy with *Salix lasiolepis* typically dominating the shrub canopy. Subdominant trees may include *Platanus racemosa*, *Populus* spp., and *Salix* spp. (*laevigata*, *gooddingii*); if present, these tree species must have a less than trace percent cover for this association to apply. Subdominant shrubs include *Vitis girdiana*, *Sambucus nigra* ssp. *caerulea*, and *Baccharis* spp. (*salicifolia*, *sarothroides*, *pilularis*). The herbaceous diversity is low and cover is generally open, including wetland affiliates such as *Artemisia palmeri*, *Ambrosia psilostachya*, *Anemopsis californica*, *Distichlis spicata*, and *Epilobium ciliatum*.



There are two possible ways to key to this association. The rule given first applies to both options:

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).

Option One:

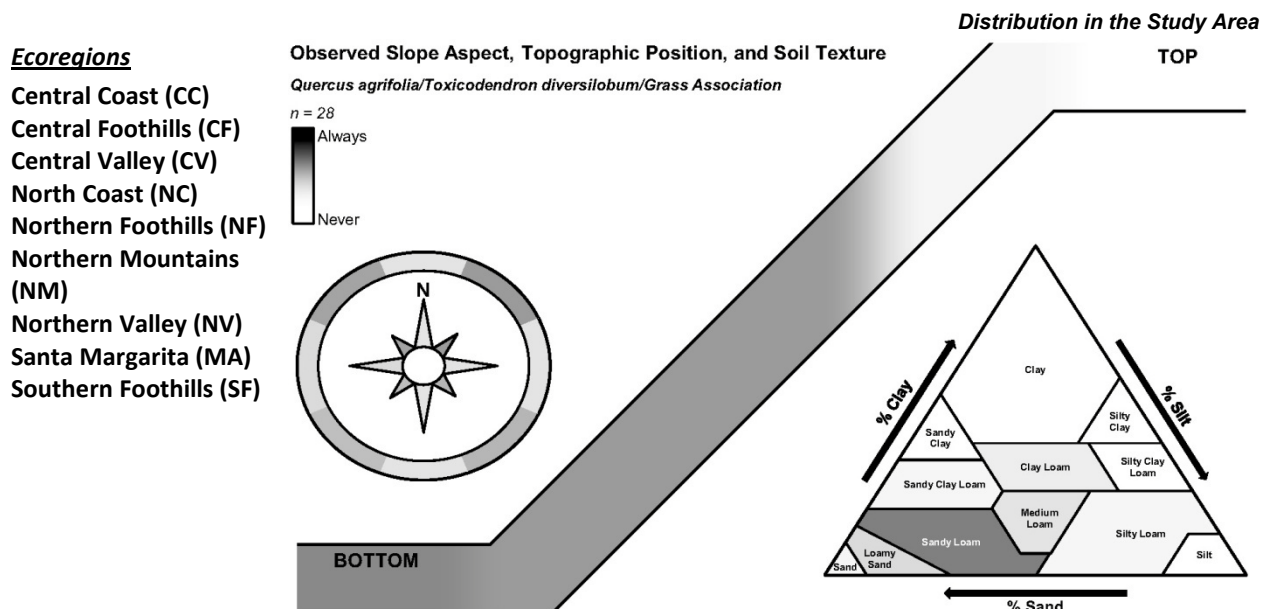
- *Salix lasiolepis* must account for at least 5 percent relative cover.
- *Quercus agrifolia* must account for at least 5 percent relative cover in the tree canopy.
- If present, *Salix laevigata* must have a lower percent cover than *Salix lasiolepis* (otherwise see *Salix laevigata* Alliance).
- *Platanus racemosa*, *Populus* spp., and *Salix gooddingii* must each have less than 5 percent relative cover in the tree canopy.

Option Two:

- *Quercus agrifolia* must account for at least 50 percent relative cover in the tree canopy.
- *Salix lasiolepis* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).
 - Note: If *S. lasiolepis* is absent, at least one other winter-deciduous tree species must be present with less than 5 percent relative cover. If winter-deciduous, broad-leaved trees are absent, see Group 1: Upland Forests and Woodlands.
- If present, *Platanus racemosa*, *Populus* spp., and *Salix* spp. must each have less than 5 percent relative cover in the tree canopy (otherwise see respective alliances).

3.6.4 *Quercus agrifolia*/Toxicodendron diversilobum/Grass Association

Quercus agrifolia is dominant in the tree canopy and *Toxicodendron diversilobum* is subdominant in the shrub canopy, with an understory of native herbaceous and ruderal species. Subdominant shrubs include *Sambucus nigra* ssp. *caerulea*, *Baccharis pilularis*, and *Artemisia palmeri*. The herbaceous diversity is high and cover is generally intermittent to continuous, including fewer wetland affiliates than the previous association and many ruderal species. This association is ecologically similar to the *Quercus agrifolia*/*Salix lasiolepis* Association but occurs higher on the hydrologic profile where many upland shrubs and ruderal plants are prevalent above the fluvial regime.



Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Quercus agrifolia* must account for at least 50 percent relative cover in the tree canopy.
- *Quercus engelmannii* must be absent (otherwise see *Quercus engelmannii* Alliance).
- *Toxicodendron diversilobum* must be present
- Nonnative grasses are generally greater than 5 percent relative cover.

- Scrub oak (*Q. berberidifolia*, *Q. ×acutidens*) is generally absent. If sclerophyllous species such as scrub oak are present, the percent cover of *T. diversilobum* should be higher than the percent cover of sclerophyllous species (otherwise see *Quercus agrifolia*/*Quercus* [*berberidifolia*, *×acutidens*] Association).
- If *Artemisia californica* is present, the percent cover of *T. diversilobum* should be higher than the percent cover of *A. californica* (otherwise see *Quercus agrifolia*/*Artemisia californica* Association).

3.7 *Quercus engelmannii* Alliance

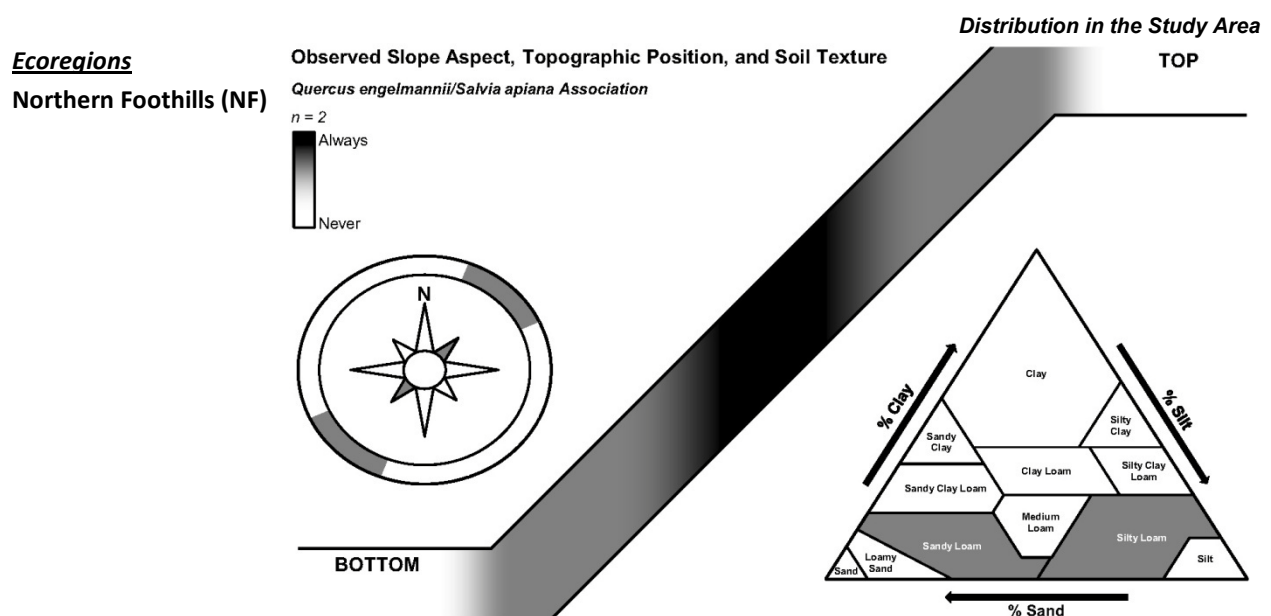
Quercus engelmannii is endemic to south coastal California and adjacent Baja California Norte, Mexico. It is a subtropical oak that is partially drought deciduous. It occupies interior portions of the study area and only a few individuals and no stands are known within 5 miles of the coast, with an exception being Marine Corps Base Camp Pendleton, which is outside of the study area. Recent fires in San Diego County have had varied effects on *Q. engelmannii*, including mortality of some mature trees. Stands with grassy understories tend to suffer minimal damage, while trees in stands with shrubby understories are top-killed but may survive by resprouting.

In general, *Q. engelmannii* is dominant or codominant in the tree canopy with *Juglans californica*, *Q. agrifolia*, and *Q. kelloggii* sometimes present as associates. Trees are usually < 18 m tall, and the canopy may be open to closed. The shrub layer is sparse to open and the herbaceous layer is sparse and often dominated by grass species.

This alliance is uncommon in the study area, and identified stands fall into two previously described plant associations. The *Quercus engelmannii*/*Salvia apiana* Association, which is represented by two samples, has a coastal scrub shrub understory and is also known from other inland portions of San Diego County (Evens and San 2005). The *Quercus engelmannii*-*Quercus agrifolia*/*Toxicodendron diversilobum*/Grass Association, which has been previously described from western Riverside County (Klein and Evens 2006), is more widespread in the study area. It is characterized by a codominance of *Q. agrifolia* and *Q. engelmannii* and a largely herbaceous understory.

3.7.1 *Quercus engelmannii*/Salvia apiana Association

Quercus engelmannii is dominant in an open tree canopy with *Salvia apiana* diagnostically present in an open shrub canopy. Subdominant shrubs include many coastal sage scrub species such as *Salvia mellifera*, *S. apiana*, *Artemisia californica*, and *Malosma laurina*. In stands transitional to chaparral, additional species may include *Adenostoma fasciculatum*, *Ceanothus leucodermis*, and *Cercocarpus minutiflorus*. The herbaceous diversity is high and cover is open to continuous in openings, including *Leymus condensatus*, *Nassella pulchra*, *N. cernua*, *Bloomeria crocea* var. *crocea*, and *Dichelostemma capitatum* ssp. *capitatum*.

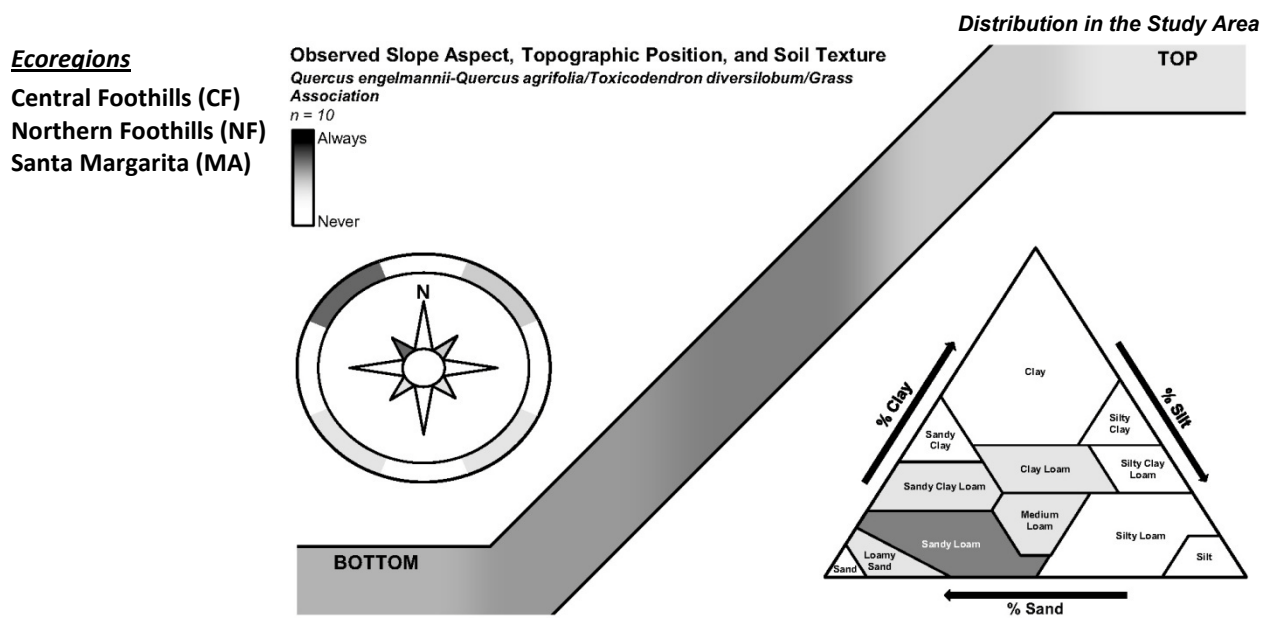


Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Quercus engelmannii* must be present.
- *Quercus agrifolia* must be absent.
- *Salvia apiana* is diagnostically present (i.e., is not required to be present but is expected to occur with a probability of 80 percent or greater), generally occurring with other soft-leaved, succulent, microphyllous, or sclerophyllous shrub species.
 - Note: If *S. apiana* is absent but other soft-leaved, succulent, microphyllous, or broad-leaved shrub species are present, this association still applies.

3.7.2 *Quercus engelmannii*-*Quercus agrifolia*/*Toxicodendron diversilobum*/Grass Association

Quercus engelmannii and *Quercus agrifolia* are codominants in the tree canopy, *Toxicodendron diversilobum* is diagnostically present in the shrub canopy, and grasses and other herbs are dominant in the herbaceous understory. Subdominant shrubs include many coastal sage scrub species including *Salvia mellifera*, *S. apiana*, *Artemisia californica*, *Malosma laurina*, *Mimulus aurantiacus*, and *Keckiella cordifolia*; however, their combined cover is less than *T. diversilobum*. The herbaceous understory is often dominated by nonnative ruderal plants.



Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Q. engelmannii* must be present.
- *Q. agrifolia* must be present.
- *T. diversilobum* is diagnostically present (i.e., is not required to be present but is expected to occur with a probability of 80 percent or greater).

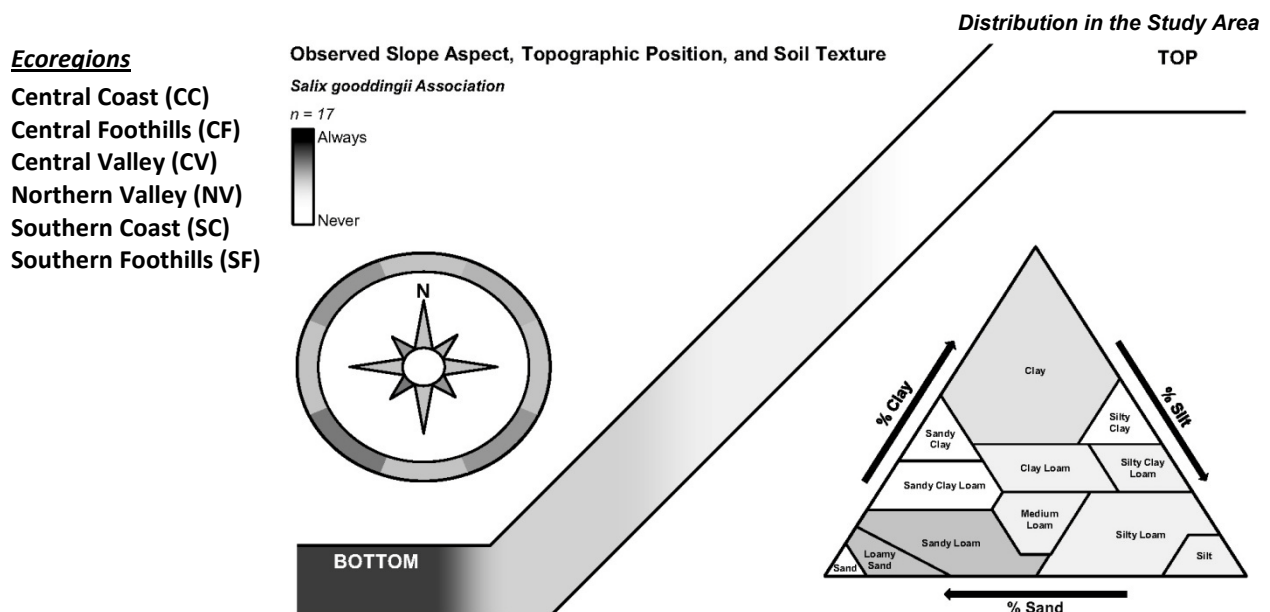
3.8 *Salix gooddingii* Alliance

Salix gooddingii is a common riparian tree in the West and this alliance occurs throughout the southwestern United States and northern Mexico. Mixed and pure stands of *S. gooddingii* occur regularly in the Central Valley and Southern California. In Southern California, this alliance has been identified along riparian corridors at low elevations in western Riverside County (Klein and Evens 2006), along the San Dieguito River and eastward into San Felipe Wash (Evens and San 2005), and in Anza-Borrego Desert State Park (Keeler-Wolf et al. 1998). In this treatment, mixed stands with *Populus fremontii* are included in the *Populus fremontii* Alliance.

In California, this alliance is generally defined by *Salix gooddingii* as dominant or codominant in the tree canopy with *Alnus rhombifolia*, *Populus fremontii*, *Salix laevigata*, *S. lasiolepis*, *S. lucida* ssp. *lasiandra*, *Sambucus nigra*, and/or *Washingtonia filifera*. Shrubs may include *Baccharis pilularis*, *B. salicifolia*, and *Cornus sericea*. Trees are generally < 30 m and the canopy may be open to continuous. The shrub layer is open to continuous and the herbaceous layer is open to continuous.

3.8.1 [Salix gooddingii Association](#)

Salix gooddingii is dominant in an open to closed tree canopy with other willows (*Salix lasiolepis*, *S. laevigata*) and *Populus fremontii*. Subdominant shrubs include *Baccharis salicifolia*, *B. pilularis*, *Amorpha fruticosa*, *Pluchea sericea*, and *Ambrosia monogyra*. Wetland affiliates include herbaceous plants such as *Ambrosia psilostachya*, *Artemisia douglasiana*, *Anemopsis californica*, *Distichlis spicata*, *Urtica dioica*, and *Pluchea odorata*, as well as many ruderal species.



Membership Rules

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Salix gooddingii* must account for at least 5 percent relative cover in the tree canopy.
- If present, *Platanus racemosa* and *Populus* spp. must each account for less than 5 percent relative cover (otherwise see respective alliances).

3.9 *Salix laevigata* Alliance

Salix laevigata is a widespread tree willow throughout the American Southwest. It is common throughout much of Central and Southern California, including desert riparian settings. Stands tend to have a tree canopy dominated by *S. laevigata* and a tall shrub layer dominated by *Salix lasiolepis*.

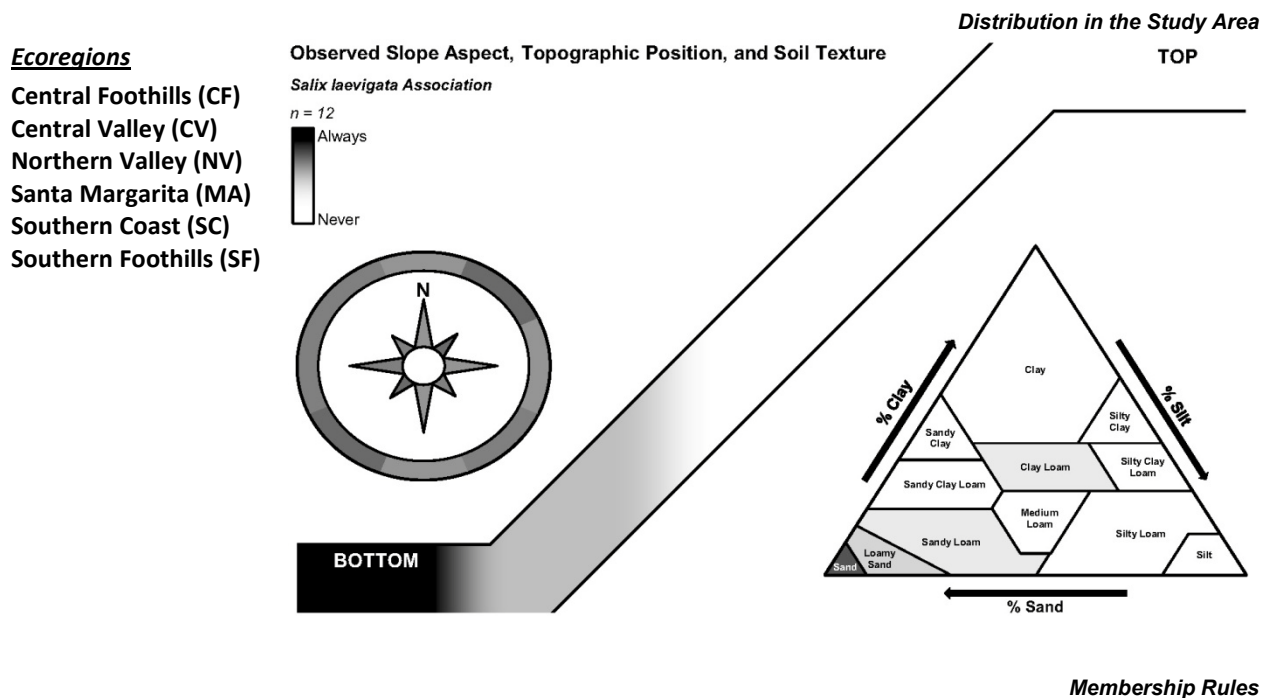
In California, *Salix laevigata* is generally dominant or codominant in the tree canopy with *Acer negundo*, *Aesculus californica*, *Alnus rhombifolia*, *Calocedrus decurrens*, *Pinus jeffreyi*, *P. sabiniana*, *Platanus racemosa*, *Populus fremontii*, *Quercus agrifolia*, *Q. chrysolepis*, *Salix gooddingii*, *S. lasiolepis*, *S. lucida* ssp. *lasiandra*, and/or *Sambucus nigra*. Trees are generally < 20 m with an open to continuous canopy. The shrub layer is open to continuous and the herbaceous layer is sparse to open.

Stands occur regularly along foothill streams and in low-gradient riparian settings. Stands below several dams in California have become denser since the dam construction, due to reduced scouring action by spring floods. Stands have expanded along some intermittent creeks in the Southern California coastal area, probably as a result of increased summer irrigation runoff. All 12 samples collected for this study were classified within a single association.

3.9.1 [Salix laevigata Association](#)

Salix laevigata is dominant in an open tree canopy with other willow species (*Salix lasiolepis*, *S. laevigata*, *S. gooddingii*, *S. exigua*), *Platanus racemosa*, or *Populus fremontii*. Codominant shrubs may include *Baccharis salicifolia*, *B. pilularis*, *Toxicodendron diversilobum*, and *Artemisia palmeri*.

The herbaceous canopy is often characterized by a sparse cover of wetland associated species such as *Artemisia douglasiana*, and *Cyperus* spp. This association is a diverse assemblage of riparian trees, shrubs, and herbaceous plants most often occurring within more continuous wetland hydrologies than willow scrub of *Salix lasiolepis* and *Baccharis salicifolia*.



There are two possible ways to key to this association (both tree and shrub stratum classes), but both revolve around the same set of membership rules:

- *Salix laevigata* must account for at least 5 percent relative cover.
- If present, *Salix lasiolepis* must have a lower percent cover than *Salix laevigata* (otherwise see *Salix lasiolepis* Alliance).
- If present, *Platanus racemosa*, *Populus* spp., and *Salix gooddingii* must each have less than 5 percent relative cover (otherwise see respective alliances).

3.10 *Salix lasiolepis* Alliance

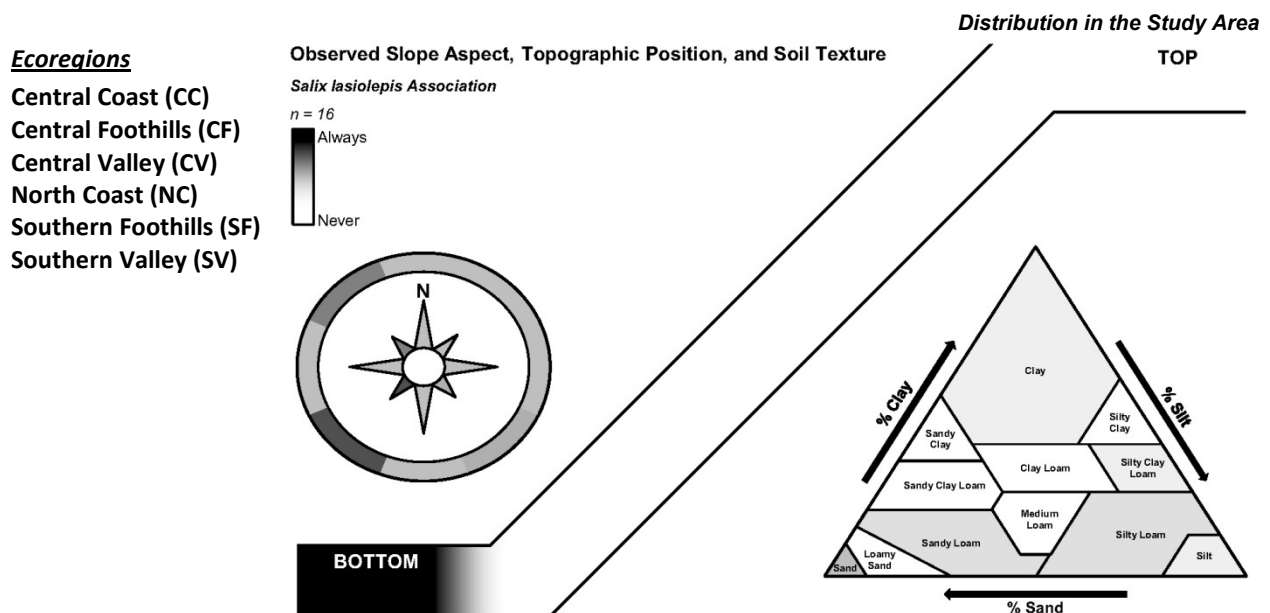
Salix lasiolepis is an extremely variable species. It is probably the most abundant single riparian willow in California and comprises among the most extensive riparian scrub alliances in the state. *Salix lasiolepis* grows on seasonally or intermittently flooded sites. The rationale for classifying this alliance among the tree types extends from the treatment of the related *Salix laevigata* Alliance. Elsewhere in California, *S. laevigata* typically adopts a tree form; however, within the study area these two *Salix* species exhibit similar form and enjoy similar ecological conditions. While *S. lasiolepis* is often multi-branched and somewhat shrubby, most plants in Southern California stands sampled are sufficiently tall to be called trees.

In general, stands of this alliance in California have *Salix lasiolepis* dominant or codominant in the shrub or tree canopy with *Acer macrophyllum*, *Baccharis pilularis*, *B. salicifolia*, *Cephalanthus occidentalis*, *Cornus sericea*, *Morella californica*, *Platanus racemosa*, *Populus trichocarpa*, *P. fremontii*, *Salix* spp., and/or *Sambucus nigra*. Larger tree species may be emergent at low cover. Plants are generally <10 m and the canopy is open to continuous. The herbaceous layer is variable.

A number of poorly differentiated associations have been proposed for California, but most seem to intergrade with few distinctive differential species or environmental correlates.

3.10.1 *Salix lasiolepis* Association

Salix lasiolepis is dominant in the shrub canopy often with subdominants, including *Salix exigua*, *Baccharis salicifolia*, or *B. pilularis*, and may include occasional *Salix gooddingii* and/or *S. laevigata* as emergent trees with trace cover. The herbaceous canopy (stratum) includes a number of wetland species as subdominants, such as *Ambrosia psilostachya*, *Artemisia douglasiana*, and *Juncus acutus* ssp. *leopoldii*.



Membership Rules

There are two possible ways to key to this association (both tree and shrub stratum classes), but both revolve around the same set of membership rules:

- *Salix lasiolepis* must account for at least 5 percent relative cover.
- If present, *S. laevigata* must have a lower percent cover than *S. lasiolepis* (otherwise see *Salix laevigata* Alliance).
- *S. lucida* ssp. *lasiandra* must be absent.
- If present, *Platanus racemosa*, *Populus* spp., *S. gooddingii*, and *S. laevigata* must each have less than 5 percent relative cover (otherwise see respective alliances).
- If present, *Quercus agrifolia* must account for less than 5 percent relative cover in the tree canopy (otherwise see *Quercus agrifolia*/*Salix lasiolepis* Association).

3.11 *Salix lucida* ssp. *lasiandra* Alliance

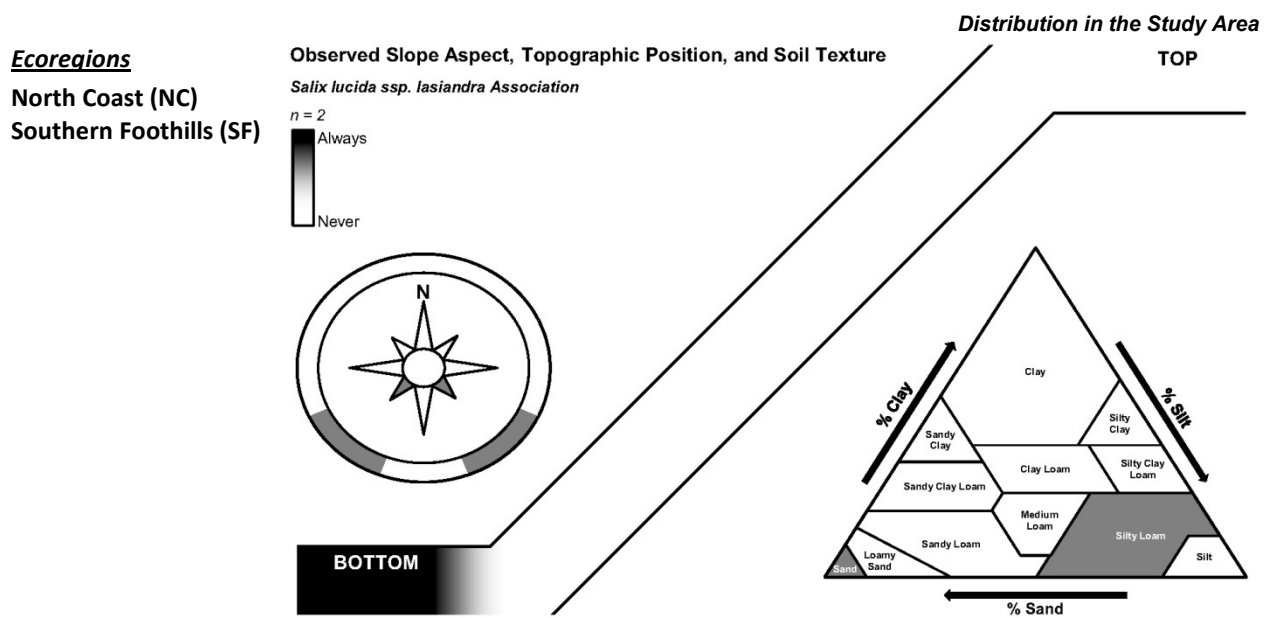
Salix lucida grows throughout temperate North America. This species ranges all through the western United States, including California. *Salix lucida* stands in California appear to be limited to relatively moist coastal areas, permanently flooded bottomlands, low-gradient streams, or saturated montane meadows.

In California, this alliance is generally dominated or codominated by *Salix lucida* in the shrub or tree canopy with *Acer macrophyllum*, *Alnus rhombifolia*, *Cornus sericea*, *Platanus racemosa*, *Populus trichocarpa*, *P. fremontii*, *Quercus agrifolia*, *Salix* spp., and *Sambucus nigra* as codominants. Where this association occurs as a shrubland, emergent trees may be present. Trees are < 20 m and the canopy is intermittent to continuous. The shrub layer is sparse to intermittent, and the herbaceous layer is variable.

Stands in south coastal California are not well known. The two stands sampled in this study have been classified within a single association.

3.11.1 *Salix lucida* ssp. *lasiandra* Association

Salix lucida ssp. *lasiandra* occurs with *Salix lasiolepis*, *Salix exigua*, and/or *Populus balsamifera* in a continuous tree canopy. Associated shrubs often include *Baccharis salicifolia*, *B. sarothroides*, and *Toxicodendron diversilobum*. Herbaceous diversity is moderate and cover is open to intermittent, including *Artemisia palmeri*, *A. douglasiana*, *Schoenoplectus* spp., *Urtica dioica*, *Juncus acutus* ssp. *leopoldii*, *J. xiphioides*, and *Euthamia occidentalis*. This association occupies the wettest position in the riparian hydrologic profile and is uncommon in San Diego County.



Membership Rules

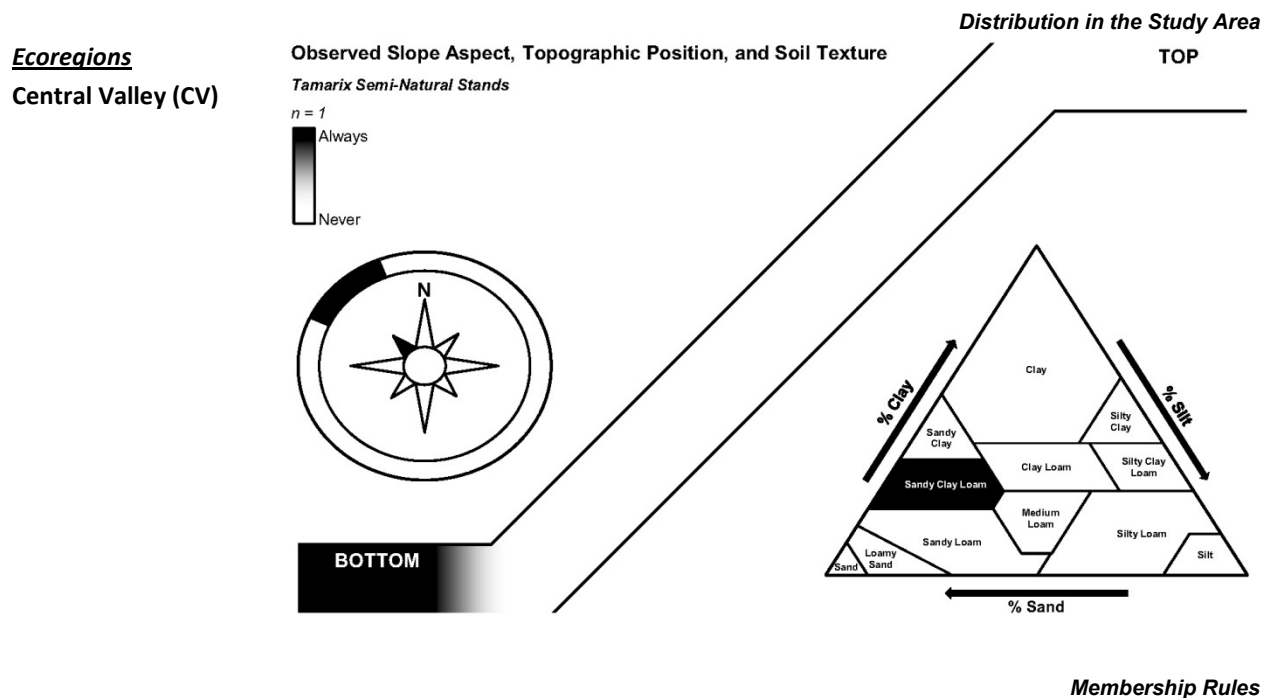
- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Salix lucida* ssp. *lasiandra* must be present.
- If present, *Platanus racemosa*, *Populus* spp., *S. gooddingii*, and *S. laevigata* must each have less than 5 percent relative cover (otherwise see respective alliances).

3.12 *Tamarix* spp. Semi-Natural Stands

Tamarix species have invaded riparian areas across the western United States, where they have displaced native species and formed dense, monotypic stands in floodplains, wetlands, and lake margins. Probably the most common *Tamarix* species in San Diego County is *T. ramosissima*; however, *T. chinensis*, *T. gallica*, and *T. parviflora* are also present. All of these *Tamarix* species have similar ecologies and thrive under altered hydrologic regimes. They are also known to lower water tables, increase soil salinity, and contribute to increased fire frequency. All of these conditions favor the persistence and increase of *Tamarix* over riparian native species. Eradication is costly and labor intensive but has been carried out in many places in the county, including large areas of Anza-Borrego Desert State Park. Small patches remain and must be addressed rapidly (early detection).

Tamarix growth forms range from shrub to trees. Within this classification, these semi-natural stands are included amongst the tree types.

In California, all semi-natural *Tamarix* stands are dominated by one of various *Tamarix* species in an open to continuous tree or shrub canopy. Emergent *Populus fremontii* or *Salix* spp. trees are trace. The shrub canopy is continuous or open. The herbaceous layer is sparse.



There are two possible ways to key to this association (both tree and shrub stratum classes), but both revolve around the same membership rule:

- *Tamarix* spp. must account for at least 75 percent relative cover.

CHAPTER 4.0
VEGETATION DOMINATED BY SHRUBS

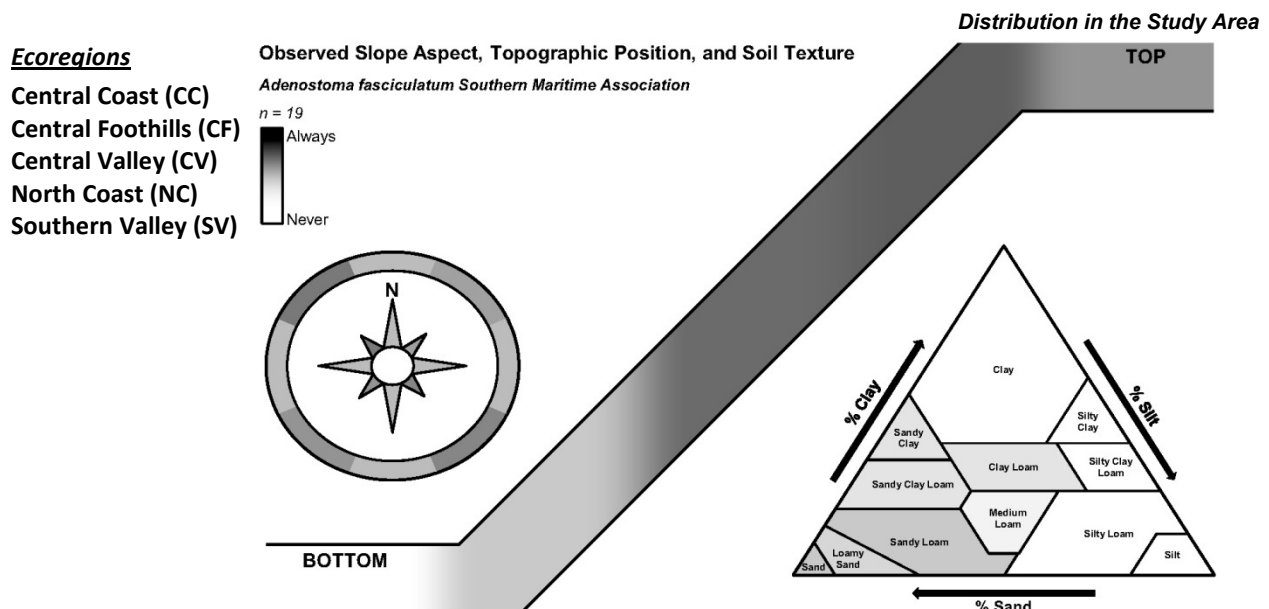
4.1 *Adenostoma fasciculatum* Alliance

This alliance is one of the most diagnostic of the California Chaparral macrogroups, covering hundreds of thousands of acres of well-drained sunny slopes from Shasta County south to northern Baja California, Mexico. Throughout its range, *Adenostoma fasciculatum* is dominant in the shrub canopy and, depending on the location, may have *A. sparsifolium*, *Arctostaphylos glandulosa*, *A. manzanita*, *A. viscida*, *Ceanothus* spp., *Mimulus aurantiacus*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Q. wislizeni*, *Salvia apiana*, *S. leucophylla*, *S. mellifera*, and *Toxicodendron diversilobum* as associates to co- or sub-dominates. Emergent trees may be present at low cover. Shrubs are typically < 4 m; the canopy is intermittent to continuous, and the herbaceous layer is sparse to intermittent.

As a result of extensive high-frequency and high-intensity fires in western San Diego County over the past few decades, this alliance is now poorly represented as mature stands, and there is evidence of type conversion to post-fire alliance stands of *Malosma laurina* and *Lotus scoparius*, and also to largely annual nonnative grasslands. Of the five associations represented in the study, three—*Adenostoma fasciculatum*-*Ceanothus crassifolius*, *Adenostoma fasciculatum*-*Ceanothus tomentosus*, and *Adenostoma fasciculatum*-*Lotus scoparius*—are diagnostic of different post-fire conditions. Only the relatively rare *Adenostoma fasciculatum* Southern Maritime and *Adenostoma fasciculatum* (*Eriogonum fasciculatum*, *Artemisia californica*, *Salvia mellifera*) associations regularly include mature stands, and these are the two rarest and most localized associations. The closely related *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance has similar over-representation of early seral stages in the study area.

4.1.1 *Adenostoma fasciculatum* Southern Maritime Association

Adenostoma fasciculatum is dominant often with open shrub cover, and occurs most frequently without other dominant plants species. Codominant shrubs include *Ceanothus verrucosus*, *Arctostaphylos glandulosa* ssp. *crassifolia*, and low cover of subdominant herbs can include *Deinandra fasciculata*, *Selaginella cinerascens*, and *Agrostis pallens*. Subdominant shrub species include *Salvia mellifera*, *Mimulus aurantiacus*, *Xylococcus bicolor*, *Malosma laurina*, *Rhus integrifolia*, *Quercus dumosa*, and *Cercocarpus minutiflorus*. Trace tree cover can include *Pinus torreyana* var. *torreyana*. This vegetation type occurs on bluffs and mesas along the immediate coastline and inland in the San Marcos Hills.



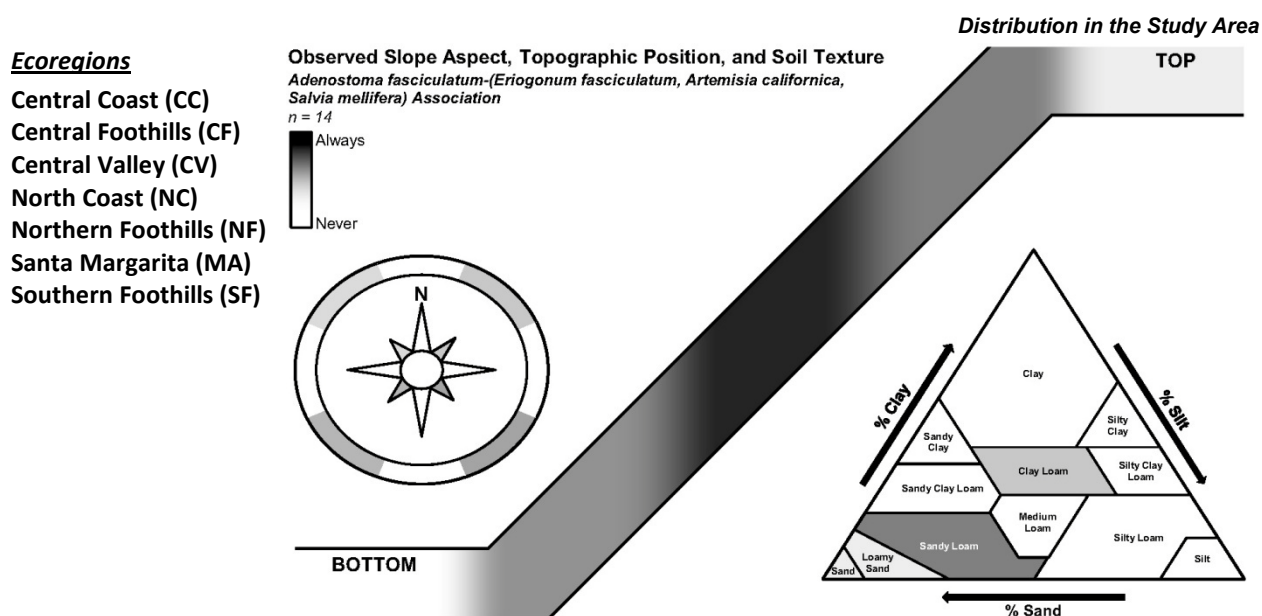
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Adenostoma fasciculatum* must account for at least 50 percent relative cover in the shrub canopy.
- If *Xylococcus bicolor* is present, *A. fasciculatum* must have at least 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance).

- The shrub canopy is open to intermittent, not continuous, generally with 5 to 66 percent absolute cover.
- *Arctostaphylos glandulosa* ssp. *crassifolia* and *Ceanothus verrucosus* are good indicator species for this association (i.e., they are not required to be present, but their presence corroborates this type). If one or both of these species are present, their cover combined with *A. fasciculatum* must account for at least 50 percent relative cover in the shrub canopy (i.e., relax the second criterion above).
 - Note: This is a native vegetation type that consists of a naturally open to intermittent shrub canopy; if the shrub canopy is open to intermittent and exhibits signs of disturbance, this type may not apply. If *A. glandulosa* ssp. *crassifolia* and *C. verrucosus* are absent, fire-following and/or disturbance-related species (e.g., *Lotus scoparius*, *Helianthemum scoparium*, and nonnative species) must account for less than 5 percent relative cover in the shrub canopy (otherwise see *Adenostoma fasciculatum*-*Lotus scoparius* Association, which is the most appropriate disturbance-related type within the *Adenostoma fasciculatum* Alliance).
- This association generally occurs near the coast.

4.1.2 *Adenostoma fasciculatum*-(*Eriogonum fasciculatum*, *Artemisia californica*, *Salvia mellifera*) Association

Adenostoma fasciculatum is dominant with other shrubs occurring as subdominants; together, these species form either a continuous or more often open canopy cover. Subdominant shrubs most commonly include *Artemisia californica*, *Eriogonum fasciculatum*, *Cneoridium dumosum*, *Hazardia squarrosa*, *Salvia mellifera*, *Quercus berberidifolia*, *Q. xacutidens*, *Q. dumosa*, *Ceanothus tomentosus*, *C. verrucosus*, and *Arctostaphylos glandulosa*. Dominant herbs often include native and nonnative grasses, such as *Leymus condensatus* and *Bromus madritensis* ssp. *Rubens*, with a rich diversity of herb species. This association is a mix of chaparral and coastal sage scrub. It occurs both as a mature, stable shrub community or an early transitional stage of other shrublands in response to fire or other disturbance.



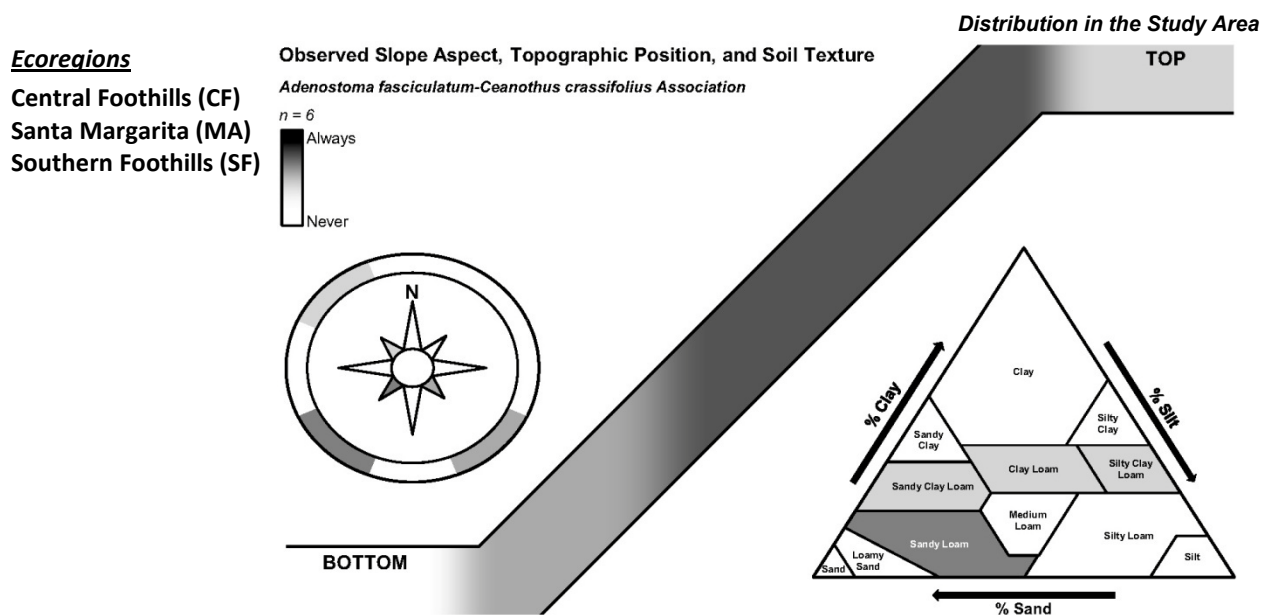
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Adenostoma fasciculatum* must account for at least 5 percent relative cover in the shrub stratum.

- Microphyllous, succulent, or drought-deciduous, soft-leaved shrubs such as *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, or *Bahiopsis laciniata* must account for at least 5 percent relative cover in the shrub stratum.
- *Ceanothus crassifolius* must be absent (otherwise see *Adenostoma fasciculatum*-*Ceanothus crassifolius* Association).

4.1.3 *Adenostoma fasciculatum*-*Ceanothus crassifolius* Association

Adenostoma fasciculatum and *Ceanothus crassifolius* form mostly continuous cover and are the dominant shrubs. Other shrubs species occurring as subdominants include scrub oak species (*Quercus* spp.), *Arctostaphylos* spp., *Salvia mellifera*, *C. leucodermis*, *C. tomentosus*, *Hesperoyucca whipplei*, *Rhamnus ilicifolia*, *Mimulus aurantiacus*, and *Heteromeles arbutifolia*. Herb diversity and cover is generally low except after fires. This association typically occupies xeric interior sites in the cismontane portion of the study area. In the absence of fire, *C. crassifolius* may become senescent, causing the stand to open up and become *A. fasciculatum* dominated; however, *C. crassifolius* can recolonize from a soil seed bank following fire.



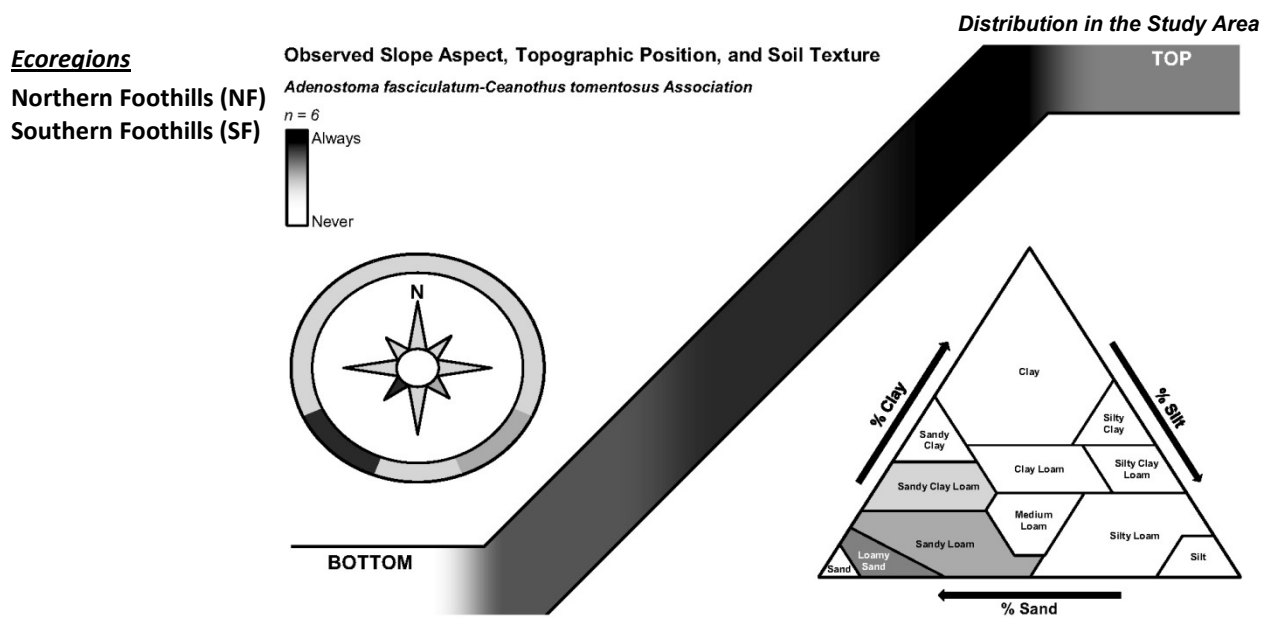
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Adenostoma fasciculatum* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *A. fasciculatum* and *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy.

- If *X. bicolor* is present, *A. fasciculatum* must have at least 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance).
- *Ceanothus crassifolius* must be present.

4.1.4 *Adenostoma fasciculatum*-*Ceanothus tomentosus* Association

Ceanothus tomentosus and *Adenostoma fasciculatum* form mostly continuous cover and are the dominant shrubs. Other shrubs species occurring as codominants include *Malosma laurina*, scrub oak species (*Quercus* spp.), *Arctostaphylos* spp., *C. tomentosus*, *C. oliganthus*, *C. leucodermis*, *C. cyaneus*, and *Rhus ovata*. The normally low herb cover and diversity is enhanced following fire. Slopes of cismontane foothills appear as a continuous cover of blue when the *Ceanothus* spp. of this association are in bloom, although these same slopes appear white with flowering *A. fasciculatum* in late spring.



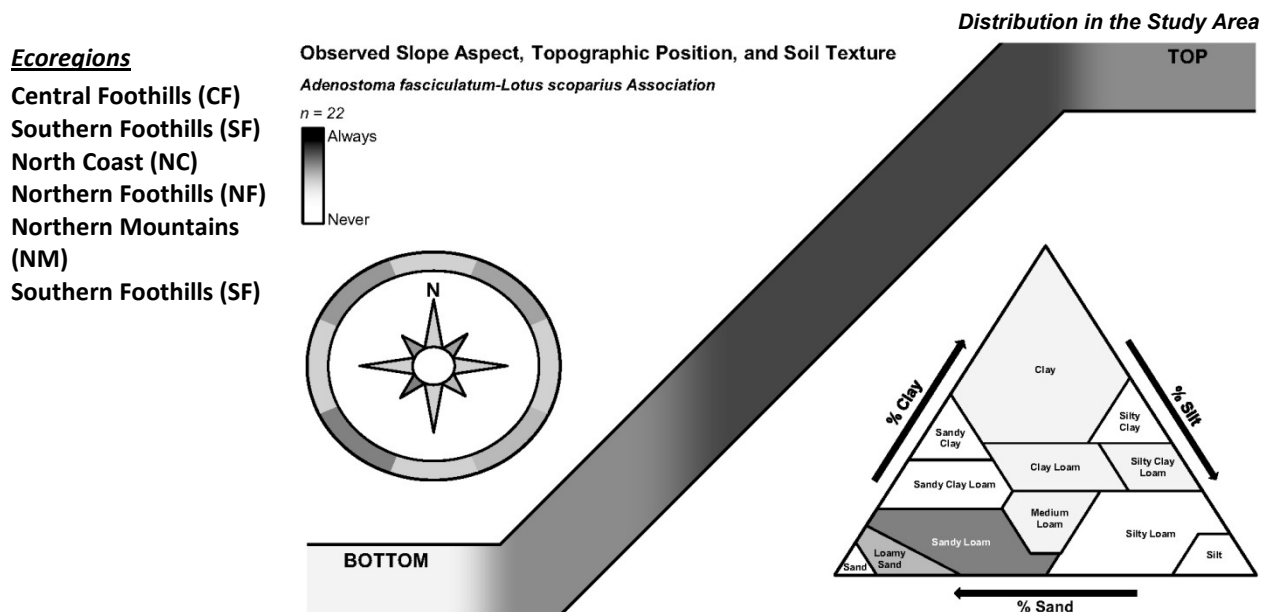
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Adenostoma fasciculatum* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *A. fasciculatum* and *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy.
- If *X. bicolor* is present, *A. fasciculatum* must have at least 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance).

- The other *A. fasciculatum* Associations must not fit (i.e., rule out the following associations before choosing this association: Sections E.1.a through E.1.d of the key for Group 1: Sclerophyllous, Evergreen Shrubs).

4.1.5 *Adenostoma fasciculatum*-*Lotus scoparius* Association

Adenostoma fasciculatum and *Lotus scoparius* form mostly open cover and are the dominant shrubs. Other shrub species may occur at low densities as seedlings or stump sprouts. Many other shrub, subshrub, and herbaceous species occur, including *Malosma laurina*, *Eriogonum fasciculatum*, *Helianthemum scoparium*, *Gutierrezia sarothrae*, *Chaenactis* spp., *Calystegia macrostegia*, and *Phacelia* spp. This association is a transitional stage to other chaparrals, usually as a result of fire or other disturbance.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Adenostoma fasciculatum* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *A. fasciculatum* and *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy.
- If *X. bicolor* is present, *A. fasciculatum* must have at least 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance).

- *Lotus scoparius*, *Malosma laurina*, and/or *Helianthemum scoparium* must account for at least 5 percent relative cover in the shrub canopy.
- If present, microphyllous, succulent, or drought-deciduous, soft-leaved shrubs such as *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, or *Bahiopsis laciniata* must account for less than 5 percent relative cover in the shrub stratum (otherwise see *Adenostoma fasciculatum*-[*Eriogonum fasciculatum*, *Artemisia californica*, *Salvia mellifera*] Association).
- If *A. fasciculatum* accounts for at least 5 percent relative cover in the shrub canopy and the vegetation exhibits high disturbance (e.g., dominance of nonnative species, evidence of ground disturbance/clearing), consider assigning this type even in the absence of *L. scoparius*.

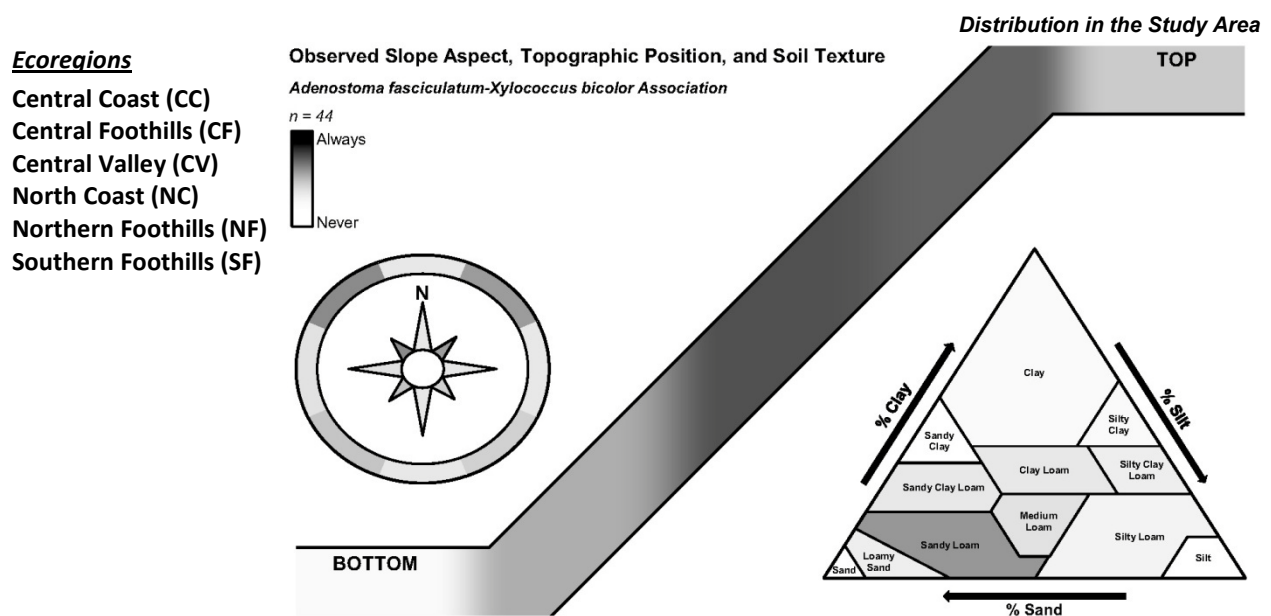
4.2 *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance

In this alliance, *Adenostoma fasciculatum* and *Xylococcus bicolor* are codominants in the shrub canopy; subdominant shrubs may include *Ceanothus crassifolius*, *C. tomentosus*, *C. verrucosus*, *Cneoridium dumosum*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Malosma laurina*, *Quercus berberidifolia*, *Rhamnus ilicifolia*, *Rhus ovata*, *Salvia apiana*, and *S. mellifera*. Shrubs are usually < 3 m and the canopy is intermittent to continuous. The herbaceous layer is sparse to intermittent.

This alliance is restricted to the south coast of California and adjacent Baja California Norte, Mexico. Like *A. fasciculatum*, *X. bicolor* resprouts following fire, but is typically representative of more mesic settings than where chamise is the sole dominant. Most stands of this alliance occupy neutral to relatively mesic slopes from the immediate coast to the inland edges of the study area. Six associations occur in the study area. These associations represent a complex chaparral gradient that extends from the coast to hotter-summer and cooler-winter settings inland, and from cooler to more moderate winter temperatures in post-fire settings. The *A. fasciculatum*-*X. bicolor*-*C. verrucosus* association is a mesic form of southern maritime chaparral usually found within 2 to 5 miles of the coast. The widespread *A. fasciculatum*-*X. bicolor* association represents modal conditions inland, while the *A. fasciculatum*-*X. bicolor*-*Quercus (berberidifolia, xacutidens)* association represents mesic settings in the foothills. One association, the *A. fasciculatum*-*X. bicolor*-*Pickeringia montana* Association, occurs on meta-volcanic soils on the upper reaches of Otay Mountain. There are also two associations representing post-fire conditions. The *A. fasciculatum*-*X. bicolor*-*C. crassifolius* Association occurs in inland locations where winter temperatures tend to regularly drop below freezing, while the *A. fasciculatum*-*X. bicolor*-*C. tomentosus* Association tends to occur in lower elevations with more moderate winter temperatures.

4.2.1 *Adenostoma fasciculatum*-*Xylococcus bicolor* Association

Adenostoma fasciculatum and *Xylococcus bicolor* often form continuous cover and are the dominant shrubs in this association. Subdominant shrubs include *Malosma laurina*, *Salvia mellifera*, *Cneoridium dumosum*, *Rhus integrifolia*, *Rhus ovata*, *Ceanothus tomentosus*, *C. verrucosus*, *C. crassifolius*, *Hesperoyucca whipplei*, *Yucca schidigera*, scrub oak (*Quercus* spp.), and *Rhamnus crocea*. Many other subshrubs and herbs occur, primarily in openings, such as *Marah macrocarpus*, *Hazardia squarrosa*, *Calystegia macrostegia*, *Chlorogalum parviflorum*, and *Melica imperfecta*. The normally low herbaceous species cover and diversity is enhanced following fire. This association occurs in the cismontane foothills south of the Transverse Range and is mostly confined to San Diego County and Baja California Norte, Mexico.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *Adenostoma fasciculatum* and *X. bicolor* must account for at least 5 percent relative cover in the shrub canopy. *X. bicolor* must be present.

- If *A. fasciculatum* is present, it must have less than 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum* Alliance).
- The other *A. fasciculatum*-*X. bicolor* Associations must not fit (i.e., rule out the following associations before choosing this association: Sections E.2.a through E.2.e of the key for Group 1, Sclerophyllous, Evergreen Shrubs).

4.2.2 *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Ceanothus crassifolius* Association

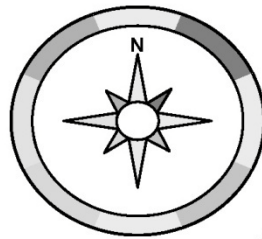
Adenostoma fasciculatum, *Xylococcus bicolor*, and *Ceanothus crassifolius* form an open or continuous canopy and occur as codominant shrubs. Many other shrub species commonly occur, including scrub oaks (*Quercus* spp.), *Ceanothus leucodermis*, *C. tomentosus*, *Arctostaphylos* spp., *Rhus ovata*, *Rhamnus* spp., *Malosma laurina*, and *Gutierrezia sarothrae*. *Eriogonum fasciculatum* and *Artemisia californica* may be present in ecotonal areas or as early transitional components. Diverse herb cover often occurs in openings and following fire.

Ecoregions

Central Foothills (CF)
Northern Foothills (NF)
Southern Foothills (SF)

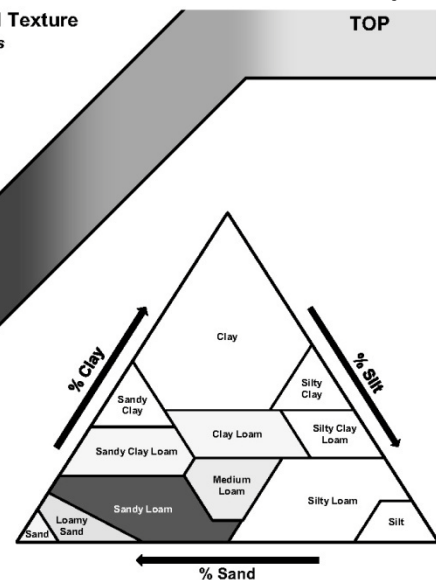
Observed Slope Aspect, Topographic Position, and Soil Texture
Adenostoma fasciculatum-*Xylococcus bicolor*-*Ceanothus crassifolius*
Association
n = 26

Always
Never



BOTTOM

Distribution in the Study Area

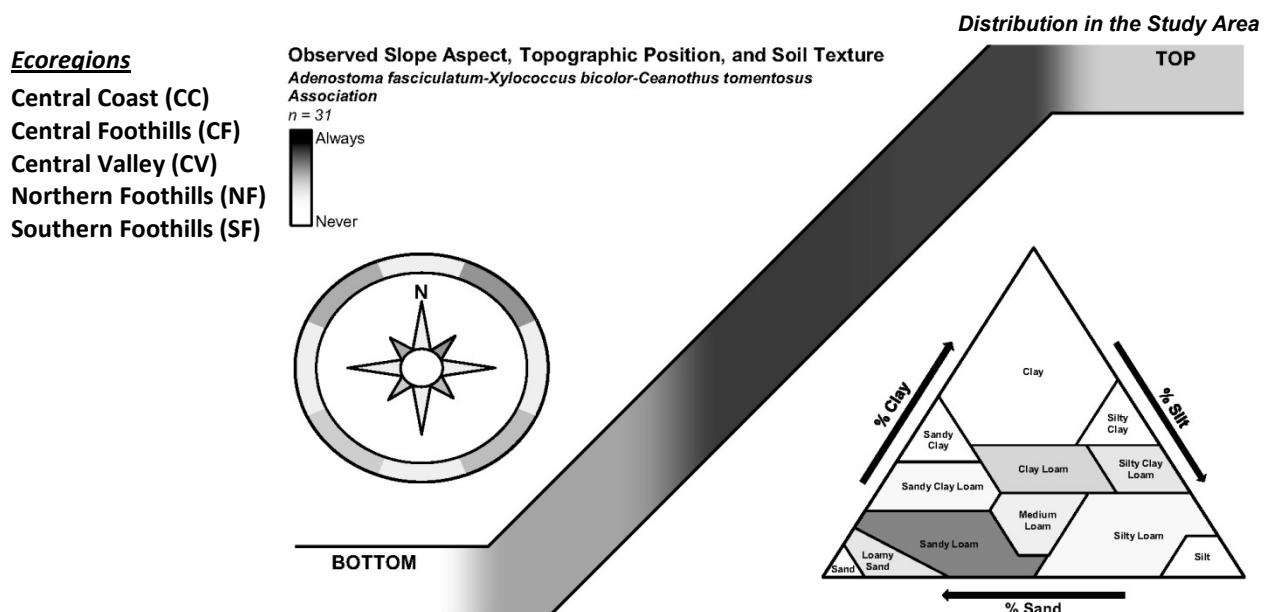


Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *Adenostoma fasciculatum* and *X. bicolor* must account for at least 5 percent relative cover in the shrub canopy. *X. bicolor* must be present.
- If *A. fasciculatum* is present, it must have less than 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum* Alliance).
- *Ceanothus crassifolius* must be present.
- *C. verrucosus* must be absent (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Ceanothus verrucosus* Association).

4.2.3 *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Ceanothus tomentosus* Association

Adenostoma fasciculatum, *Xylococcus bicolor*, and *Ceanothus tomentosus* form an open or continuous canopy and occur as codominant shrubs. Many other codominant shrubs may also be present, including *Malosma laurina*, *Ceanothus leucodermis*, *Rhus* spp., *Rhamnus* spp., *Heteromeles arbutifolia*, *Hesperoyucca whipplei*, and *Salvia mellifera*. *Eriogonum fasciculatum* and *Artemisia californica* may be present in ecotonal areas or as early transitional components. Diverse herb cover often occurs in openings and following fire.



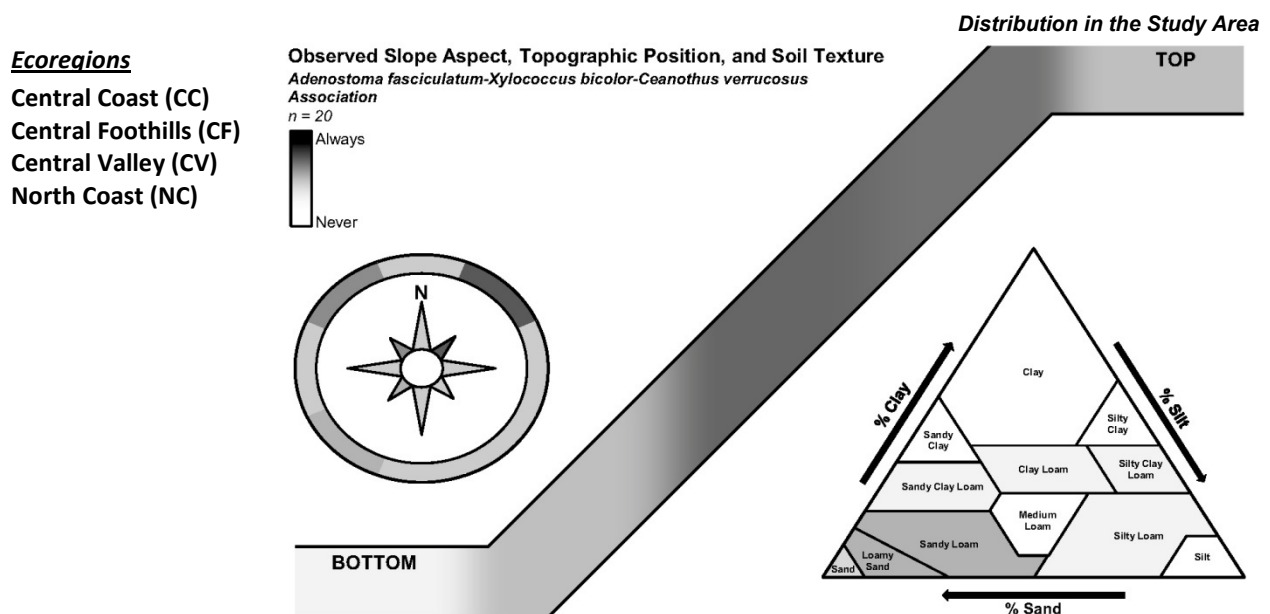
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *Adenostoma fasciculatum* and *X. bicolor* must account for at least 5 percent relative cover in the shrub canopy. *X. bicolor* must be present.
- If *A. fasciculatum* is present, it must have less than 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum* Alliance).
- *Ceanothus tomentosus* must be present.

- *C. crassifolius*, *C. verrucosus*, and *Quercus berberidifolia*/*Q. ×acutidens* must be absent (otherwise see the respective *A. fasciculatum*-*X. bicolor* Associations).

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

Adenostoma fasciculatum, *Xylococcus bicolor*, and *Ceanothus verrucosus* typically form a continuous canopy and occur as codominant shrubs. Other subdominant shrubs may include scrub oaks (*Quercus* spp.), *Mimulus aurantiacus*, *Salvia mellifera*, *Rhus integrifolia*, *Malosma laurina*, *Cneoridium dumosum*, *Hazardia squarrosa*, *Yucca schidigera*, and *Hesperoyucca whipplei*. *Eriogonum fasciculatum* and *Artemisia californica* may be present in ecotonal areas or as early transitional components. This association is confined to coastal mesas and foothills of San Diego County, including Black Mountain, and San Marcos.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy or the combined cover of *Adenostoma fasciculatum* and *X. bicolor* must account for at least 5 percent relative cover in the shrub canopy. *X. bicolor* must be present.

- If *A. fasciculatum* is present, it must have less than 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum* Alliance).
- *Ceanothus verrucosus* must be present.

4.2.5 *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Pickeringia montana* Association

Adenostoma fasciculatum and *Xylococcus bicolor* form an open to continuous canopy and occur as codominants with *Pickeringia montana* as a subdominant. Other subdominant shrubs include *Ceanothus tomentosus*, *C. greggii*, scrub oaks (*Quercus* spp.), *Chamaebatia australis*, *Romneya trichocalyx*, *Dendromecon rigida*, *Malosma laurina*, *Hazardia squarrosa*, and *Cercocarpus minutiflorus*. A diverse herbaceous cover occurs in openings and after fire.

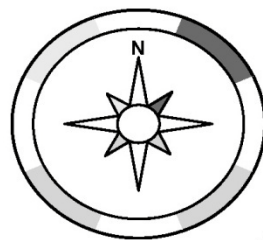
Ecoregions

Southern Foothills (SF)

Observed Slope Aspect, Topographic Position, and Soil Texture
Adenostoma fasciculatum-*Xylococcus bicolor*-*Pickeringia montana* Association

$n = 12$

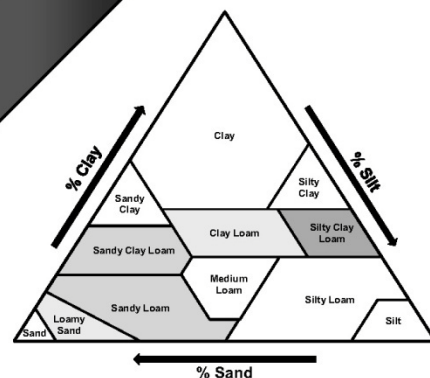
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *X. bicolor* must be present.
- If *A. fasciculatum* is present, it must have less than 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum* Alliance).
- *Pickeringia montana* and/or *Lepechinia ganderi* must be present on metavolcanic/gabbroic soils.
- *Callitropsis forbesii* may be present as an emergent tree.

4.2.6 *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Quercus berberidifolia*, *×acutidens* Association

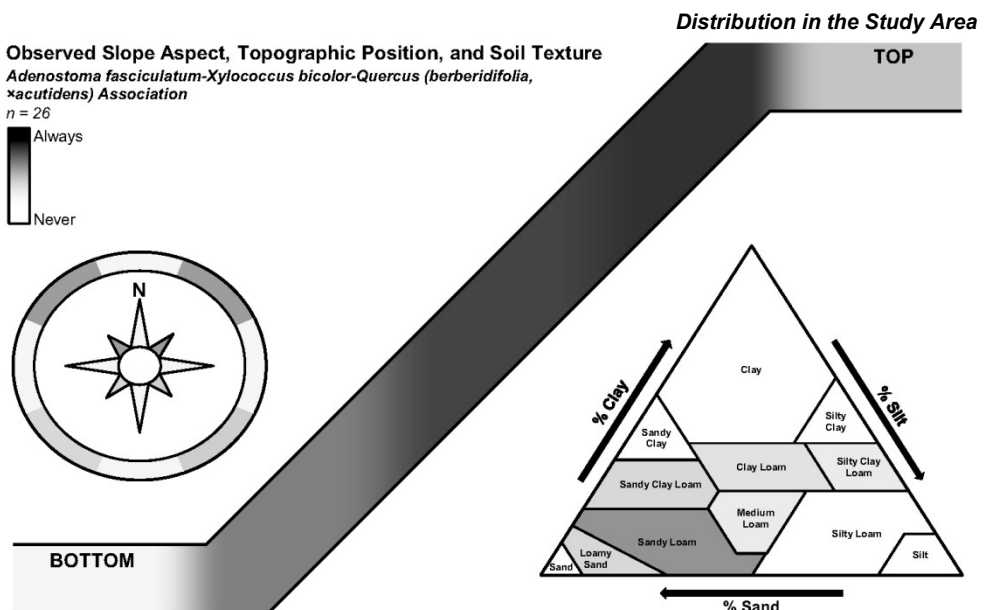
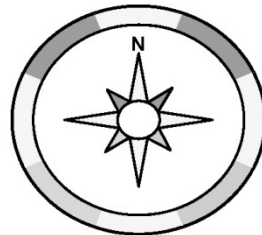
Adenostoma fasciculatum, *Xylococcus bicolor*, *Quercus berberidifolia*, and *Quercus ×acutidens* occur as codominants, often with an open canopy. Other subdominant shrubs include *Ceanothus tomentosus*, *C. leucodermis*, *Eriogonum fasciculatum*, *Cercocarpus minutiflorus*, *Malosma laurina*, *Rhamnus* spp., *Heteromeles arbutifolia*, *Yucca schidigera*, and *Hesperoyucca whipplei*. The herbaceous understory is often sparse except after fires.

Ecoregions

Central Coast (CC)
Central Foothills (CF)
Central Valley (CV)
North Coast (NC)
Northern Foothills (NF)
Southern Foothills (SF)

Observed Slope Aspect, Topographic Position, and Soil Texture
Adenostoma fasciculatum-*Xylococcus bicolor*-*Quercus (berberidifolia, ×acutidens)* Association
n = 26

Always
Never



Membership Rules

There are two possible ways to key to this association. The rule given first applies to both options:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.

Option One:

- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.

- *Xylococcus bicolor* must account for at least 5 percent relative cover in the shrub canopy, or the combined cover of *Adenostoma fasciculatum* and *X. bicolor* must account for at least 5 percent relative cover in the shrub canopy. *X. bicolor* must be present.
- If *A. fasciculatum* is present, it must have less than 10 times greater cover than *X. bicolor* (otherwise see *Adenostoma fasciculatum* Alliance).
- *Quercus berberidifolia* and/or *Q. ×acutidens* must be present.
- *Ceanothus verrucosus* must be absent (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Ceanothus verrucosus* Association).
- *C. crassifolius* must be absent (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Ceanothus crassifolius* Association).

Option Two:

- Scrub oak (*Quercus berberidifolia*/*Q. ×acutidens*) must account for at least 50 percent relative cover in the shrub canopy, or *Q. berberidifolia*/*Q. ×acutidens* must account for the highest percent relative cover in the shrub canopy versus any other single shrub genus (except for *Adenostoma fasciculatum*, which may be present at a greater percent relative cover than *Quercus* spp).
- *Adenostoma fasciculatum* must account for at least 30 percent relative cover in the shrub canopy.
- If present, *Xylococcus bicolor* must account for 1 percent relative cover or less (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Quercus* [*berberidifolia*, *×acutidens*] Association).

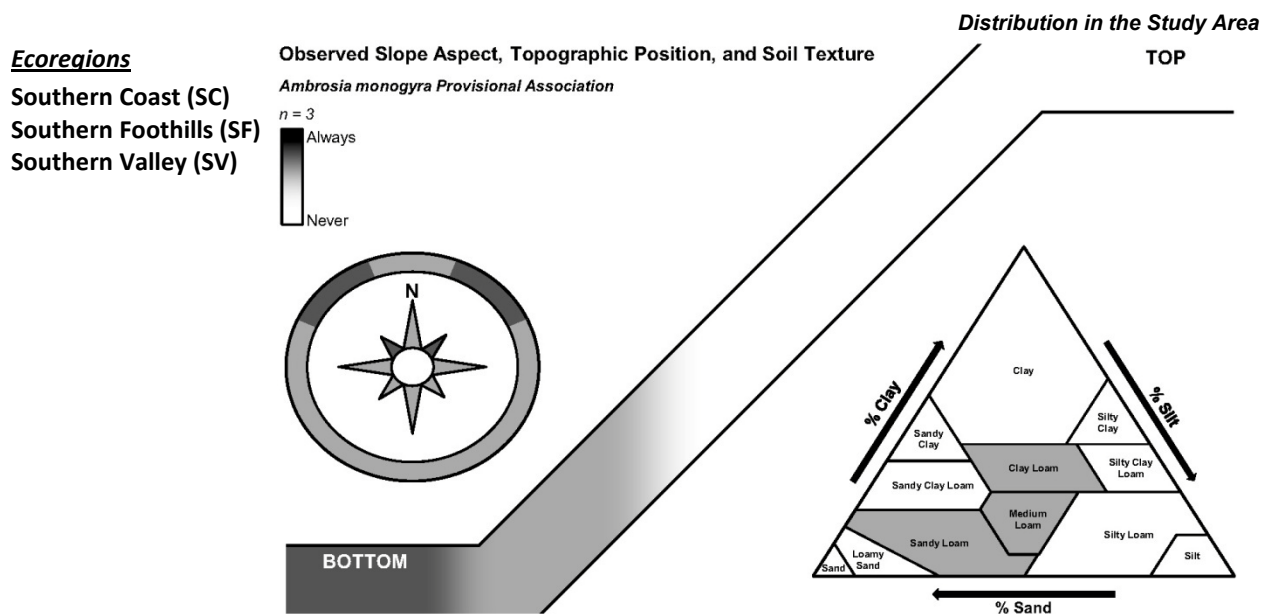
4.3 *Ambrosia monogyra* Alliance

Ambrosia monogyra is a shrub that is widespread in northern Mexico and stretches eastward to Arizona, New Mexico, and Texas. It barely extends into southwestern San Diego County, where stands occupy washes in a few localities in the general vicinity of Otay Mountain and Sweetwater Valley. Much like its widespread California dryland relative, *A. salsola*, this shrub prefers intermittent fluvial disturbance and often occupies arroyos and stream margins in proximity to *Baccharis salicifolia* alliance stands. The *A. monogyra* stands seem to occur in stream cobbles or gravels where subterranean water is not regularly accessible to the plant's root system.

Samples of stands of this vegetation were first collected as a result of this study. This vegetation has not been previously described for California and yet probably represents a widespread wash alliance in the warmer portions of southwestern North America.

4.3.1 *Ambrosia monogyra* Association

Ambrosia monogyra occurs typically in open stands with several other riparian shrub species, including *Baccharis sarothroides*, *B. salicifolia*, and *Artemisia dracunculus*. Many other subdominant riparian herbaceous species can occur in this association, including *A. psilostachya*, *Iva hayesiana*, *Heterotheca grandiflora*, and numerous ruderal species. The ruderal species often dominate the herbaceous stratum. This association is largely restricted to drainages and river valleys in southwestern San Diego County.



Membership Rules

There are two possible ways to key to this association (both soft-leaved, drought-deciduous shrublands and riparian shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Ambrosia monogyra* must account for at least 50 percent relative cover in the shrub canopy.

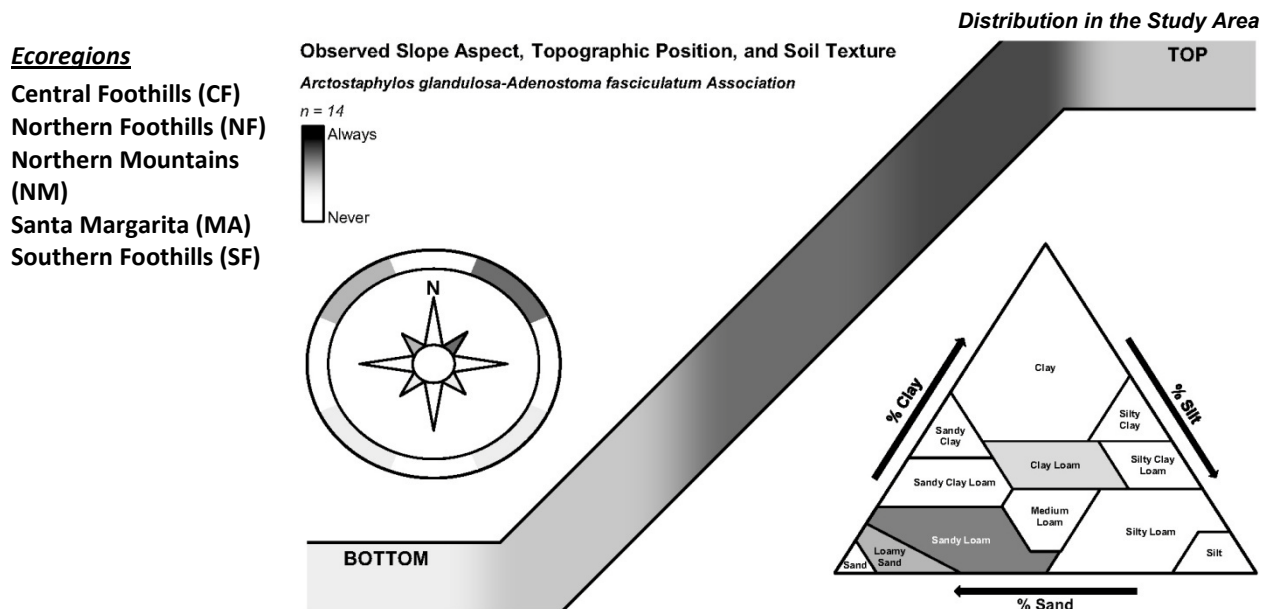
4.4 *Arctostaphylos glandulosa* Alliance

This chaparral alliance is widespread in California. It is characterized by the resprouting manzanita, *Arctostaphylos glandulosa*, which is dominant or codominant in the shrub canopy. Depending on location, subdominant species may include *A. glauca*, *Adenostoma fasciculatum*, *Baccharis pilularis*, *Ceanothus crassifolius*, *C. cuneatus*, *C. greggii*, *C. leucodermis*, *Cercocarpus minutiflorus*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Q. wislizeni*, and *Rhus ovata*. Emergent trees such as *Callitropsis* spp., *Pinus coulteri*, or *Q. agrifolia* may be present in some parts of the state. The shrub canopy is < 3 m; and is continuous in mature stands. The herbaceous layer is sparse or absent in mature stands.

Most stands of *A. glandulosa* occur at higher elevations than many chaparral stands, in areas where freezing temperatures regularly occur in the winter. In western San Diego County, stands are usually restricted to upper slopes and ridges in inland areas. Due to the typical ridgeline-slope position, these stands are subjected to intense fires and many have burned at a relatively high frequency in the past several decades. Two associations have been defined in the study area. Both have *Adenostoma fasciculatum* as a codominant shrub with *A. glandulosa*. The *Arctostaphylos glandulosa*-*Adenostoma fasciculatum* Association is widespread in Southern and Central California, while the *Arctostaphylos glandulosa*-*Adenostoma fasciculatum*-*Chamaebatia australis* association appears to be restricted to the vicinity of upper Otay Mountain and perhaps other areas where the diagnostic *C. australis* occurs. The latter association was described as a result of data collected and analyzed for this study.

4.4.1 *Arctostaphylos glandulosa*-*Adenostoma fasciculatum* Association

Arctostaphylos glandulosa and *Adenostoma fasciculatum* occur as codominant shrubs, most often as continuous canopies. Other subdominant associates include *Quercus berberidifolia*, *Q. cedrosensis*, *Q. xacutidens*, *Ceanothus tomentosus*, *C. crassifolius*, *C. leucodermis*, *Hesperoyucca whipplei*, *Yucca schidigera*, *Xylococcus bicolor*, *Cercocarpus minutiflorus*, *Heteromeles arbutifolia*, and *Rhus ovata*. The herb understory is often sparse except after fires.



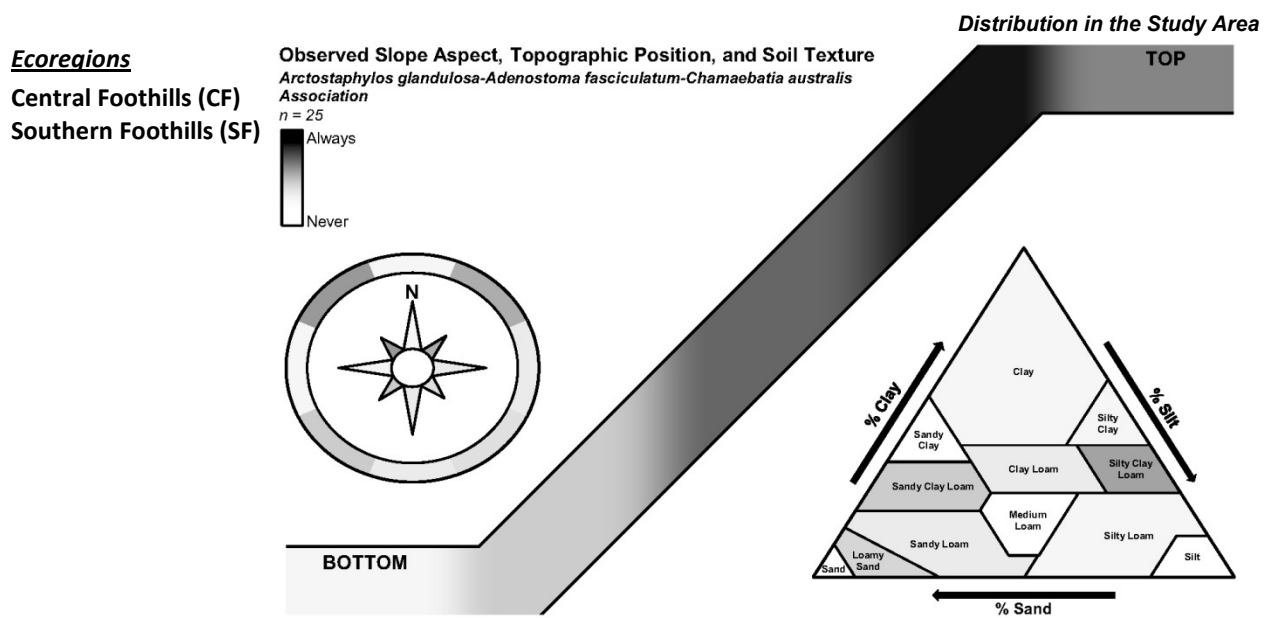
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Arctostaphylos* spp. must account for the highest percent relative cover in the shrub canopy versus any other single shrub genus (except for *Adenostoma fasciculatum*, which may be present at a greater percent relative cover than *Arctostaphylos* spp.).
 - Note: If *A. glandulosa* ssp. *crassifolia* is present, see *Adenostoma fasciculatum* Southern Maritime Association.
- *Arctostaphylos glandulosa* must be the dominant *Arctostaphylos* spp.

- Vegetation must lack the indicator species of metavolcanic/gabbroic soil conditions; indicator species include *Chamaebatia australis*, *Pickeringia montana* var. *tomentosa*, *Lepechinia ganderi*, and *Ceanothus xotayensis*.

4.4.2 *Arctostaphylos glandulosa*-*Adenostoma fasciculatum*-*Chamaebatia australis* Association

Arctostaphylos glandulosa, *Adenostoma fasciculatum*, and *Chamaebatia australis* typically form a continuous canopy and occur as codominant shrubs. Other subdominant shrubs may include *Xylococcus bicolor*, *Pickeringia montana*, *Eriodictyon trichocalyx*, *Dendromecon rigida*, *Helianthemum scoparium*, *Ceanothus tomentosus*, *C. greggii*, *C. otayensis*, and scrub oak (*Quercus* spp.). The herb understory is often sparse except after fires. This vegetation type is known from mafic soils (e.g., gabbro) and metasedimentary- and metavolcanic-derived soils.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Arctostaphylos glandulosa* must be present with indicator species of metavolcanic/gabbroic soil conditions; indicator species include *Chamaebatia australis*, *Pickeringia montana* var. *tomentosa*, *Lepechinia ganderi*, and *Ceanothus xotayensis*.

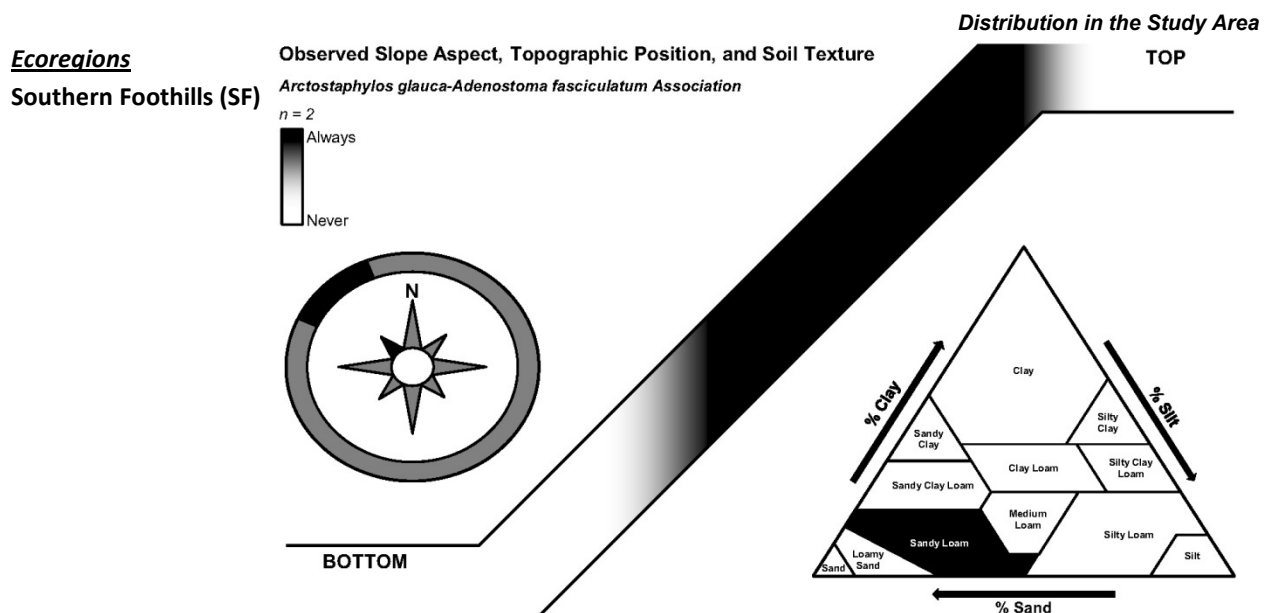
4.5 *Arctostaphylos glauca* Alliance

In this widespread Southern and Central coastal Californian chaparral alliance, *Arctostaphylos glauca* is dominant or codominant in the shrub canopy with *Adenostoma fasciculatum*. Other subdominant shrubs may include *A. glandulosa*, *Artemisia californica*, *Ceanothus crassifolius*, *C. cuneatus*, *C. leucodermis*, *Cercocarpus montanus*, *Garrya flavescens*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Q. durata*, *Q. wislizeni*, *Rhamnus ilicifolia*, and *Salvia mellifera*. Emergent trees such as *Q. agrifolia* or *Q. wislizeni* may be present with sparse cover. Shrubs are usually < 3 m; the canopy is open to continuous, and the herbaceous layer is usually sparse.

Arctostaphylos glauca is an obligate seeding species that is not widely distributed in western San Diego County. Locally, this alliance is more common in inland foothills and eastward to the edges of the desert mountains. The two stands that were sampled in this study represent a widespread association characterized by the codominance of *A. fasciculatum* and *A. glauca*.

4.5.1 *Arctostaphylos glauca*-*Adenostoma fasciculatum* Association

Arctostaphylos glauca and *Adenostoma fasciculatum* occur as codominant shrubs that typically form a continuous canopy. Other subdominant shrubs include *Xylococcus bicolor*, scrub oak (*Quercus* spp.), *Malosma laurina*, *Hesperoyucca whipplei*, *Salvia apiana*, *Ceanothus tomentosus*, *C. greggii*, and *C. oliganthus*. The herb understory is often sparse except after fires. This association occurs primarily in inland foothill and montane areas.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Arctostaphylos* spp. must account for the highest percent relative cover in the shrub canopy versus any other single shrub genus (except for *Adenostoma fasciculatum*, which may be present at a greater percent relative cover than *Arctostaphylos* spp.).
 - Note: If *A. glandulosa* ssp. *crassifolia* is present, see *Adenostoma fasciculatum* Southern Maritime Association.
- *Arctostaphylos glauca* must be the dominant *Arctostaphylos* spp.

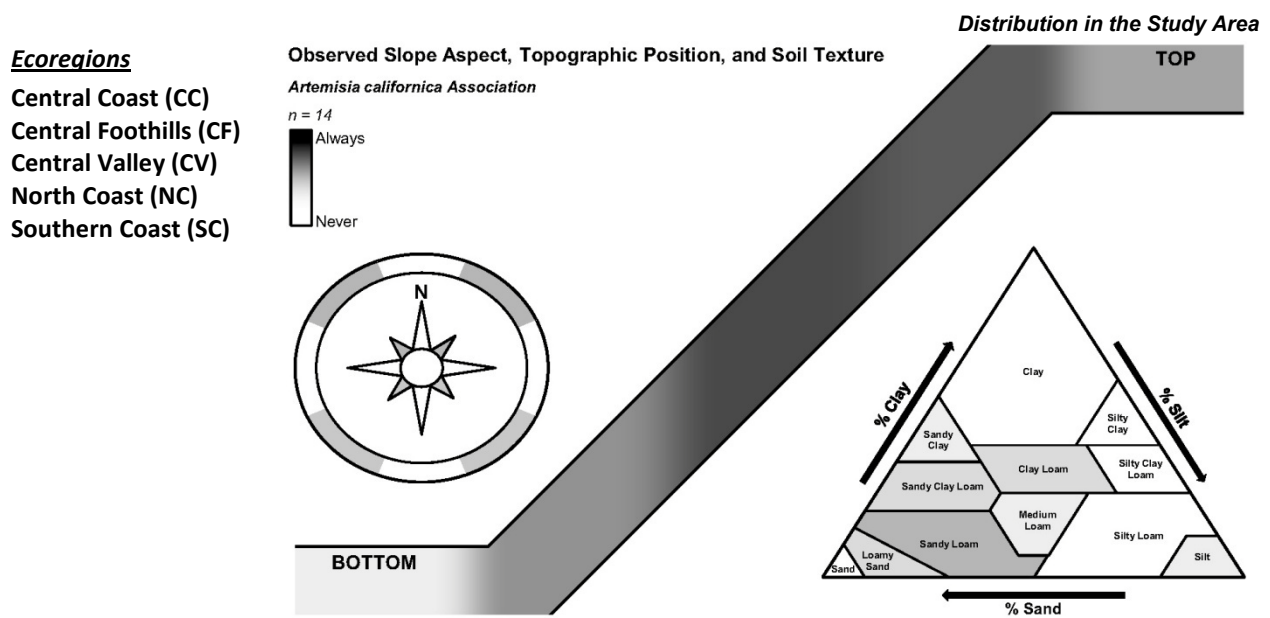
4.6 *Artemisia californica* Alliance

This quintessential alliance of the California coastal sage scrub macrogroup is widespread from the San Francisco Bay Area south to northwestern Baja California. Throughout the range of this alliance, *Artemisia californica* is dominant or codominant in the shrub canopy. The shrub canopy is intermittent to continuous. Subdominant shrubs, depending on location, may include *Adenostoma fasciculatum*, *Baccharis pilularis*, *Mimulus aurantiacus*, *Encelia californica*, *E. farinosa*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Isocoma menziesii*, *Keckiella cordifolia*, *Lotus scoparius*, *Opuntia littoralis*, *Salvia apiana*, *S. leucophylla*, *S. mellifera*, and *Toxicodendron diversilobum*. The main shrub layer is usually <2 m tall, and, in some cases, there is a second tier of emergent taller shrubs (< 5 m tall) such as *Malosma laurina*, *Rhus integrifolia*, or *Sambucus nigra*. The herbaceous layer is variable both seasonally and annually.

There are two associations of this alliance defined for the project area. Both are widespread and extend well north of the study area. The *A. californica* Association has high cover and strong dominance of the nominate species, while the *A. californica*-*Mimulus aurantiacus* Association may have *M. aurantiacus* as a codominant.

4.6.1 *Artemisia californica* Association

Artemisia californica clearly dominates this association, often with a relatively open cover and high diversity of subdominant shrubs, including *Atriplex canescens*, *Rhus integrifolia*, *Encelia californica*, *Malsoma laurina*, *Eriogonum fasciculatum*, *Baccharis pilularis*, *B. sarothroides*, *Isocoma menziesii*, *S. mellifera*, *S. apiana*, and *Malacothamnus fasciculatus*. Higher herb cover and diversity occurs in openings. This association can occur both as a mature stable shrub community or as an early transitional stage of other shrublands in response to fire or other disturbance.



Membership Rules

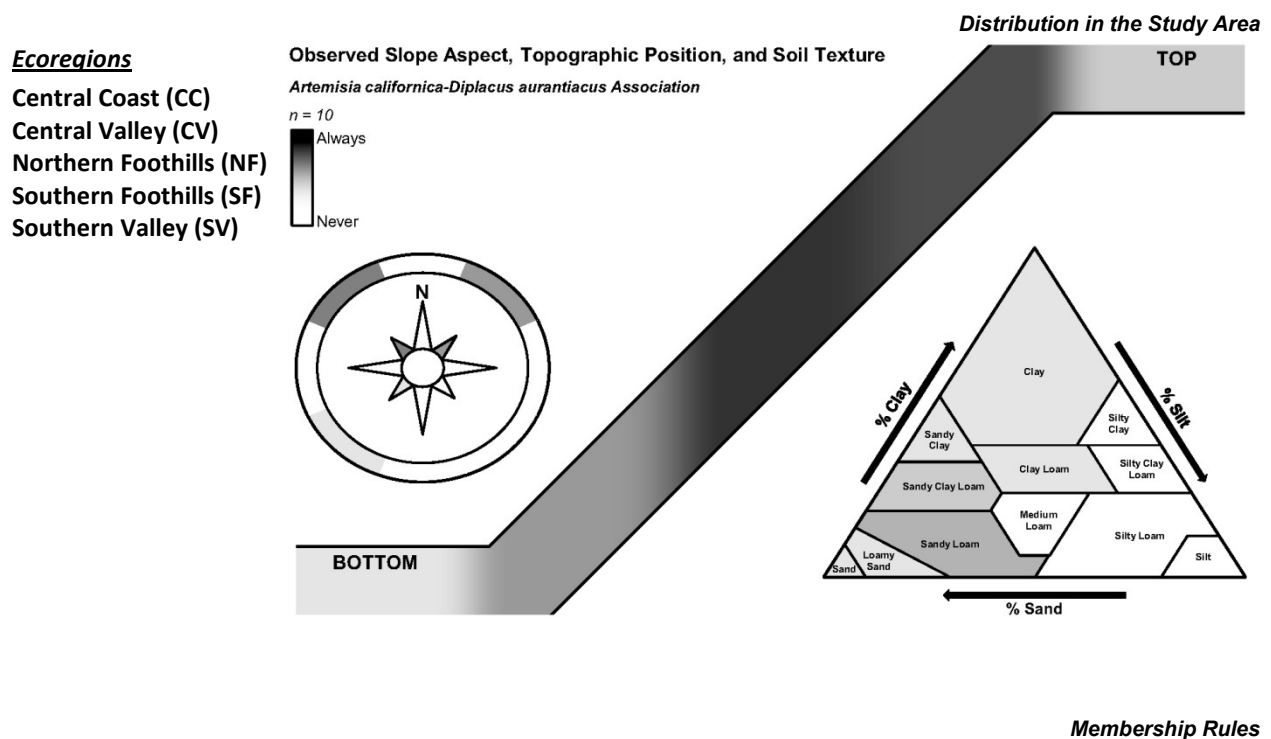
- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Artemisia californica* must account for at least 50 percent relative cover in the shrub canopy.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

- *Encelia californica*, *Mimulus aurantiacus*, *Keckiella antirrhinoides*, *Salvia apiana*, *Salvia mellifera*, and *Toxicodendron diversilobum* must be absent (otherwise see respective associations with *A. californica*).
- If present, *Eriogonum fasciculatum* must account for less than 5 percent relative cover in the shrub canopy (otherwise see *Artemisia californica*-*Eriogonum fasciculatum*-*Malosma laurina* Association).

4.6.2 *Artemisia californica*-*Mimulus aurantiacus* Association

[MCV Synonym: *Artemisia californica*-*Diplacus aurantiacus*]

Artemisia californica and *Mimulus aurantiacus* are codominant with a relatively open canopy. Other subdominant shrub species include *Rhus integrifolia*, *Encelia californica*, *Malosma laurina*, *Eriogonum fasciculatum*, *Baccharis pilularis*, *B. sarothroides*, *Isocoma menziesii*, *Salvia apiana*, *S. mellifera*, and *Toxicodendron diversilobum*. Herb cover is well-developed in openings with high diversity, including *Acourtia microcephala*, *Clematis pauciflora*, *Eriophyllum confertiflorum*, and *Scrophularia californica*.



There are two possible ways to key to this association, but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica* and *Mimulus aurantiacus* must account for at least 50 percent relative cover in the shrub canopy.

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).
- If present, *Encelia californica*, combined cover of *Keckiella antirrhinoides*/*Malosma laurina*, combined cover of *Salvia apiana*/*S. mellifera*, and *Toxicodendron diversilobum* must all be less than the cover of *M. aurantiacus* (otherwise see respective associations with *A. californica*).

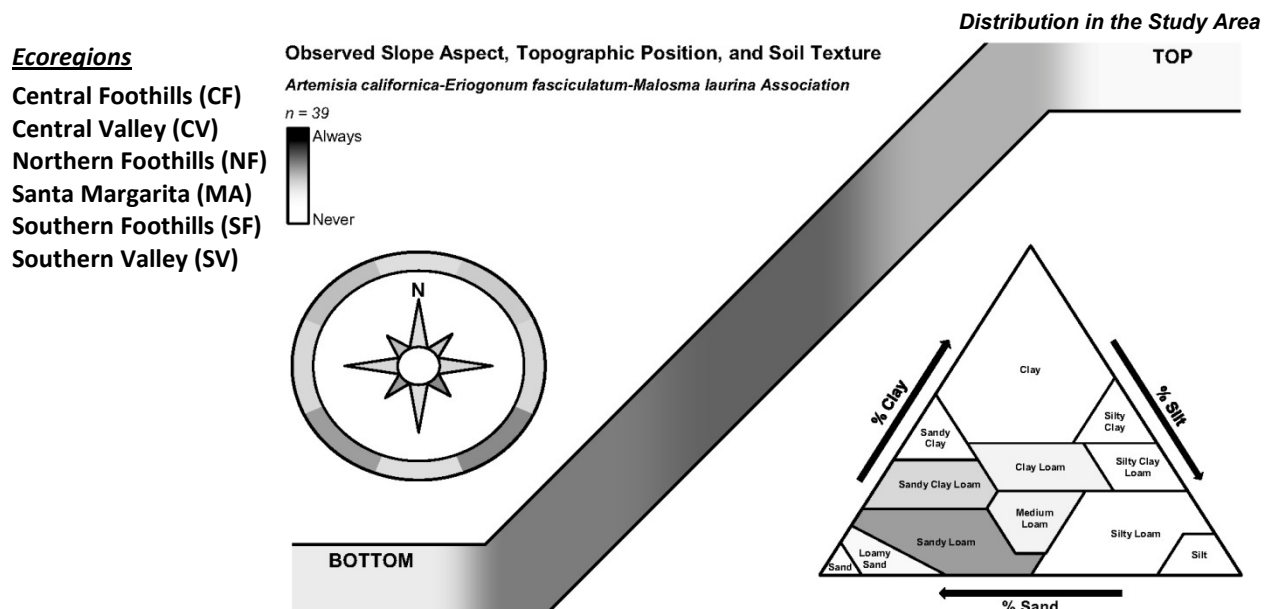
4.7 *Artemisia californica*-*Eriogonum fasciculatum* Alliance

This alliance is often found in drier and more exposed settings either adjacent to *Artemisia californica* Alliance stands or farther inland away from direct maritime fog influence. The alliance is characterized by *Artemisia californica* and *Eriogonum fasciculatum* as codominants in the shrub canopy, and may include lower cover of *Adenostoma fasciculatum*, *Mimulus aurantiacus*, *Ephedra californica*, *Hesperoyucca whipplei*, *Lotus scoparius*, *Malosma laurina*, *Rhus integrifolia*, *R. ovata*, and/or *Salvia apiana*. Most shrubs are < 2 m. Some emergent large shrubs are up to 5 m tall. The canopy can be one or two tiered, and ranges from intermittent to continuous cover. The herbaceous layer is present and dominated by spring annuals, but may have some perennial grasses and geophytes.

This alliance occurs from the Mount Diablo Range of Central California to Northern Baja California. It is made up of two associations locally. One, the *Artemisia californica*-*Eriogonum fasciculatum*-*Malosma laurina*, is typical of drier coastal sage scrub slopes at lower and mid elevations, usually away from the immediate coast. This association ranges north to the western base of the Transverse Ranges in Santa Barbara County. The other association, the *Artemisia californica*-*Eriogonum fasciculatum*-*Opuntia littoralis*/*Dudleya (edulis)* Association, was recently defined from coastal San Diego County using data from this study and the Cabrillo National Monument project (Klein and Keeler-Wolf 2010, MS). The latter association is usually found on coastal bluffs, and, although within the fog belt, is characterized by the presence of several succulent xerophytes.

4.7.1 *Artemisia californica*-*Eriogonum fasciculatum*-*Malosma laurina* Association

Artemisia californica, *Eriogonum fasciculatum*, and *Malosma laurina* are codominant with a relatively open shrub canopy. Many other subdominant shrub species include *Rhus integrifolia*, *Encelia californica*, *Salvia apiana*, *Bahiopsis laciniata* (= *Bahiopsis l.*), *Hazardia squarrosa*, *Baccharis sarothroides*, *Hesperoyucca whipplei*, *Cneoridium dumosum*, *Opuntia littoralis*, *Brickellia californica*, *Mimulus aurantiacus*, *Keckiella antirrhinoides*, and *Rhamnus crocea*. Herb cover is usually open and with high species diversity. This association can occur both as a mature stable shrub community or as an early transitional stage of other shrublands in response to fire or other disturbance.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, and *Malosma laurina* (if present) must account for at least 50 percent relative cover in the shrub canopy.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia*

chinensis-Bahiopsis laciniata Association or the *Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum* Association).

- The following species combinations must account for less than 50 percent relative cover in the shrub canopy:
 - *A. californica* and *Encelia californica* (see *Encelia californica-Artemisia californica* Association)
 - *A. californica* and *Mimulus aurantiacus* (see *Artemisia californica-Mimulus aurantiacus* Association)
 - *A. californica* and *Keckiella antirrhinoides* (see *Keckiella antirrhinoides-Artemisia californica* Association)
 - *A. californica* and *Salvia apiana* (see *Salvia apiana-Artemisia californica* Association)
 - *A. californica* and *Salvia mellifera* (see *Artemisia californica-Salvia mellifera* Association)
 - *A. californica* and *Toxicodendron diversilobum* (see *Toxicodendron diversilobum-Artemisia californica/Leymus condensatus* Association)
 - *A. californica* (see *Artemisia californica* Association)
 - *E. fasciculatum* (see *Eriogonum fasciculatum* Association)
 - *M. laurina* and *Lotus scoparius* (see *Malosma laurina-Lotus scoparius* Association)
- The following species combinations should not key to this association:
 - *E. fasciculatum* with *Bebbia juncea* (see *Eriogonum fasciculatum-Bebbia juncea* Association)
 - *E. fasciculatum* with *Salvia apiana* (see *Eriogonum fasciculatum-Salvia apiana* Association)
 - *E. fasciculatum* with *Mirabilis laevis* and/or *Salvia apiana* (see *Eriogonum fasciculatum/Salvia columbariae* Association)

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

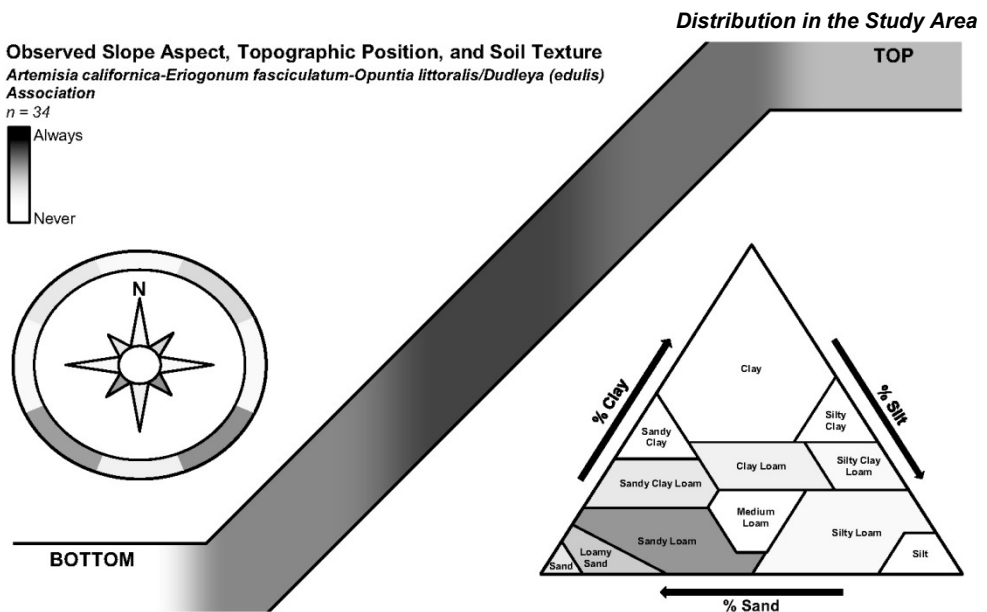
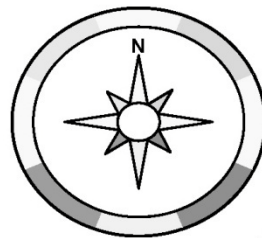
Artemisia californica and *Eriogonum fasciculatum* are codominant, having a relatively open canopy with *Opuntia littoralis* and/or *Dudleya edulis* present in the understory. Subdominant shrub species include *Rhus integrifolia*, *Bahiopsis laciniata*, *Lycium californicum*, *Encelia californica*, *Cylindropuntia prolifera*, *Cneoridium dumosum*, *Euphorbia misera*, *Simmondsia chinensis*, *Salvia apiana* and *S. mellifera*. The herbaceous understory is well-developed and includes *Dudleya pulverulenta*, *D. edulis*, *D. lanceolata*, *Achnatherum coronatum*, *Ferocactus viridescens*, *Pterostegia drymarioides*, *Chlorogalum parviflorum*, *Selaginella cinerascens*, and *Mirabilis laevis*.

Ecoregions

Central Coast (CC)
Central Valley (CV)
North Coast (NC)
Northern Foothills (NF)
Southern Coast (SC)
Southern Valley (SV)

Observed Slope Aspect, Topographic Position, and Soil Texture
Artemisia californica-*Eriogonum fasciculatum*-*Opuntia littoralis*/*Dudleya (edulis)*
Association
 $n = 34$

Always
Never



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, and succulent species must account for more shrub cover than any other single shrub genus.
- Two or more succulent species (e.g., *Dudleya* spp., *Ferocactus viridescens*, *Mammillaria* spp., *Opuntia* spp., and/or *Cylindropuntia* spp.) must co-occur with *A. californica* and *E.*

fasciculatum, or succulent species must account for at least 5 percent relative cover in the shrub canopy.

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.8 *Artemisia californica*-*Salvia mellifera* Alliance

The *Artemisia californica*-*Salvia mellifera* Alliance occurs from the Central Coast (including Santa Clara and San Benito counties), south through the coastal parts of the Transverse and Peninsular ranges (including Santa Ana Mountains and San Jacinto Foothills), and probably ranges into northwestern Baja California Norte, Mexico.

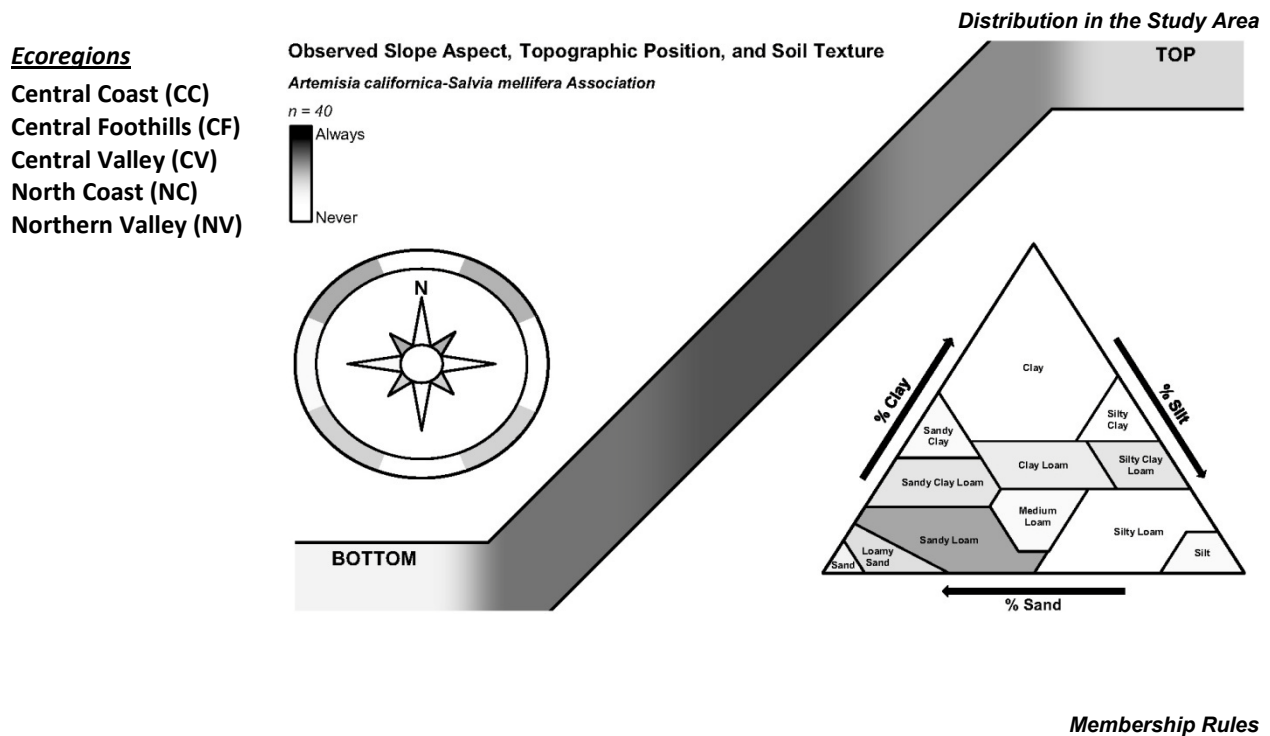
The alliance is represented throughout most of its range by a single association in which the two nominate species comprise the majority of the shrub cover. Despite regional variation in associated species, only one association is known at this time. The alliance is generally found on moderate-to-steep, low-elevation slopes.

Artemisia californica and *S. mellifera* are codominant in the shrub canopy, with *Adenostoma fasciculatum*, *Mimulus aurantiacus*, *Encelia californica*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Lotus scoparius*, and *Salvia apiana* as subdominants. Emergent shrubs of *Malosma laurina*, *Rhus integrifolia*, or *R. ovata* may be present at low cover. Shrubs are < 2 m and sometimes two-tiered, the shrub canopy is intermittent to continuous, and the herbaceous layer is variable.

A single association is represented in the study area, with 40 samples recorded and analyzed for this project.

4.8.1 *Artemisia californica*-*Salvia mellifera* Association

Artemisia californica and *Salvia mellifera* are codominant with a relatively open canopy. Other subdominant plants include *Encelia californica*, *Eriogonum fasciculatum*, *Malosma laurina*, *Mimulus aurantiacus*, *Baccharis sarothroides*, *Rhus integrifolia*, *Encelia californica*, and *Toxicodendron diversilobum*. The herbaceous understory is well-developed, and may include *Calystegia macrostegia* and *Astragalus trichopodus*.



There are two possible ways to key to this association. The rules given first apply to both options:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

Option One:

- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, and succulent species must account for more shrub cover than any other single shrub genus.
- *Salvia* spp. must be present with higher cover than *A. californica* and *E. fasciculatum* (do not combine the cover of *A. californica* and *E. fasciculatum* for this comparison).
- *S. mellifera* must occur with higher percent cover than any other *Salvia* spp. present.
- *A. californica* must account for at least 5 percent relative cover in the shrub canopy (otherwise see *Salvia mellifera* Alliance).

Option Two:

- The combined cover of *A. californica* and *S. mellifera* must account for at least 50 percent relative cover in the shrub canopy.

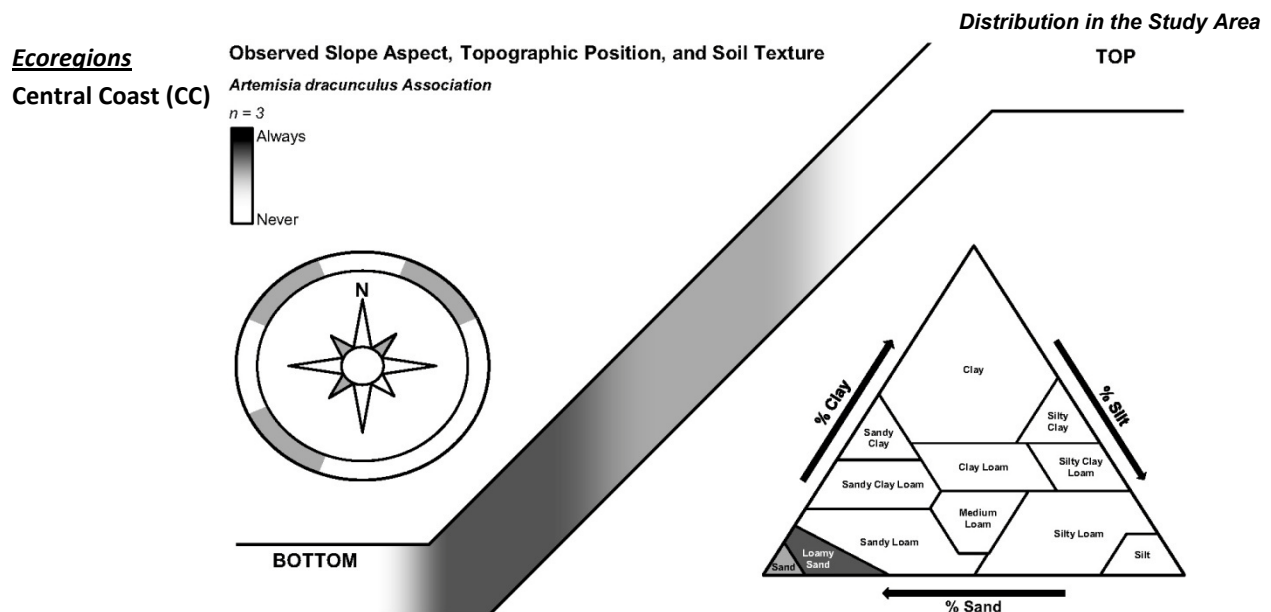
4.9 *Artemisia dracunculus* Alliance

This alliance is made up of scattered patches of the relatively tall shrub *Artemisia dracunculus*. Stands are usually associated with riparian terraces and occur on sandy substrates. Stands have been reported sporadically from the south coast and up into the inner Central Coast Ranges of San Benito County (Sawyer et al. 2009). In all stands described so far, *Artemisia dracunculus* is dominant, codominant, or characteristically present in the shrub layer with a number of herbs such as *Amsinckia menziesii*, *Artemisia douglasiana*, *Bromus* spp., *Centaurea melitensis*, *Clarkia purpurea*, *C. unguiculata*, *Erodium cicutarium*, *Eschscholzia californica*, *Hirschfeldia incana*, *Hypochaeris glabra*, *H. radicata*, *Lotus unifoliolatus*, *L. purshianus*, *L. scoparius*, *Lupinus bicolor*, *Pseudognaphalium canescens*, *Rumex salicifolius*, and *Vulpia myuros*. Emergent shrubs of *Baccharis salicifolia* and *Eriogonum fasciculatum*, and *Senecio flaccidus* shrubs or *Pinus sabiniana* trees may be present at low cover. Herbs are usually < 1.5 m tall and total cover is intermittent to continuous.

Locally, *A. dracunculus* patches occur occasionally in riparian terraces or on moist slopes adjacent to springs and seeps and are usually relatively small (< 1 ha). The visually similar *Artemisia palmeri* occurs in similar settings, but did not form numerous repeating distinct patches.

4.9.1 Artemisia dracunculus Association

Artemisia dracunculus is dominant to subdominant in the shrub canopy with a large variety of other shrubs and herbs that are transitional between wetlands and uplands, including *Baccharis sarothroides*, *Heterotheca* spp., *Sambucus nigra* ssp. *caerulea*, *Artemisia californica*, *Encelia californica*, *Eriogonum fasciculatum*, *Croton californicus*, *Stephanomeria* spp., and *Ambrosia psilostachya*. *Artemisia dracunculus* often occurs as scattered individuals in riparian scrub but forms larger stands in broad dry flood plains.



There are two possible ways to key to this association (both soft-leaved, drought-deciduous shrublands and riparian shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Artemisia dracunculus* must account for at least 50 percent relative cover in the shrub canopy.

4.10 *Baccharis pilularis* Alliance

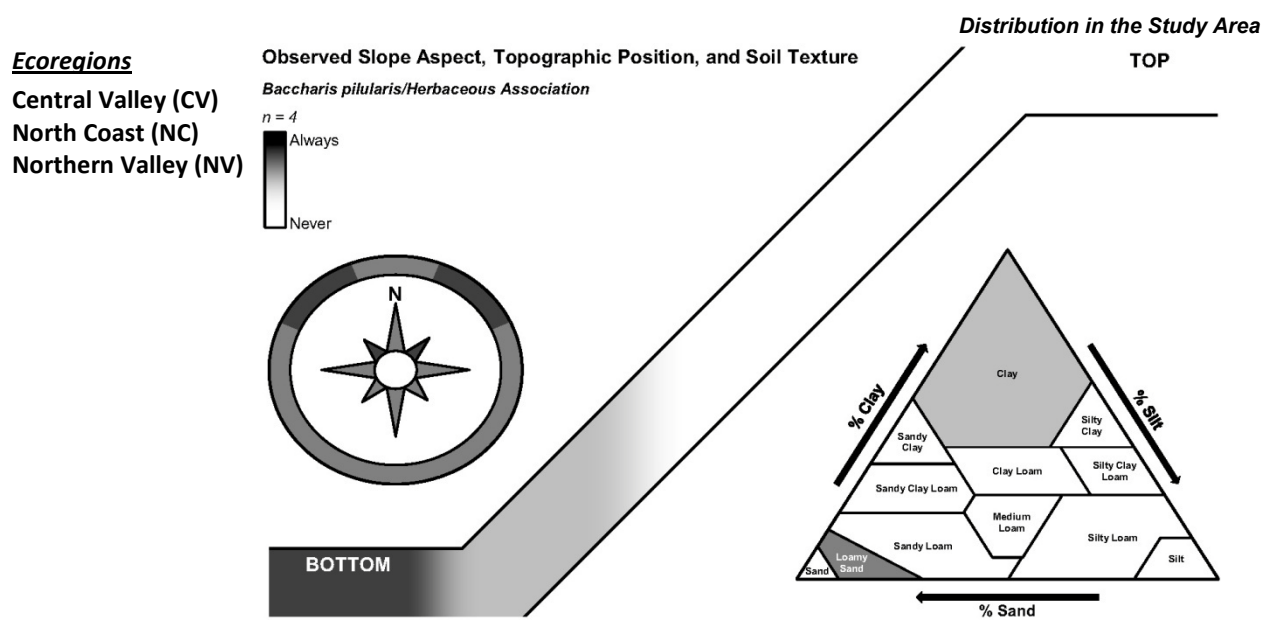
Baccharis pilularis plays multiple roles in scrublands throughout cismontane California. In the north and outer Central Coast Ranges, stands may be extensive on hills and bluffs near the ocean, persist for long periods, and contain a diversity of mesophytic shrubs and herbs. However, in drier, more inland and southerly localities, stands tend to be simpler floristically and restricted to localized mesic and recently disturbed sites such as eroded cut banks, ungrazed clearings, edges of stream channels, and openings in concave stands of coastal scrub. Barring further disturbance, stands are generally short-lived and are replaced by more extensive, surrounding alliances.

Statewide, this alliance is characterized by *Baccharis pilularis* as the dominant or codominant species in the shrub canopy. Depending on location, codominant (or subdominant) shrubs may include *Artemisia californica*, *Ceanothus thyrsiflorus*, *Corylus cornuta*, *Mimulus 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 are < 3 m tall and the canopy is open to continuous. The herbaceous layer is also open to continuous.

Most stands in the study area are small and are represented by the *B. pilularis*/herbaceous Association. In this association, the shrub canopy (stratum) is open and there is a well-developed herbaceous understory, which includes many nonnative species.

4.10.1 *Baccharis pilularis*/Herbaceous Association

Baccharis pilularis is the dominant species in the shrub canopy. Subdominant shrubs include *Artemisia californica*, *Eriogonum fasciculatum*, and *Isocoma menziesii*. Codominant species in the herbaceous understory include nonnative and native grasses such as *Bromus* spp., *Hordeum* spp., *Cynodon dactylon*, *Leymus condensatus*, *Nasella pulchra*, and *Muhlenbergia rigens*. Wetland species in the herbaceous understory include *Juncus dubius*, *Ambrosia psilostachya*, *Distichlis spicata*, and *Polypogon monspeliensis*. This association is an open, upland scrub that occurs most often on floodplains, and is transitional from riparian to upland associations.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Baccharis* spp. must account for at least 50 percent relative cover in the shrub canopy, and *B. pilularis* must be the dominant *Baccharis* sp.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.11 *Baccharis salicifolia* Alliance

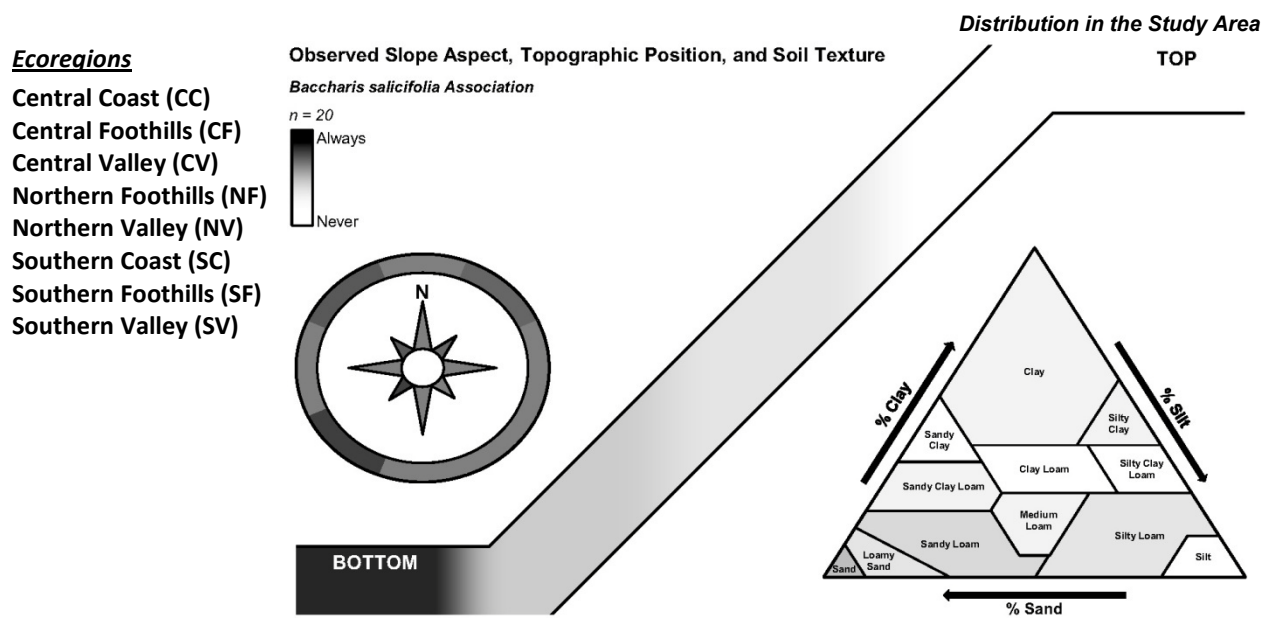
Baccharis salicifolia stands form in both seasonally or intermittently flooded habitats such as canyon bottoms, floodplains, irrigation ditches, lake margins, and stream channels. Stands are inherently variable depending on the amount of inundation and scouring. Stands usually form open shrublands or thickets in riparian corridors and along lake margins. The alliance is widespread throughout the warmer parts of California and the Southwest.

Statewide, *B. salicifolia* is dominant or codominant in the shrub canopy, with few to relatively numerous associated shrubs depending on location. These can include *Artemisia californica*, *B. emoryi*, *B. pilularis*, *Nicotiana glauca*, *Malosma laurina*, *Pluchea sericea*, *Rubus* spp., *Salix exigua*, *S. lasiolepis*, *Sambucus nigra*, and *Tamarix* spp. Emergent trees such as *Pinus sabiniana*, *Platanus racemosa*, *Populus fremontii*, *Quercus* spp., and *Salix* spp. may be present in some stands. Shrubs are generally < 5 m, with the shrub canopy open to continuous and the herbaceous layer usually sparse.

In the study area, the only association identified is the *B. salicifolia* Association. It may contain a variety of subdominant shrubs and occurs along streams, rivers, and other waterways where fluvial disturbance is frequent.

4.11.1 *Baccharis salicifolia* Association

Baccharis salicifolia is the dominant species in the shrub canopy. Subdominant shrubs may include *Isocoma menziesii* and *Toxicodendron diversilobum*. Emergent wetland trees include *Populus fremontii*, *Salix* spp., and *Sambucus nigra* ssp. *caerulea*. The herbaceous understory is diverse and may include *Asclepias fascicularis*, *Rumex salicifolius*, *Malvella leprosa*, *Xanthium strumarium*, *Artemisia douglasiana*, *Juncus* spp., *Schoenoplectus* spp., *Mimulus guttatus*, and *Heliotropium curassavicum*. This association is an open riparian scrub that is most often transitional to more fully developed riparian woodlands.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Baccharis salicifolia* must account for at least 30 percent relative cover in the shrub canopy.

4.12 *Baccharis sarothroides* Provisional Alliance

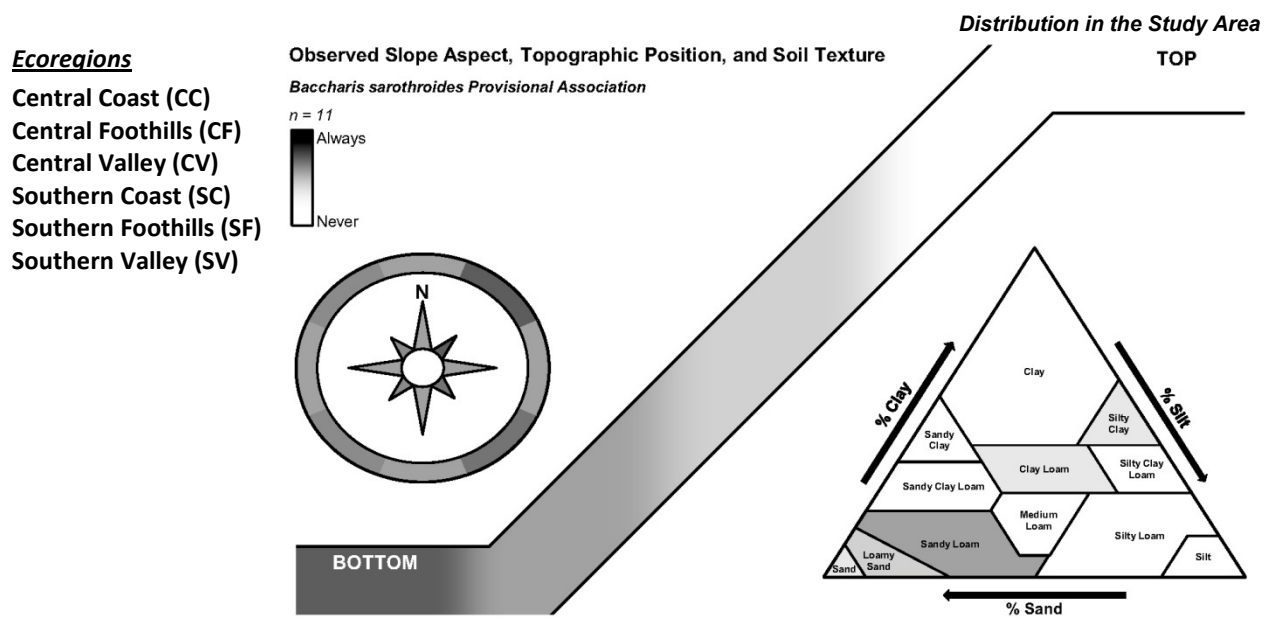
Baccharis sarothroides is an early successional shrub with similar ecology to *B. pilularis*. It occurs in recent clearings and readily colonizes moist concave slopes following disturbance such as fire or mechanical clearing. It has a more restricted range than *B. pilularis*, and is found primarily along the south coast of California.

This is the first time that stands dominated by this species have been proposed as a provisional alliance. Further sampling throughout the range of the species is recommended to substantiate the relationship of the alliance of this species with the alliance of *B. pilularis*.

A single provisional association is proposed below.

4.12.1 *Baccharis sarothroides* Association

Baccharis sarothroides is dominant in an open shrub canopy. Subdominant shrubs include *Isocoma menziesii*, *Artemisia californica*, *Salvia mellifera*, and *Eriogonum fasciculatum*. Associated wetland trees and shrubs may include *Sambucus nigra* ssp. *caerulea* and *A. dracunculus*. A diverse herbaceous understory includes *Juncus* spp., *Urtica dioica*, and many nonnative species. This association often colonizes disturbed sites, although it is also a stable upland scrub, occurring most often on floodplains that are transitional between upland and more fully developed riparian woodlands.



Membership Rules

There are two possible ways to key to this association (both soft-leaved, drought-deciduous shrublands and riparian shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Baccharis* spp. must account for at least 50 percent relative cover in the shrub canopy, and *B. sarothroides* must be the dominant *Baccharis* sp.
- If present, *B. salicifolia* must be subdominant (otherwise see *B. salicifolia* Association).

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.13 *Bahiopsis laciniata* Alliance

[MCV Synonym: *Viguiera laciniata*]

This is a newly defined alliance based on samples collected and analyzed from this study. *Bahiopsis laciniata* is a distinctive drought-deciduous shrub endemic to San Diego County and adjacent Baja California. *B. laciniata* stands occur commonly in the southwestern portion of the county. They occupy hot, southerly facing slopes generally a few miles inland from the ocean, where summer fog persists throughout the day. Stands are most closely related ecologically to drier stands of the *Eriogonum fasciculatum* Alliance. The characteristics of the alliance and the single association defined to date are described below.

4.13.1 *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association

[MCV Synonym: *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum*]

Bahiopsis laciniata, *Artemisia californica*, and *Eriogonum fasciculatum* are dominant to subdominant in closed to open shrub canopy. Subdominant associates include *Malosma laurina*, *A. californica*, *E. fasciculatum*, *Adenostoma fasciculatum*, and *Xylococcus bicolor*. Herbaceous cover is diverse largely in openings and can include *Dudleya* spp., *Cylindropuntia* spp., and *Hesperoyucca whipplei*.

Ecoregions

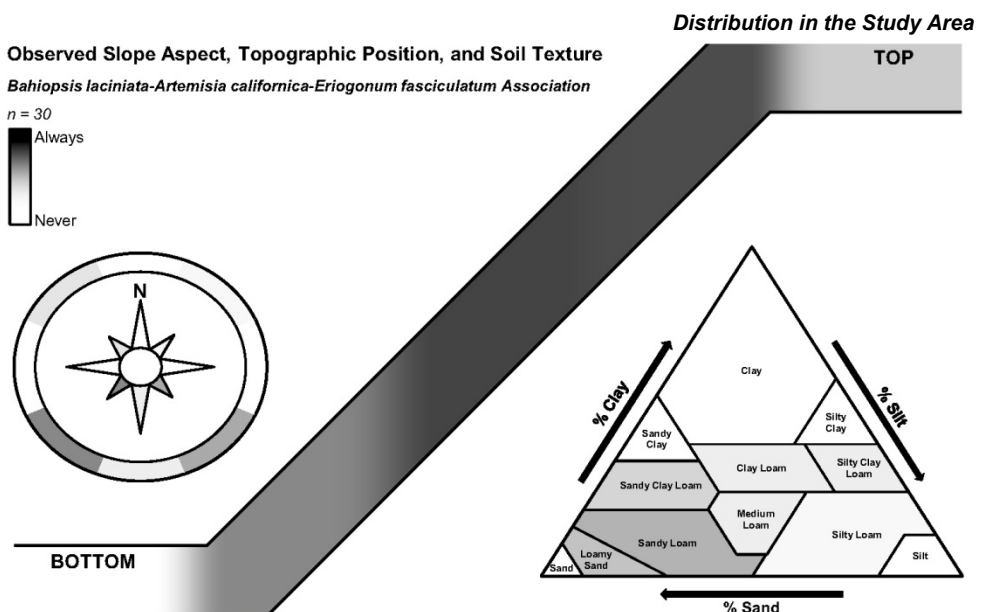
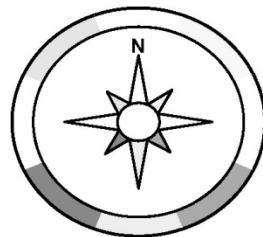
Central Coast (CC)
Central Foothills (CF)
Central Valley (CV)
Southern Coast (SC)
Southern Foothills (SF)
Southern Valley (SV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Bahiopsis laciniata-*Artemisia californica*-*Eriogonum fasciculatum* Association

n = 30

Always
Never



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Microphyllous, succulent, or drought-deciduous, soft-leaved species must account for at least 50 percent relative cover in the shrub canopy.
- *Bahiopsis laciniata* must account for at least 5 percent relative cover in the shrub canopy.
- *Simmondsia chinensis* must be absent.

4.14 *Ceanothus crassifolius* Alliance

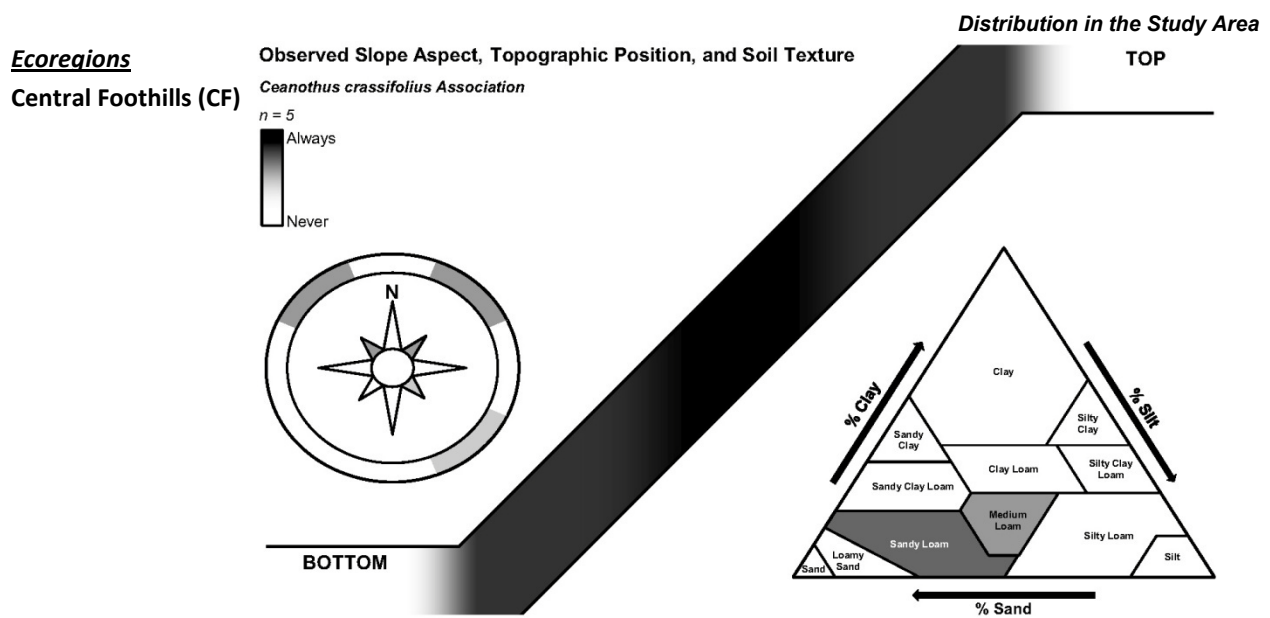
Ceanothus crassifolius is an obligate seeder that produces a persistent seed bank. Monotypic stands of *C. crassifolius* occur in post-fire situations where the fire cycle ranges between 20 and 60 years, although individuals may live for longer than 90 years. Since stands are identified by strong dominance of *C. crassifolius*, most stands sampled in the area have likely experienced fire relatively recently. Fires occurring at short intervals have the potential to cause significant changes in species density and composition.

In general, the alliance is characterized by *C. crassifolius* as the dominant or codominant species in the shrub canopy, with *Adenostoma fasciculatum*, *Arctostaphylos glauca*, *C. leucodermis*, *Cercocarpus montanus*, *Mimulus aurantiacus*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Keckiella antirrhinoides*, *Malosma laurina*, *Quercus berberidifolia*, *Rhus ovata*, and/or *Salvia mellifera* occurring as subdominants. Emergent *Q. agrifolia* and other trees may be present at low cover. Shrubs are usually < 3.5 m with the canopy intermittent to continuous. In mature stands, the herbaceous layer is open.

C. crassifolius is tolerant of freezing winter temperatures and is, therefore, often found at higher elevations and more inland locations than stands of *C. tomentosus* or *C. verrucosus*. Most stands in San Diego County occur east of the study area in the higher parts of the Peninsular Range. A single widespread association is represented in the study area.

4.14.1 *Ceanothus crassifolius* Association

Ceanothus crassifolius is dominant in the shrub canopy in dense to open stands with low cover of other subdominant shrubs including *Adenostoma fasciculatum*, *Malosma laurina*, *Eriogonum fasciculatum*, scrub oak (*Quercus* spp.), *Xylococcus bicolor*, *Cneoridium dumosum*, and *Keckiella antirrhinoides*. A diverse herb flora occurs mostly in openings and after fire, and includes *Marah macrocarpus*, *Phacelia* spp., *Calystegia macrostegia*, *Zigadenus fremontii*, *Cryptantha* spp., and *Collinsia heterophylla*. This vegetation type occupies xeric sites in the interior of San Diego County, where other *Ceanothus* spp. are largely absent.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Ceanothus crassifolius* must account for at least 30 percent relative cover in the shrub canopy.
 - Note: If *C. crassifolius* is codominant with *Adenostoma fasciculatum* or *Xylococcus bicolor*, see the *Adenostoma fasciculatum*-*Ceanothus crassifolius* Association or *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Ceanothus crassifolius* Association).

- *Xylococcus bicolor* is diagnostically present (i.e., is not required to be present but is expected to occur with a probability of 80 percent or greater). If present, *X. bicolor* must account for less than 30 percent relative cover in the shrub canopy (see note above).

4.15 *Ceanothus cyaneus* Special Stands

Ceanothus cyaneus is an endemic shrub to San Diego County and has deep blue thyrses. Almost all reliable collections are from the Crest or El Cajon Mountain region. It hybridizes with *C. tomentosus* and *C. leucodermis*. Like other *Ceanothus* spp., *C. cyaneus* tends to proliferate following fires as long as the intervals are not too short between fires. Two stands were sampled in the study area. This species is not expected to be found in extensive stands or in enough locations to warrant an association and, thus, is currently considered a special stand.

Ceanothus cyaneus is dominant in the shrub canopy in open stands with low cover of subdominant shrubs including *Adenostoma fasciculatum*, *Malosma laurina*, *Eriogonum fasciculatum*, scrub oak (*Quercus* spp.), *Xylococcus bicolor*, *C. tomentosus*, *C. leucodermis*, *C. oliganthus*, and *Hesperoyucca whipplei*. A diverse herb flora occurs mostly in openings and after fire, and includes *Helianthus gracilentus*, *Eriophyllum confertiflorum*, *Calystegia macrostegia*, *Cryptantha* spp., and *Chaenactis* spp. This special stand is restricted to coarse granitic soil derived from acid igneous rock in terrain that exhibits large rock outcrops between Crest and Ramona in San Diego County.

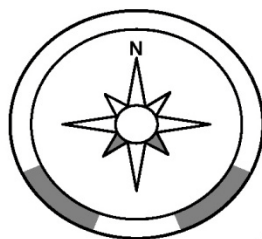
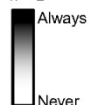
Ecoregions

Central Foothills (CF)

Observed Slope Aspect, Topographic Position, and Soil Texture

Ceanothus cyaneus Special Stands

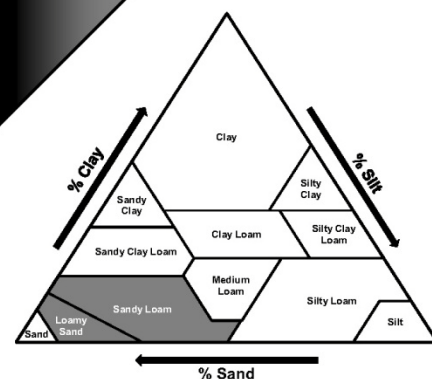
n = 2



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Ceanothus cyaneus* must account for at least 50 percent relative cover in the shrub canopy, or *C. cyaneus* must account for at least 30 percent relative cover and combine with other *Ceanothus* spp. to form at least 50 percent relative cover in the shrub canopy.
- If present, other shrubs (e.g., *Adenostoma fasciculatum*, *Malosma laurina*, and *Lotus scoparius*) must each account for less than 30 percent relative cover in the shrub canopy (otherwise see respective associations for these species).

4.16 *Ceanothus leucodermis* Alliance

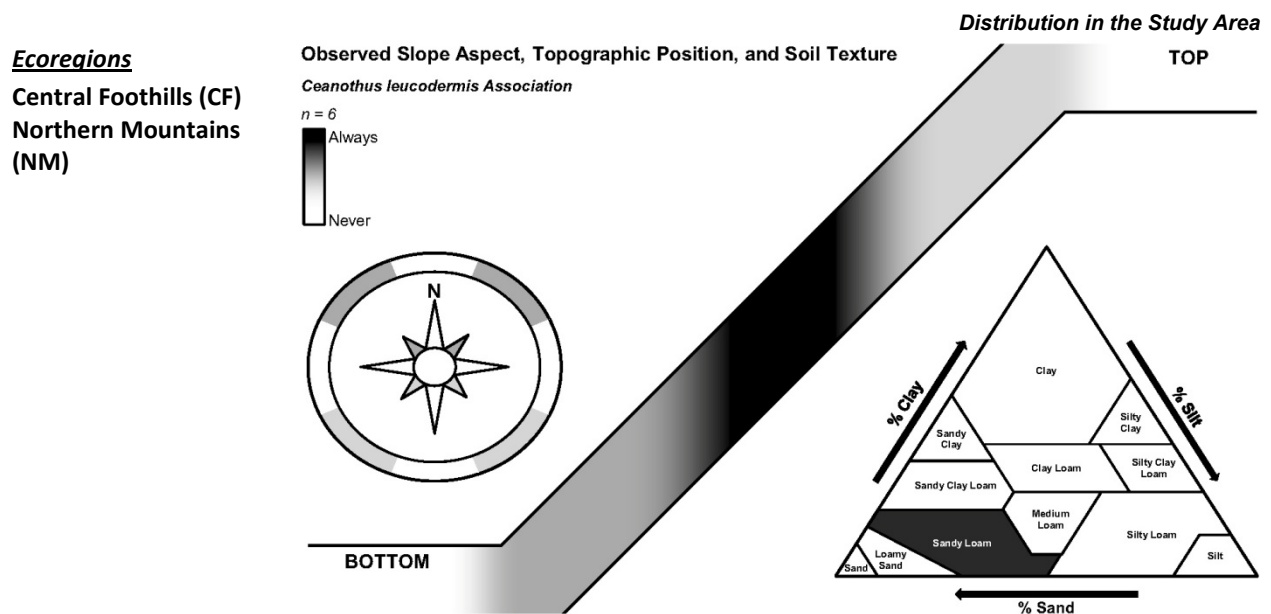
Stands of *Ceanothus leucodermis* are found at moderate to high elevations for chaparral species in early post-fire sites, and they appear to live longer in coastal settings than in desert exposures. *Ceanothus leucodermis* experiences moderate to high mortality in mature stands, particularly where the fire interval exceeds 40 years. *Ceanothus leucodermis* resprouts rapidly from root crowns when branches are removed by fire (or other disturbance), but also seeds readily after fires. Stands form at ecotones between coastal scrub, chaparral, and conifer-oak forests.

In general, this alliance is characterized by *C. leucodermis* as the dominant species in the shrub canopy. Subdominant shrubs include *Adenostoma fasciculatum*, *Arctostaphylos glauca*, *Eriodictyon* spp., *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Rhus trilobata*, and *Toxicodendron diversilobum*. In some stands, emergent trees such as *Quercus chrysolepis*, *Q. kelloggii*, or *Q. wislizeni* may be present at low cover. The shrub stratum is < 4 m, the canopy is intermittent to continuous, and the herbaceous layer is typically sparse.

Most of the six stands sampled in this study were found at higher and more inland locations than stands in *C. verrucosus* or *C. tomentosus* alliances. These six stands represent a single association, as described below.

4.16.1 *Ceanothus leucodermis* Association

Ceanothus leucodermis is dominant in the shrub canopy in open stands with low cover of other subdominant shrubs including *Adenostoma fasciculatum*, *Malosma laurina*, *Eriogonum fasciculatum*, *Xylococcus bicolor*, *C. tomentosus*, *Salvia apiana*, and *Hesperoyucca whipplei*. A diverse herb flora occurs mostly in openings, which becomes more diverse following fire, and may include *Helianthus gracilentus*, *Antirrhinum coulterianum*, *A. nuttallianum*, *Phacelia* spp., and *Cryptantha* spp.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Ceanothus leucodermis* must account for at least 30 percent relative cover in the shrub canopy.

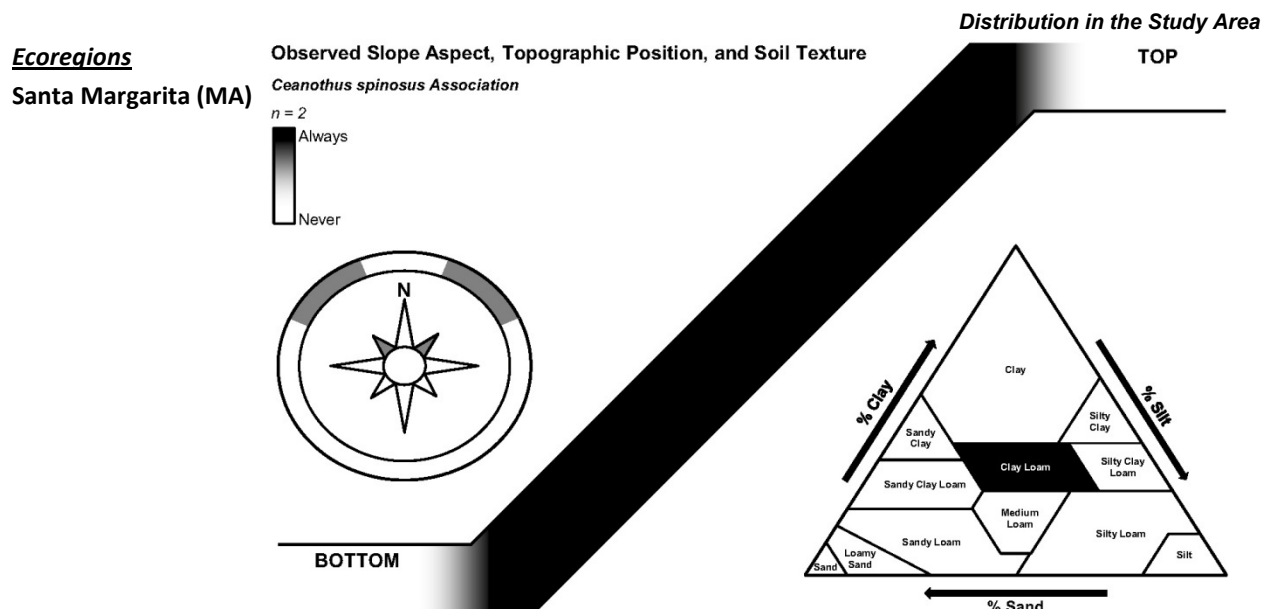
4.17 *Ceanothus spinosus* Alliance

Ceanothus spinosus is dominant or codominant in the shrub canopy with *C. megacarpus*, *Heteromeles arbutifolia*, *Keckiella cordifolia*, *Prunus ilicifolia*, and *Rhus ovata*. Emergent trees such as *Juglans californica*, *Quercus agrifolia*, and *Umbellularia californica* may be present at sparse to trace cover. Shrubs are < 5 m and the shrub canopy is intermittent to continuous.

This alliance is endemic to south coastal California and is prominent on north-facing slopes. Unlike most mesic north-slope chaparral shrubs, *C. spinosus* regenerates both from sprouting root crowns and from seedling recruitment after fire. Throughout its range, this alliance occurs on ocean-facing slopes where summer fog may decrease evapotranspiration. The understory may be diverse and well-developed in mature stands. The stands in the western Santa Ana Mountains adjacent to Marine Corps Base Camp Pendleton are among the southernmost stands of this alliance, although the species has been found farther south in San Diego County. These moist, foggy stands are much like those described farther north from the Santa Monica and Santa Ynez mountains of Ventura and Santa Barbara counties. They represent a single association, as described below.

4.17.1 *Ceanothus spinosus* Association

Ceanothus spinosus is dominant in the shrub canopy in open stands with other subdominant shrubs including scrub oak (*Quercus* spp.), *Cercocarpus minutiflorus*, *Toxicodendron diversilobum*, *Heteromeles arbutifolia*, *C. crassifolius*, and *Ribes speciosum*. An herbaceous understory of subdominants typifies the mesic site conditions, including *Keckiella cordifolia*, *Agrostis pallens*, *Dryopteris arguta*, *Adiantum jordanii*, and *Polypodium californicum*. Emergent trees such as *Q. agrifolia* or *Q. engelmannii* may be present. The *Ceanothus spinosus* Association occurs primarily in northwest San Diego County and continues northward along the Southern California coastline to Santa Barbara County.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Ceanothus spinosus* must account for at least 30 percent relative cover in the shrub canopy.

4.18 *Ceanothus tomentosus* Alliance

Ceanothus tomentosus is dominant or codominant in the shrub canopy with *Adenostoma fasciculatum*, *A. sparsifolium*, *Arctostaphylos glandulosa*, *C. megacarpus*, *C. oliganthus*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Rhus ovata*, *Salvia mellifera*, *Toxicodendron diversilobum*, and *Xylococcus bicolor*. Emergent *Q. agrifolia*, *Q. chrysolepis*, *Q. wislizeni*, and *Umbellularia californica* trees may be present at low cover. Shrubs are generally < 4 m, the shrub canopy is continuous to intermittent, and the herbaceous layer is sparse in mature stands.

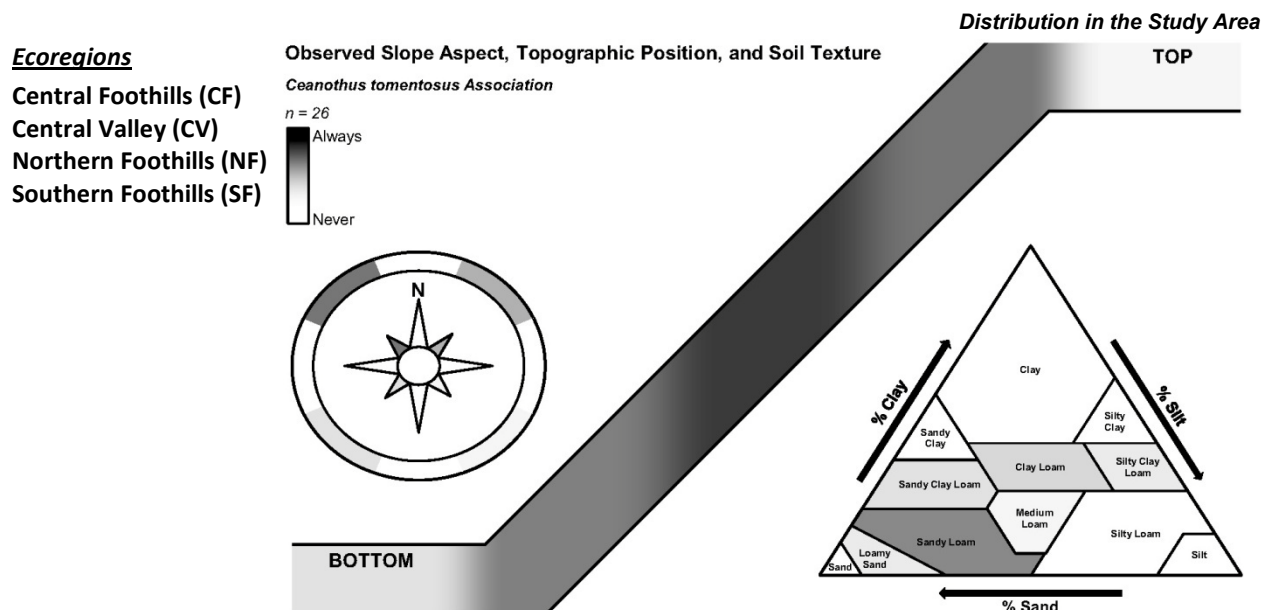
In *A Manual of California Vegetation: Second Edition* (Sawyer et al. 2009), this alliance was treated as part of the *C. oliganthus* shrubland Alliance. Although *C. oliganthus* and *C. tomentosus* are ecologically and morphologically similar, at least in Southern California there are sufficient distinctions to consider them as separate alliances. *C. tomentosus* occurs at lower elevations with less winter frost than *C. oliganthus* stands. *C. oliganthus* is occasional in western San Diego County, but is more typical of higher elevations and typically replaces stands of *Q. chrysolepis*, *Pseudotsuga macrocarpa*, and other montane tree or shrub alliances following crown fires. Conversely, stands of *C. tomentosus* typically replace recently burned stands of *A. fasciculatum*-*X. bicolor*, *A. fasciculatum*, or *Q. xacutidens* alliances found at mid to lower elevations.

In Gordon and White (1994), stands with *C. tomentosus* codominant with *X. bicolor* and *A. fasciculatum* were considered as a single alliance: *A. fasciculatum*-*X. bicolor*-*C. tomentosus*. There is now a broader spectrum of samples from a broader elevational and successional gradient that offers the current perspective of three separate alliances: the *A. fasciculatum*-*X. bicolor* Alliance, the post-fire *C. tomentosus* Alliance, and the related but higher elevation *C. oliganthus* Alliance.

A single association characterized by strong dominance of *C. tomentosus* is described below from 26 samples collected in this study.

4.18.1 *Ceanothus tomentosus* Association

Ceanothus tomentosus is dominant in the shrub canopy in continuous stands with relatively low cover of other subdominant shrubs, including *Quercus berberidifolia*, *Q. xacutidens*, *Q. berberidifolia*, *Cercocarpus minutiflorus*, *Ceanothus leucodermis*, *C. otayensis*, *C. crassifolius*, *Toxicodendron diversilobum*, *Heteromeles arbutifolia*, *Dendromecon rigida*, and *Keckiella cordifolia*. Sparse cover from a diverse herb flora occurs in the understory, which becomes more diverse following fire. Coastal foothills that support this association appear as a continuous cover of dark blue when *C. tomentosus* is flowering.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Ceanothus tomentosus* must account for at least 30 percent relative cover in the shrub canopy.

- If present, *Malosma laurina*, *Adenostoma fasciculatum*, and *Xylococcus bicolor* each account for less than 30 percent relative cover in the shrub canopy (otherwise see respective associations for these species).

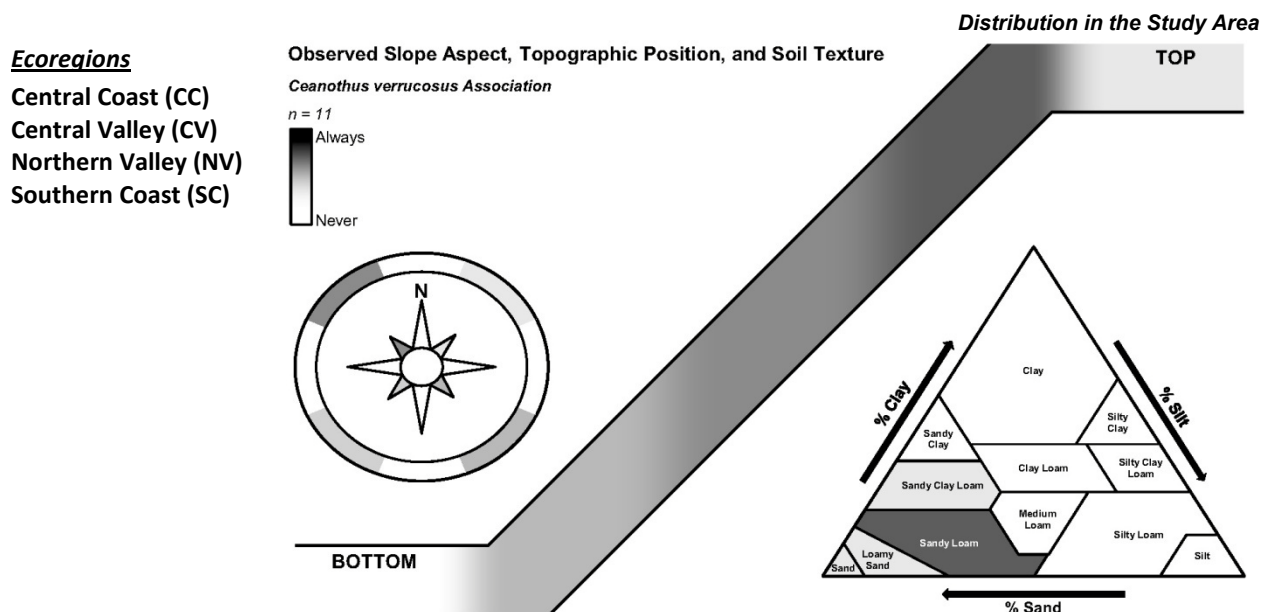
4.19 *Ceanothus verrucosus* Alliance

In general, this alliance is characterized by having *Ceanothus verrucosus* dominant in the shrub canopy with *Adenostoma fasciculatum*, *Cneoridium dumosum*, *Eriogonum fasciculatum*, *Lotus scoparius*, *Malosma laurina*, *Rhus integrifolia*, *Salvia mellifera*, and *Xylococcus bicolor*, among other shrubs. The shrub stratum is generally < 3 m and the canopy is intermittent to continuous. The herbaceous layer is variable.

Ceanothus verrucosus is restricted to San Diego County and adjacent northwestern Baja California. It is a characteristic species of southern maritime chaparral (Holland 1986) and dominates stands following fire or other disturbance in maritime chaparral, often replacing *A. fasciculatum*, *A. fasciculatum*-*X. bicolor*, or *Quercus dumosa* alliances. Recent sampling and mapping at Cabrillo National Monument/Point Loma Navy Base and within the study area have substantiated the existence of a number of stands, and is sufficient to elevate the vegetation type from a provisional to a full alliance treatment in the California Vegetation Classification. A single association has been defined and is described below.

4.19.1 *Ceanothus verrucosus* Association

Ceanothus verrucosus forms a continuous canopy with other shrubs, with *Rhus integrifolia*, *Adenostoma fasciculatum*, *Mimulus aurantiacus*, *Salvia mellifera*, *Malosma laurina*, *Cneoridium dumosum*, *Hazardia squarrosa*, *Yucca schidigera*, and *Hesperoyucca whipplei* occurring as subdominants. The herbaceous layer occurs mostly in openings, increasing in cover and diversity following fire. This association occurs primarily on coastal mesas and foothills in southwest San Diego County.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Ceanothus verrucosus* must account for at least 50 percent relative cover in the shrub canopy.
- *Salvia mellifera* and *Malosma laurina* are diagnostically present (i.e., are not required to be present but are expected to occur with a probability of 80 percent or greater) and generally account for less than 30 percent relative cover in the shrub canopy.

4.20 *Cercocarpus minutiflorus* Alliance[MCV Synonym: *Cercocarpus montanus*]

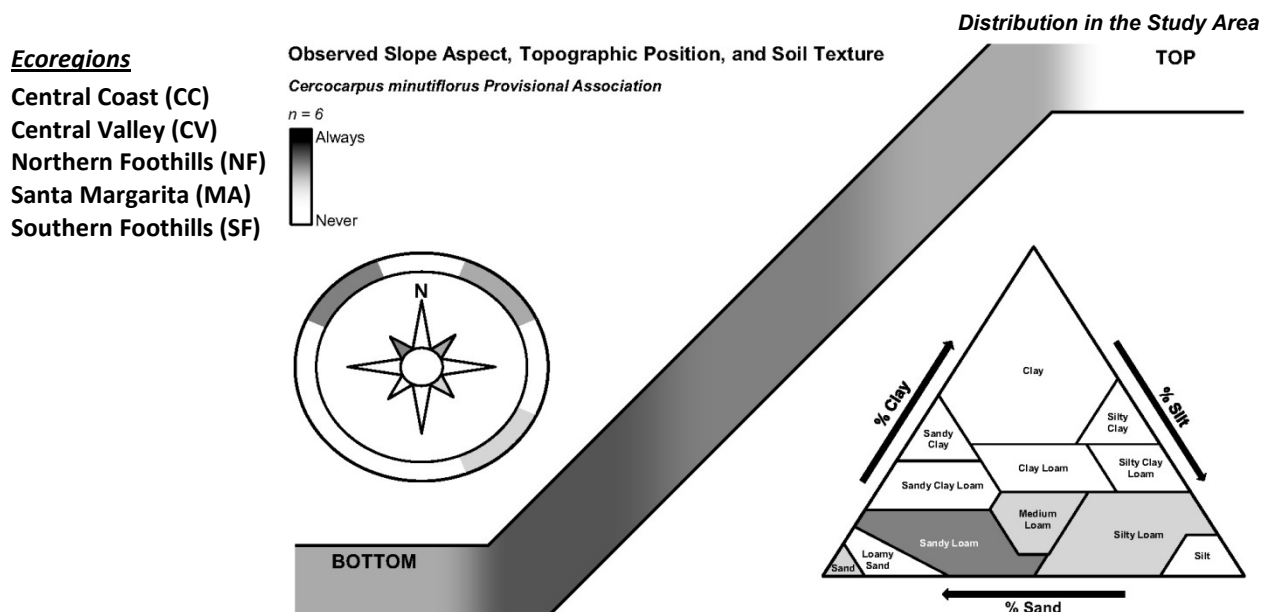
Cercocarpus montanus grows throughout the western United States. Within the study area, this alliance is occasional on steep, lower, sheltered slopes, often adjacent to stands of *Quercus berberidifolia* and *Q. ×acutidens*. Stand distribution is somewhat spotty, but generally occurs close to the coast in steep shaded ravines.

Throughout California, *C. montanus* is generally dominant or codominant in the shrub canopy of this alliance. Subdominant shrubs include *Adenostoma fasciculatum*, *A. sparsifolium*, *Arctostaphylos glandulosa*, *A. glauca*, *Artemisia californica*, *Ceanothus crassifolius*, *C. cuneatus*, *C. megacarpus*, *C. spinosus*, *Eriogonum fasciculatum*, *E. wrightii*, *Fremontodendron californicum*, *Garrya flavescens*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Malosma laurina*, *Prunus ilicifolia*, *Quercus berberidifolia*, *Q. john-tuckeri*, *Rhamnus ilicifolia*, *Salvia apiana*, and *S. mellifera*. Emergent trees may be present with trace cover. Shrubs are usually < 5 m; and the shrub canopy is single or two-tiered and open to continuous. The herbaceous layer is sparse or grassy depending on canopy cover and location.

4.20.1 *Cercocarpus minutiflorus* Provisional Association

[MCV Synonym: *Cercocarpus montanus* var. *minutiflorus*]

Cercocarpus minutiflorus is the dominant shrub species in this association, forming an open canopy. Subdominant shrubs include *Adenostoma fasciculatum*, *Xylococcus bicolor*, *Heteromeles arbutifolia*, *Malosma laurina*, *Mimulus aurantiacus*, *Hesperoyucca whipplei*, *Prunus ilicifolia*, *Artemisia californica*, and *Salvia mellifera*. A relatively open herb cover occurs mostly in openings, but increases following fire. This vegetation type is widespread on mesic exposures throughout cismontane San Diego, Orange, and Riverside counties, but decreases farther north.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Cercocarpus minutiflorus* must account for at least 30 percent relative cover in the shrub canopy (but often accounts for at least 40 percent relative cover).
- If present, scrub oak (*Quercus. berberidifolia* or *Q. xacutidens*) must account for less than 30 percent relative cover in the shrub canopy (otherwise see *Quercus [berberidifolia, xacutidens]-Cercocarpus minutiflorus* Association).

4.21 *Dendromecon rigida* Alliance

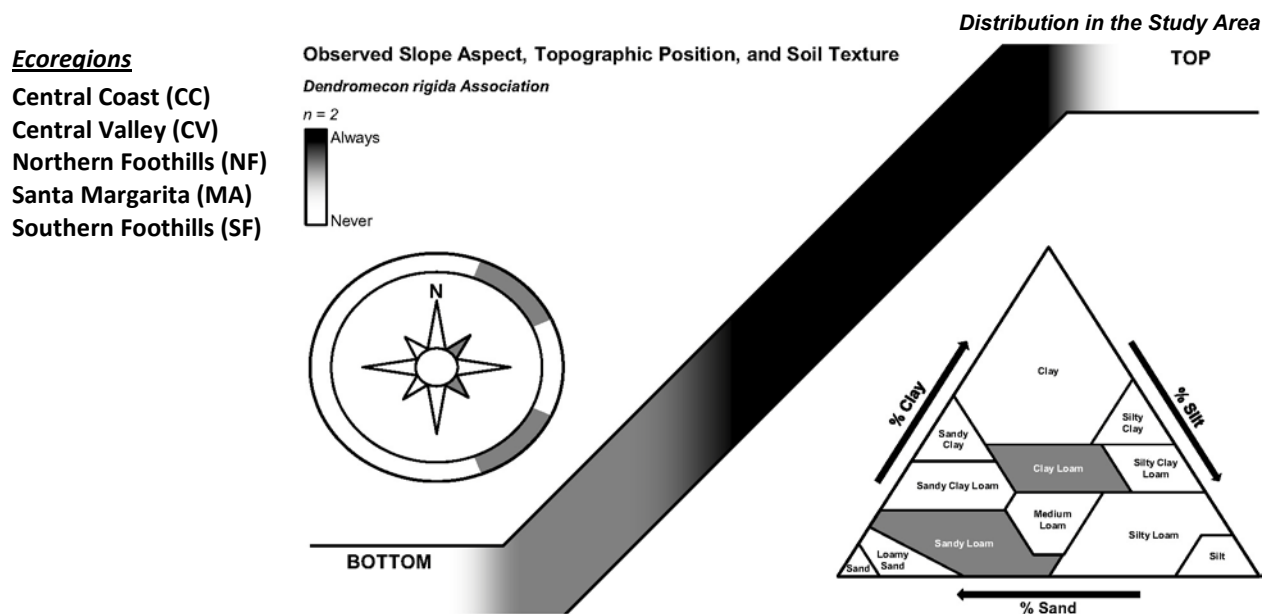
Dendromecon rigida is a short-lived shrub that forms stands from a seed bank following fire in chaparral throughout California. The stands are ephemeral, lasting typically less than a decade, and are replaced by longer-lived chaparral species. The ecological relationship between *D. rigida* Alliance stands and other early seral post-fire scrubs such as *Malacothamnus fasciculatus*, *Eriodictyon* spp., *Lotus scoparius*, and several *Ceanothus* spp. alliances has yet to be fully understood. *D. rigida* appears to be less frequently associated with drought-deciduous coastal scrubs than with chaparral. Its longevity is similar to *Lotus* spp. and *Malacothamnus* spp., and is typically shorter than most obligate-seeding *Ceanothus* spp.

The general characteristics of this alliance include: *D. rigida* as a dominant in the shrub canopy, with *Adenostoma fasciculatum*, *C. greggii*, *Eriophyllum confertiflorum*, *M. densiflorus*, and *Trichostema parishii* occurring as subdominants. Shrubs are usually < 3 m, the shrub canopy is open to intermittent, and the herbaceous layer is sparse.

The two stands in the study area were associated with chaparral at mid to upper elevations.

4.21.1 [Dendromecon rigida Association](#)

Dendromecon rigida is dominant in the shrub canopy in open stands that include trace cover of subdominant shrubs such as *Ceanothus tomentosus*, *Adenostoma fasciculatum*, and *Arctostaphylos glandulosa*. Sparse cover of subshrubs and herbaceous plants, such as *Lotus scoparius*, *Helianthemum scoparium*, *Dicentra chrysantha*, *Eriophyllum confertiflorum*, *Gnaphalium* spp., and *Pseudognaphalium* spp., are often present, since this association occurs in a disturbance-related and/or post-fire successional phase.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Dendromecon rigida* accounts for greater than 30 percent relative cover in the shrub canopy.

4.22 *Encelia californica* Alliance

Encelia californica is a relatively short-lived shrub that leafs out and flowers whenever moisture is available, usually in spring and sometimes through the fall. Its leaves drop in drought conditions. This alliance is one of several coastal sage scrub alliances. Despite its preference for sunny, steep exposures, it typically occurs close to the coast in association with some summer fog.

General alliance characteristics include *Encelia californica* as the dominant or codominant in the shrub canopy, with *Artemisia californica*, *Baccharis pilularis*, *Peritoma arborea*, *Mimulus aurantiacus*, *Eriogonum cinereum*, *Isocoma menziesii*, *Lotus scoparius*, *Hesperoyucca whipplei*, *Mirabilis californica*, *Opuntia littoralis*, *Salvia leucophylla*, and/or *S. mellifera* occurring as subdominants. Emergent taller shrubs of *Rhus integrifolia* or *Sambucus nigra* ssp. *caerulea* may be present at trace cover. Shrubs are generally < 2 m, the shrub canopy is intermittent to continuous, and the herbaceous layer is variable.

Stands in the study area are found close to the coast and comprise a single association, as described below.

4.22.1 *Encelia californica*-*Artemisia californica* Association

Encelia californica and *Artemisia californica* are codominant in an open shrub canopy with sparse cover of subdominant shrubs including *Isocoma menziesii*, *Lycium californicum*, *Eriogonum fasciculatum*, *Salvia apiana*, *S. mellifera*, *Rhus integrifolia*, *Peritoma arborea*, *Cylindropuntia prolifera*, and *Malosma laurina*. A diverse herb cover occurs mostly in openings and includes *Astragalus trichopodus*, *Calystegia macrostegia*, *Phacelia distans*, and *Pterostegia drymarioides*.

Ecoregions

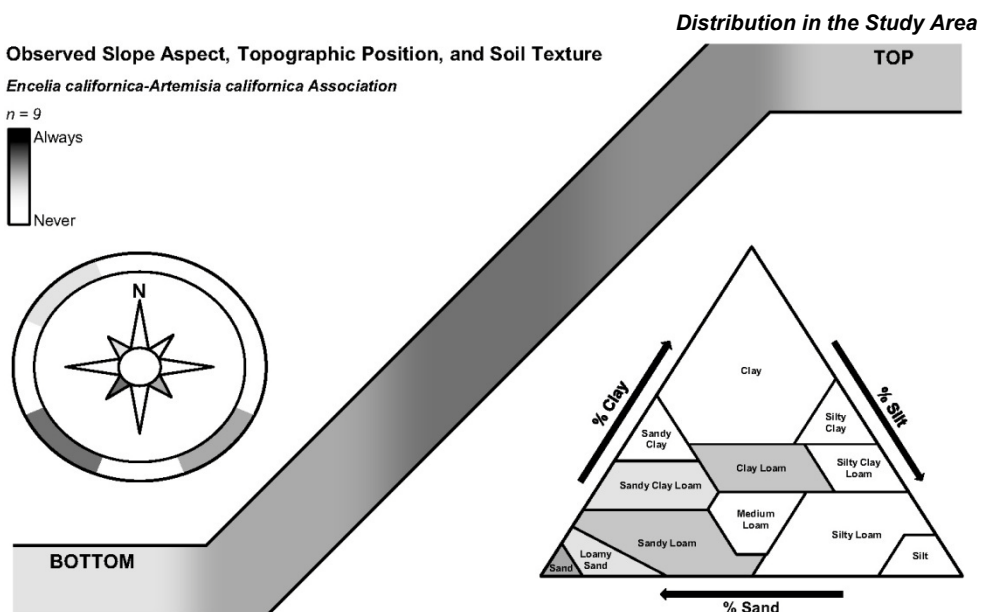
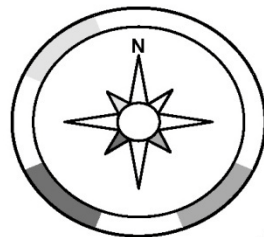
Central Coast (CC)
Central Valley (CV)
North Coast (NC)
Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Encelia californica-*Artemisia californica* Association

$n = 9$

Always
Never



Membership Rules

There are two possible ways to key to this association, but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica* and *Encelia californica* must account for at least 50 percent relative cover in the shrub canopy.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia*

chinensis-Bahiopsis laciniata Association or the *Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum* Association).

- If present, *Mimulus aurantiacus*, combined cover of *Keckiella antirrhinoides*/*Malosma laurina*, combined cover of *Salvia apiana*/*S. mellifera*, and *Toxicodendron diversilobum* must all be less than the cover of *E. californica* (otherwise see respective associations with *A. californica*).

4.23 *Eriogonum fasciculatum* Alliance

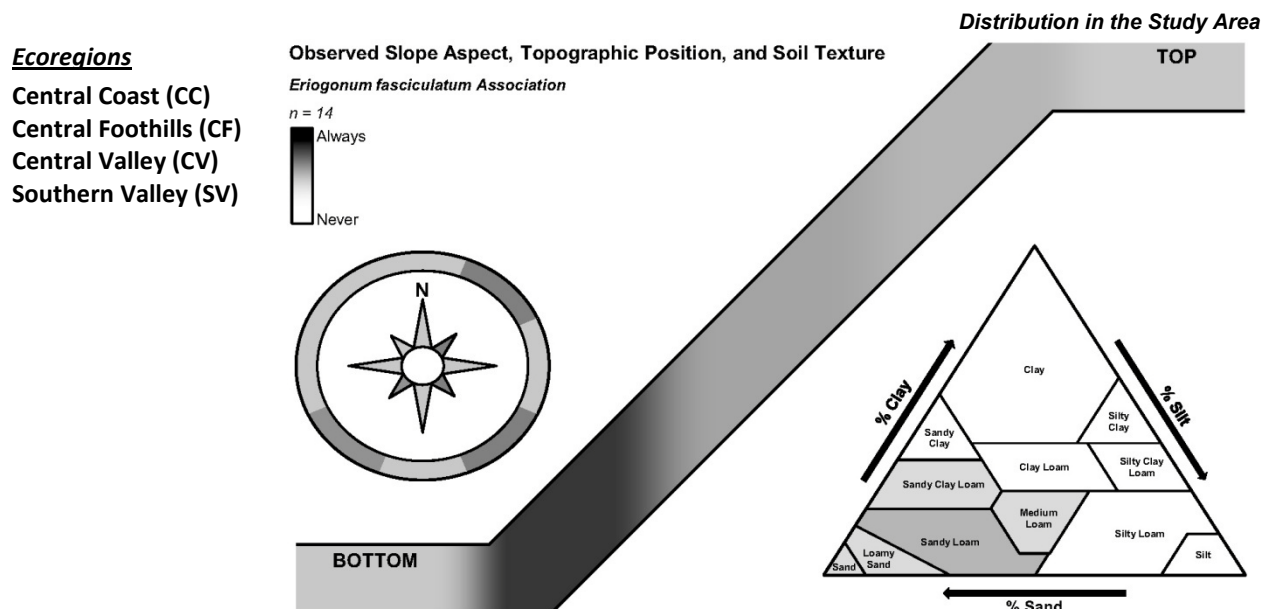
Eriogonum fasciculatum is one of the most diagnostic species of the Californian Mediterranean drought deciduous scrub macrogroups. It dominates or codominates many thousands of acres from the San Francisco Bay region south to northern coastal Baja California. Stands thrive on rocky sites and in shallow soils, and they establish after fire, flood, or grazing-related disturbances. In coastal Southern California, this alliance is usually one of the first of the coastal scrubs to establish in mechanically disturbed areas, such as road cuts or slope failures, and it persists in areas with light to moderate grazing.

In general, stands of this alliance are characterized by *E. fasciculatum* as dominant or codominant in the shrub canopy. In cismontane areas, subdominant species include *Artemisia californica*, *A. tridentata*, *Baccharis pilularis*, *Mimulus aurantiacus*, *Encelia californica*, *E. farinosa*, *Isocoma menziesii*, *Lotus scoparius*, *Malacothamnus fasciculatus*, *Salvia apiana*, and *S. mellifera*. In transmontane areas, subdominants include *Ambrosia dumosa*, *A. salsola*, *Coleogyne ramosissima*, *Ephedra nevadensis*, *Ericameria teretifolia*, *Larrea tridentata*, *Salazaria mexicana*, *Simmondsia chinensis*, and *Bahiopsis parishii*. Emergent trees such as *Juniperus californica*, *J. osteosperma*, or *Yucca brevifolia* may be present at trace cover. Shrubs are typically < 2 m and the canopy is continuous or intermittent. The herbaceous layer is variable and may be dominated by grasses.

In the study area, this alliance is represented by three associations: The *E. fasciculatum* Association occurs throughout; the *E. fasciculatum*-*Bebbia juncea* Association occurs in drier inland washes, stream terraces, or steep rocky slopes; and the provisionally described *E. fasciculatum*/*Salvia columbariae*-*Mirabilis laevis* Association is characteristic of hot, sunny, rocky or gravelly slopes where the herbaceous understory includes native annual forbs such as *S. columbariae*. The latter association is provisionally defined from several samples in this study.

4.23.1 *Eriogonum fasciculatum* Association

Eriogonum fasciculatum is the dominant or codominant species in an open shrub canopy. Subdominant shrubs include *Artemisia californica*, *Adenostoma fasciculatum*, *Ceanothus tomentosus*, *Malosma laurina*, *Cneoridium dumosum*, *Lotus scoparius*, *Baccharis pilularis*, *B. sarothroides*, *Salvia mellifera*, *S. apiana*, and *Bahiopsis laciniata* (= *Bahiopsis l.*). This association may represent an early transitional phase of other shrub associations or occur as a relatively stable association in ecotonal areas. A diverse herb cover occurs mostly in openings, and includes *Nassella pulchra*, *Deinandra fasciculata*, *Osmadenia tenella*, *Lupinus bicolor*, *Penstemon spectabilis*, and many nonnative grasses and forbs.



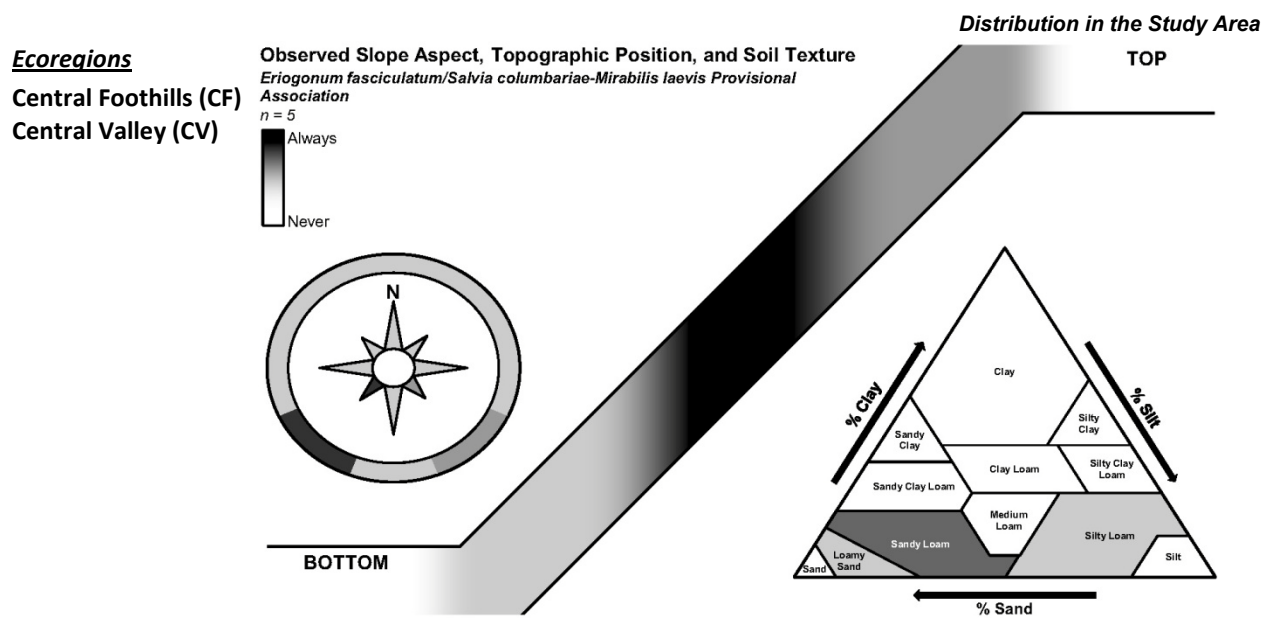
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Eriogonum fasciculatum* must account for at least 50 percent relative cover in the shrub canopy.
- *Bebbia juncea*, *Mirabilis laevis*, *Salvia apiana*, and *Salvia columbariae* must be absent (otherwise see respective associations with *E. fasciculatum*).

- If present, *A. californica* must account for less than 5 percent relative cover in the shrub canopy (otherwise see respective associations with *A. californica*, or *Artemisia californica*-*Eriogonum fasciculatum*-*Malosma laurina* Association).
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.23.2 *Eriogonum fasciculatum*/*Salvia columbariae*-*Mirabilis laevis* Provisional Association

Eriogonum fasciculatum forms an open canopy, with *Salvia columbariae* and *Mirabilis laevis* comprising a subdominant herbaceous understory. Other subdominant shrubs include *Malosma laurina*, *Artemisia californica*, *Hesperoyucca whipplei*, *Lotus scoparius*, *Cneoridium dumosum*, *Salvia mellifera*, and *S. apiana*. A diverse and continuous herbaceous understory occurs, and may include *Cryptantha* spp., *Eriastrum* spp., *Mimulus brevipes*, *Phacelia* spp., *Pterostegia drymarioides*, and *Muhlenbergia microsperma*. This association often occurs on stable xeric sites or as an early transitional stage of disturbance such as fire.



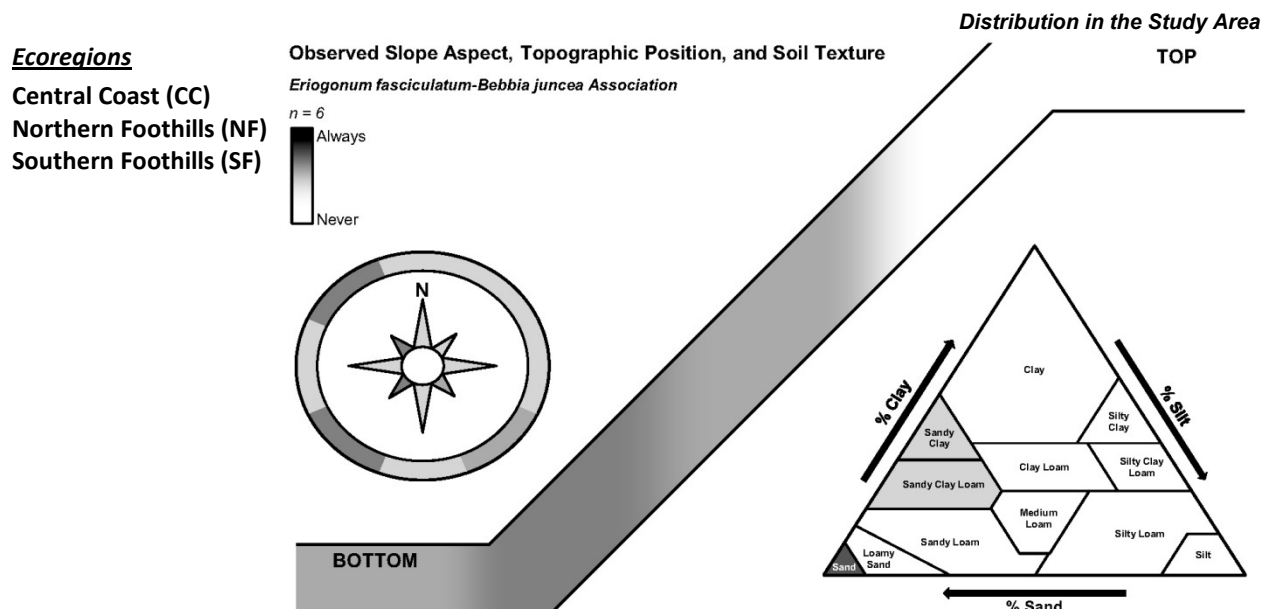
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Eriogonum fasciculatum* must combine with species other than *Artemisia californica* to account for at least 50 percent relative cover in the shrub canopy (i.e., there must be at least two shrub species with higher percent cover than *A. californica*, which is often absent or trace in this association).
- *Salvia columbariae* and/or *Mirabilis laevis* must be present.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia*

chinensis-Bahiopsis laciniata Association or the *Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum* Association).

4.23.3 *Eriogonum fasciculatum*-*Bebbia juncea* Association

Eriogonum fasciculatum and *Bebbia juncea* are codominant, forming an open canopy. Subdominant shrubs include *Malosma laurina*, *Hesperoyucca whipplei*, *Lepidospartum squamatum*, *Lotus scoparius*, *Artemisia tridentata*, *Baccharis sarothroides*, *A. californica*, *Salvia* spp., and *Brickellia californica*. A diverse herbaceous understory occurs, and may include *Aristida purpurea*, *Achnatherum diegoense*, *Pterostegia drymarioides*, *Dudleya* spp., *Selaginella bigelovii*, *Lupinus hirsutissimus*, and *Pellaea mucronata*. This association occurs on dry sites, both on slopes and alluvial terraces. It is closely allied to the *Lepidospartum squamatum* Alliance (alluvial fan scrub).



- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Eriogonum fasciculatum* must combine with species other than *Artemisia californica* to account for at least 50 percent relative cover in the shrub canopy (i.e., there must be at least two shrub species with higher percent cover than *A. californica*, which is often absent or trace in this association).
- *Bebbia juncea* must be present.

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.24 *Eriogonum fasciculatum*-*Salvia apiana* Alliance

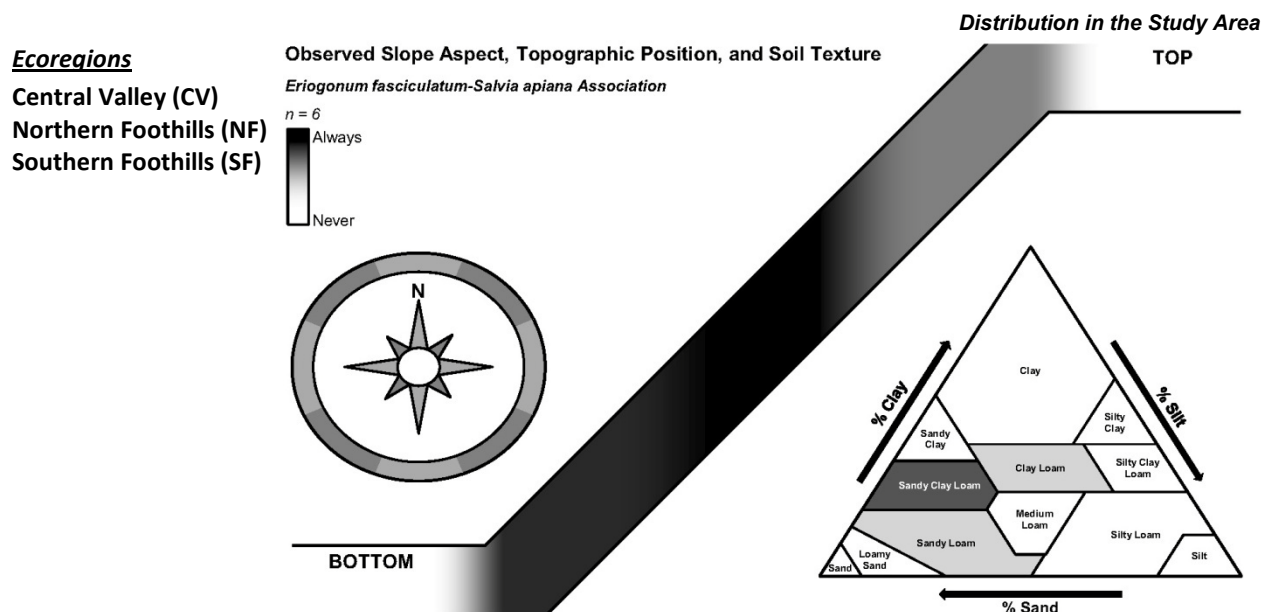
The *Eriogonum fasciculatum*-*Salvia apiana* Alliance is limited to Southern California and adjacent Baja California, Mexico. It differs from the previous *E. fasciculatum* Alliance in having *S. apiana* as a codominant. It typically occupies relatively well-drained, coarse-textured soils inland from the coast to the desert margins east of the Peninsular Ranges.

In general, stands of this alliance are characterized by *E. fasciculatum* and *S. apiana* as codominant in the shrub canopy, with *Artemisia californica*, *Adenostoma fasciculatum*, *Ceanothus greggii*, *C. leucodermis*, *Gutierrezia sarothrae*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *Keckiella antirrhinoides*, *Lotus scoparius*, *Malosma laurina*, and/or *Quercus berberidifolia* sometimes present as subdominants. Emergent *Q. agrifolia* trees may be present. Shrub canopy is usually < 2.5 m and is intermittent. The herbaceous layer is variable and may be dominated by nonnative grasses.

Most stands in the study area are located inland from the immediate coast. Stands are more abundant on granitic soils in the drier portions of the Peninsular Ranges. A single association, which also occurs elsewhere in Southern California, is described below.

4.24.1 *Eriogonum fasciculatum*-*Salvia apiana* Association

Eriogonum fasciculatum and *Salvia apiana* are codominant species in an open shrub canopy. Subdominant shrubs include *Artemisia californica*, *Malosma laurina*, *Hesperoyucca whipplei*, *Keckiella antirrhinoides*, *Baccharis sarothroides*, and *Hazardia squarrosa*. A diverse herbaceous cover occurs mostly in openings, and includes *Scrophularia californica* ssp. *floribunda*, *Nassella pulchra*, *Pseudognaphalium* spp., and *Corethrogyne filaginifolia*. This association occurs on xeric sites and is more frequent on steep inland slopes than near the coast.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Eriogonum fasciculatum* must combine with species other than *Artemisia californica* to account for at least 50 percent relative cover in the shrub canopy (i.e., there must be at least two shrub species with higher percent cover than *A. californica*, which is often absent or trace in this association).
- *Salvia apiana* must be present.

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.25 Frankenia palmeri Special Stands

Frankenia palmeri is a rare and local small shrub of the upper salt marshes of Tijuana River estuaries and a few other sites in San Diego County. A single sample strongly dominated by this halophyte was taken at San Diego Bay Wildlife Refuge. It is related ecologically to other high salt marsh vegetation types, but appears to occur above the mean high tide mark in slightly elevated areas. It is currently uncertain how many stands of this vegetation exist worldwide; however, it is likely that the association, or at least the species, is more common in northern coastal Baja California.

Frankenia palmeri occurs as the dominant subshrub in upper salt marsh habitat. Subdominant species include *Arthrocnemum subterminale* and *Salicornia* spp. Many historic stands are extirpated; additional extant sites include Famosa Slough and San Dieguito Lagoon.

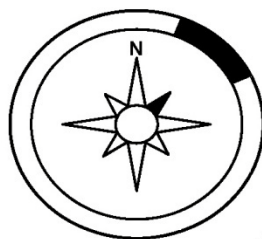
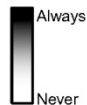
Ecoregions

Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Frankenia palmeri Special Stands

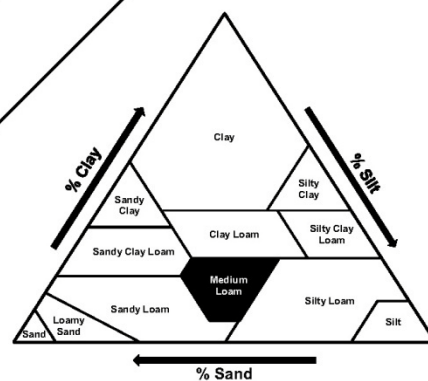
$n = 1$



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

There are two possible ways to key to this association (both shrub and herb stratum classes), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover.

- *Frankenia palmeri* must account for at least 50 percent relative cover in the shrub canopy, or *F. palmeri* must account for at least 30 percent relative cover and combine with other *Frankenia* spp. to form at least 50 percent relative cover in the shrub canopy.

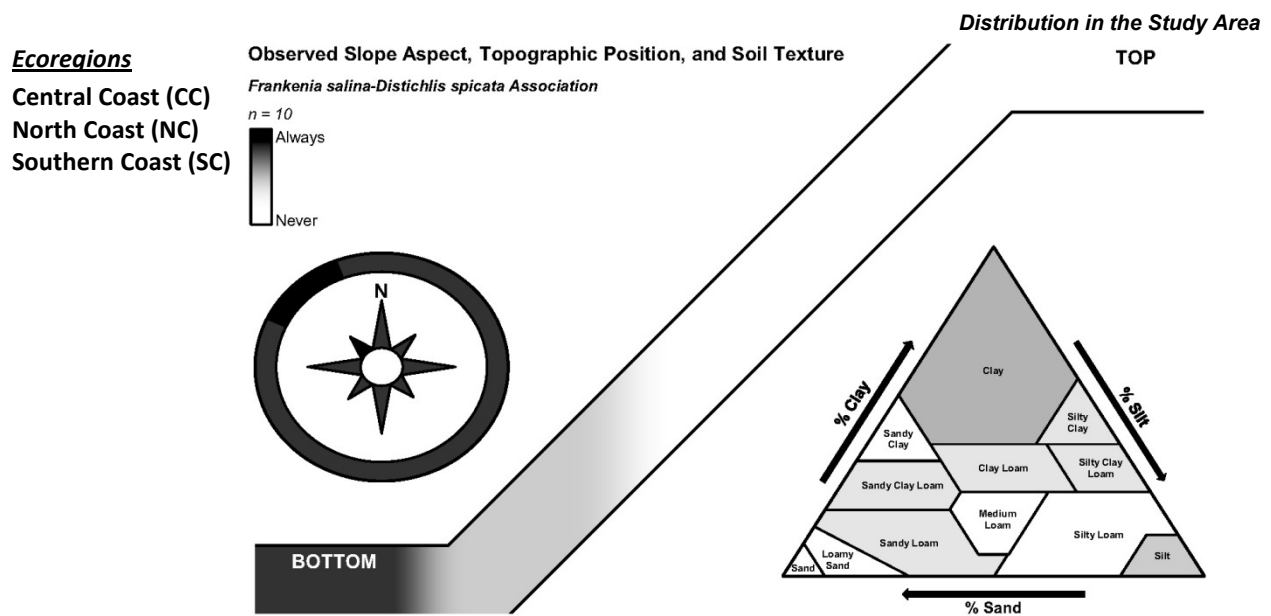
4.26 *Frankenia salina* Alliance

Stands of *Frankenia salina* occur in seasonally moist or intermittently flooded, clayey, saline soils in association with salt marsh and other halophytic vegetation types. Stands are part of the high marsh vegetation in Southern California salt marshes; inland, they occur on alkaline flats. All stands sampled in western San Diego County so far are associated with upper salt marshes adjacent to coastal lagoons. They represent a single association that has been defined as far north as Suisun Marsh in the San Francisco Bay Area. These stands are ecologically related to *Arthrocnemum subterminale*, *Distichlis spicata*, and *Cressa truxillensis*-*D. spicata* Alliance stands.

In general, the alliance is characterized by *F. salina* as the dominant or codominant in the subshrub layers, with *A. subterminale*, *Atriplex* spp., *Agrostis avenacea*, *Batis maritima*, *C. truxillensis*, *D. spicata*, *Hordeum murinum*, *Lasthenia* spp., *Lepidium* spp., *Limonium californicum*, *Monanthochloe littoralis*, *Sarcocornia pacifica*, and/or *Suaeda taxifolia* sometimes present. The dominant layer is < 60 cm tall and cover may be open to continuous.

4.26.1 *Frankenia salina*-*Distichlis spicata* Association

Frankenia salina and *Distichlis spicata* occur together as codominants in a continuous cover of subshrubs. Subdominants include other halophytes such as *Atriplex triangularis*, *Sarcocornia pacifica* (= *Salicornia virginica*), *Isocoma menziesii*, and *Arthrocnemum subterminale* (= *Salicornia* s.). Other nonwoody species may include *Parapholis incurva*, *Malvella leprosa*, *Heliotropium curassavicum*, *Cuscuta salina*, and *Cressa truxillensis*. This association occurs in coastal and inland marshes.



Membership Rules

There are two possible ways to key to this association (both shrub and herb stratum classes), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover.
- *Frankenia salina* must account for at least 30 percent relative cover in the herb stratum.
- *Distichlis spicata* is diagnostically present (i.e., not required to be present but expected to occur with a probability of 80 percent or greater).

4.27 *Fremontodendron mexicanum* Special Stands

Two stands of the showy *Fremontodendron mexicanum* were sampled in canyons on the north side of Otay Mountain. These stands, which burned in 2003 and/or 2007, are situated adjacent to semi-riparian stands in the *Quercus agrifolia* Alliance and include *Callitropsis forbesii* (*Cupressus f.*) seedlings. *Fremontodendron mexicanum* regenerates both from a persistent seedbank and by resprouting, and these special stands form thickets of tall shrubs in openings following fire. Low slope positions appear to be important for stand maintenance. Although other stands likely occur farther south in northwestern Baja California, these are the first stands sampled in California and, thus, are given “special stand” status until additional stands are defined elsewhere.

Fremontodendron mexicanum is the dominant species in a continuous shrub canopy or in open stands with a variety of chaparral and riparian shrubs and trees. Subdominants include *Ceanothus tomentosus*, *C. forbesii* (= *Cupressus f.*), *Toxicodendron diversilobum*, *Baccharis salicifolia*, and *Platanus racemosa*. Fire-following shrubs include *Malacothamnus fasciculatus* and *Dendromecon rigida*. The herbaceous cover is generally trace to open, and characteristic species include *Helianthemum scoparium*, *Venegasia carpesioides*, and *Romneya trichocalyx*.

Ecoregions

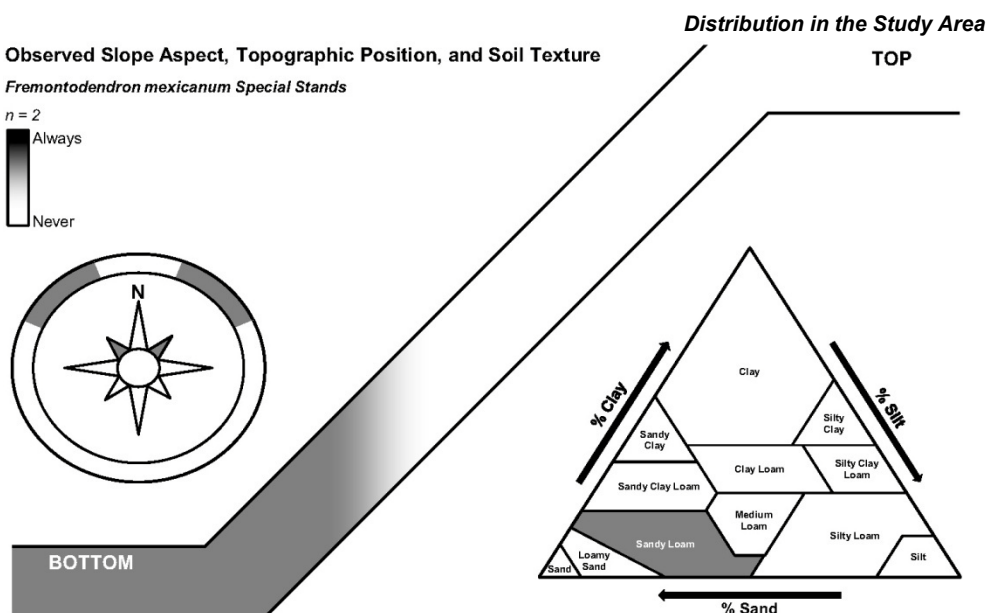
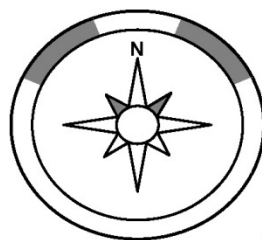
Southern Foothills (SF)

Observed Slope Aspect, Topographic Position, and Soil Texture

Fremontodendron mexicanum Special Stands

n = 2

Always
Never

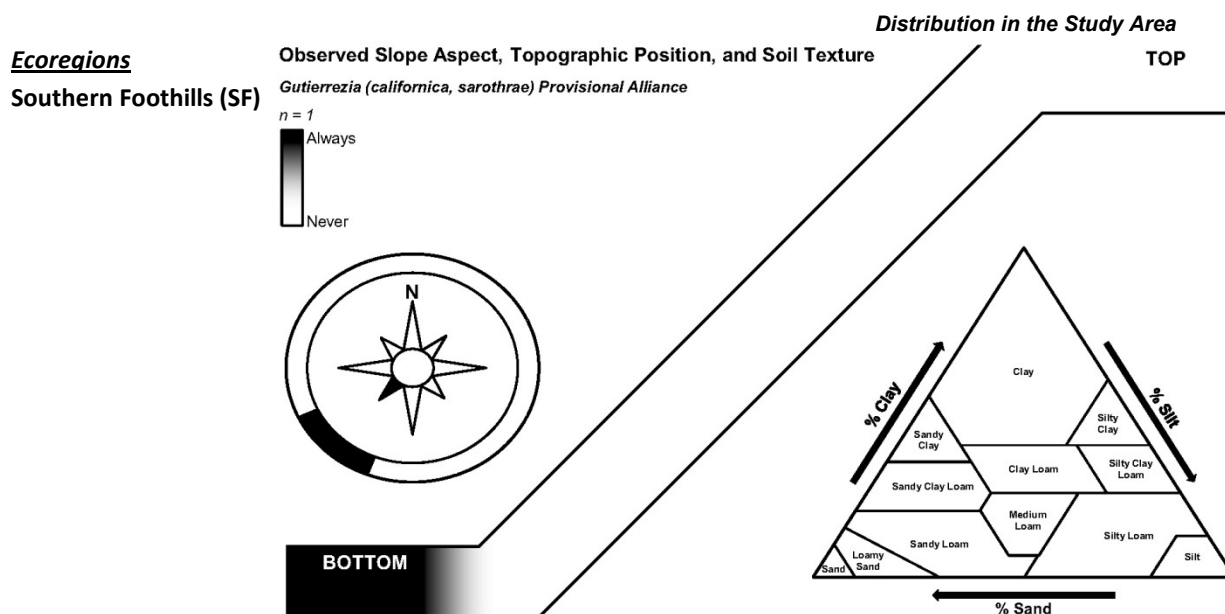


Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Fremontodendron mexicanum* must account for at least 30 percent relative cover in the shrub canopy.

4.28 *Gutierrezia (californica, sarothrae)* Provisional Alliance

Gutierrezia californica, *G. sarothrae*, and *G. microcephala* occur in open stands of the shrub canopy, mostly in openings of chaparral. Associated with a wide variety of chaparral species and subshrub associations, especially *Adenostoma fasciculatum* Associations. Some frequent associates are *Lotus scoparius*, *Bromus* spp., and stump sprouts or seedlings of shrubs such as *Ceanothus* spp., scrub oaks (*Quercus* spp.), and *Cercocarpus betuloides*. This alliance often occurs in areas recovering from disturbance such as roadsides, fuel breaks, and cleared areas.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Gutierrezia* spp. must account for at least 50 percent relative cover in the shrub canopy.

4.29 *Isocoma menziesii* Alliance

Isocoma menziesii typically forms stands on sandy soils in association with herbs and grasses. Most of these stands are the result of recent or frequent disturbance from fire, flooding, erosion, or human-related clearing. In Southern California, persistent stands composed primarily of low, mat-like plants typically occur on sea bluffs and terraces. They may contain halophytes such as *Atriplex californica* and *Cressa truxillensis*. Most stands in the study area are associated with salt marsh edges and were identified as the *I. menziesii*/*Distichlis spicata* Association. A few additional stands characterized by *I. menziesii* with a grassy understory do not occur in association with salt marshes.

In general, the alliance is characterized by *I. menziesii* dominant or codominant in the shrub layer with subdominant shrubs or subshrubs such as *A. californica*, *Baccharis sarothroides*, *Gutierrezia californica*, and *Salicornia depressa*. Shrubs are typically < 1 m tall and cover is open to intermittent. The herbaceous layer is variable.

4.29.1 *Isocoma menziesii* Provisional Association

Isocoma menziesii is dominant in open stands, often with a codominant herbaceous canopy of nonnative grasses and herbs. Associated wetland species in the herbaceous layer include *Ambrosia psilostachya* and *Lolium perenne* (*L. multiflorum*). This association occupies transitional areas between upland and both freshwater and brackish vegetation that is widespread in coastal areas.

Ecoregions

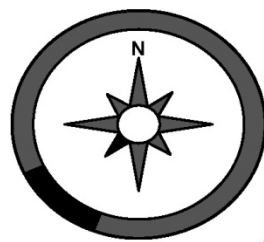
Central Coast (CC)
Central Valley (CV)
Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Isocoma menziesii Provisional Association

$n = 3$

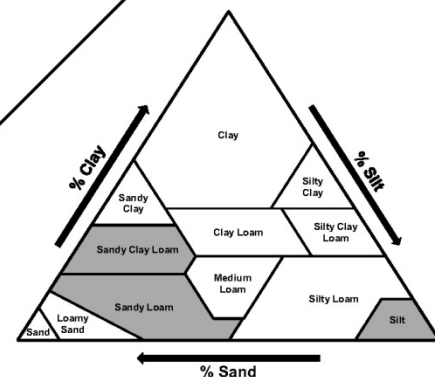
Always
Never



BOTTOM

Distribution in the Study Area

TOP



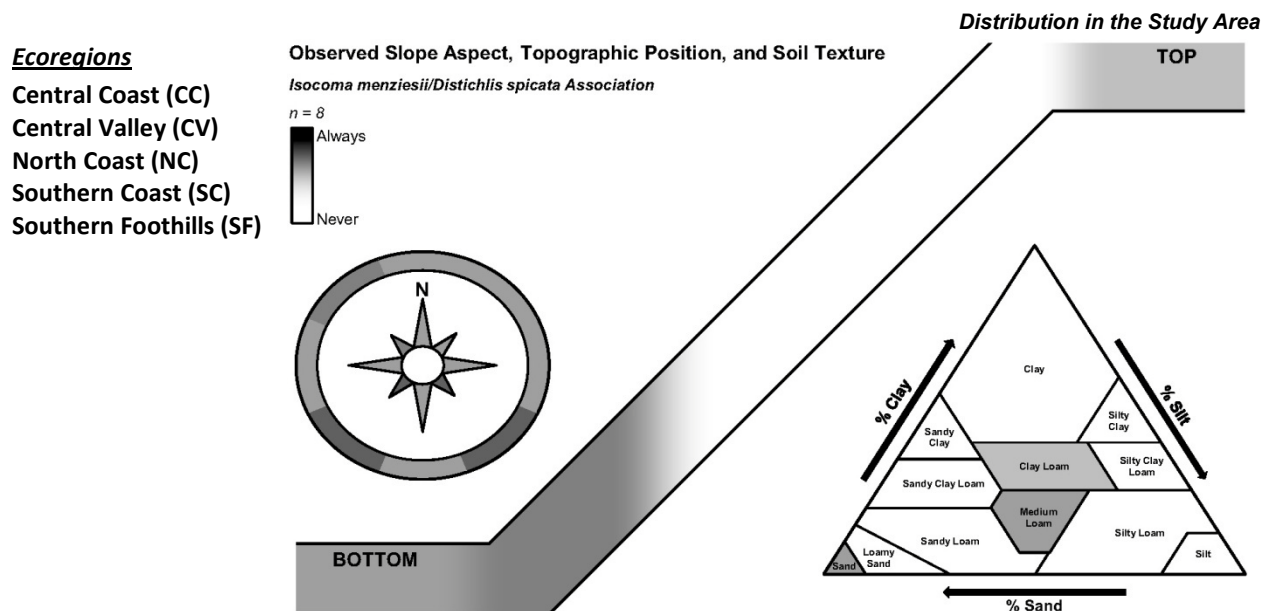
Membership Rules

There are two possible ways to key to this association (both soft-leaved, drought-deciduous shrublands and riparian shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Isocoma menziesii* must account for at least 30 percent relative cover in the shrub canopy.
- *Distichlis spicata* must be absent.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.29.2 *Isocoma menziesii*/*Distichlis spicata* Association

Isocoma menziesii occurs in open stands, often with a codominant herbaceous canopy that includes *Distichlis spicata* and nonnative weeds. Subdominant wetland plants may include *Frankenia* spp., *Iva hayesiana*, *Sarcocornia pacifica* (= *Salicornia virginica*), and *Jaumea carnosa*. This association occupies transitional areas between upland and both freshwater and brackish vegetation that is widespread in coastal areas.



Membership Rules

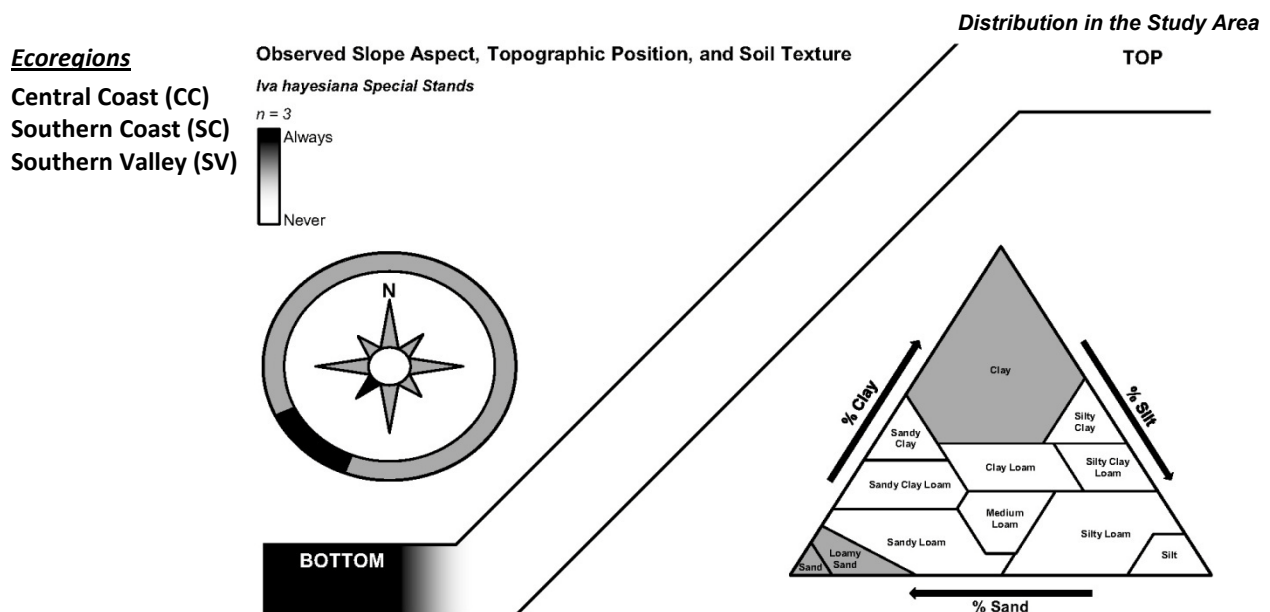
There are two possible ways to key to this association (both soft-leaved, drought-deciduous shrublands and riparian shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Isocoma menziesii* must account for at least 30 percent relative cover in the shrub canopy.
- *Distichlis spicata* must be present.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.30 *Iva hayesiana* Special Stands

In the study area, special stands of *Iva hayesiana* were identified from Del Mar, south to the U.S./Mexican border. This species occurs as a clonal colony (or genet) and is occasionally extensive enough to constitute stands. These stands are often associated with creeks, seeps, or other moist drainages. Three stands were sampled in the study area. Ecologically, these stands appear intermediate in moisture requirements between the relatively moist *Juncus acutus* and the relatively dry *Baccharis salicifolia* or *Ambrosia monogyra*. Additional sampling in the county and Mexico will clarify the validity of these stands and their ecological relationships to similar associations.

Iva hayesiana is dominant in closed to open stands in seasonally wet habitats, primarily with subdominant, wetland-affiliated shrubs and herbs such as *Isocoma menziesii*, *Juncus* spp., *Salix* spp., *Artemisia douglasiana*, *Distichlis spicata*, *Muhlenbergia rigens*, and *Typha* spp. Although this association is a wetland type, it is transitional to upland scrub associations.



Membership Rules

There are two possible ways to key to this association (both shrub and herb stratum classes), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover.
- *Iva hayesiana* must account for at least 30 percent relative cover in the shrub canopy.

4.31 *Keckiella antirrhinoides* Alliance

Keckiella antirrhinoides is a medium to large shrub that is intermediate in growth form between typical drought-deciduous coastal scrub shrubs and evergreen sclerophyllous chaparral shrubs. Consequently, it occupies intermediate positions on somewhat mesic slopes associated with elements of both macrogroups.

In general, the definition for the alliance is as follows: *K. antirrhinoides* is dominant or codominant in the shrub canopy with *Adenostoma fasciculatum*, *Artemisia californica*, *Cneoridium dumosum*, *Eriodictyon crassifolium*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Malosma laurina*, *Quercus berberidifolia*, *Rhus ovata*, *Salvia apiana*, *S. mellifera*, *Tetradymia comosa*, and *Xylococcus bicolor*. Emergent *Q. engelmannii* trees may be present at trace cover. Shrubs are generally < 2 m and the canopy is open to continuous and may be two-tiered. The herbaceous layer can range from open to intermittent.

The *K. antirrhinoides* Alliance is limited to south coastal California and adjacent Baja California. Sampling in western Riverside and San Diego counties has defined the alliance. Stands most commonly associate with *A. californica* and all stands sampled in this study have been identified as members of the *K. antirrhinoides*-*A. californica* Association.

4.31.1 *Keckiella antirrhinoides*-*Artemisia californica* Association

Keckiella antirrhinoides and *Artemisia californica* occur as codominants in a closed to open canopy. Subdominant shrubs include *Eriogonum fasciculatum*, *Salvia* spp., *Malosma laurina*, *Mimulus aurantiacus*, *Rhamnus* spp., *Adenostoma fasciculatum*, *Ceanothus tomentosus*, *C. crassifolius*, and *Xylococcus bicolor*. A diverse herbaceous cover occurs in openings and includes *Mirabilis laevis*, *Eucrypta chrysanthemifolia*, *Acourtia microcephala*, *Marah macrocarpus*, *Scrophularia californica*, and *Phacelia cicutaria* ssp. *hispida*.

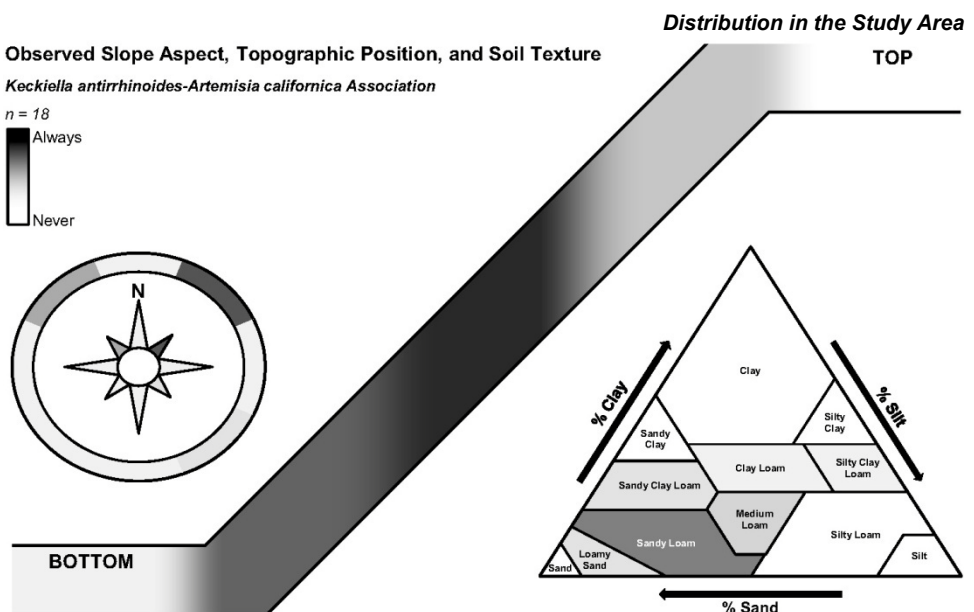
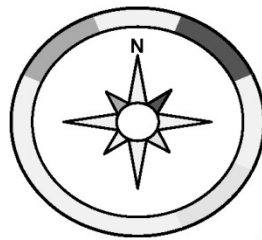
Ecoregions

Central Foothills (CF)
Central Valley (CV)
Northern Foothills (NF)
Southern Foothills (SF)
Southern Valley (SV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Keckiella antirrhinoides-*Artemisia californica* Association

$n = 18$
Always
Never



Membership Rules

There are two possible ways to key to this association, but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica*, *Keckiella antirrhinoides*, and (if present) *Malosma laurina* must account for at least 50 percent relative cover in the shrub canopy.

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).
- If present, *Encelia californica*, *Mimulus aurantiacus*, combined cover of *Salvia apiana*/*S. mellifera*, and *Toxicodendron diversilobum* must all be less than the combined cover of *Keckiella antirrhinoides*/*Malosma laurina* (otherwise see respective associations with *A. californica*).

4.32 *Lotus scoparius* Alliance

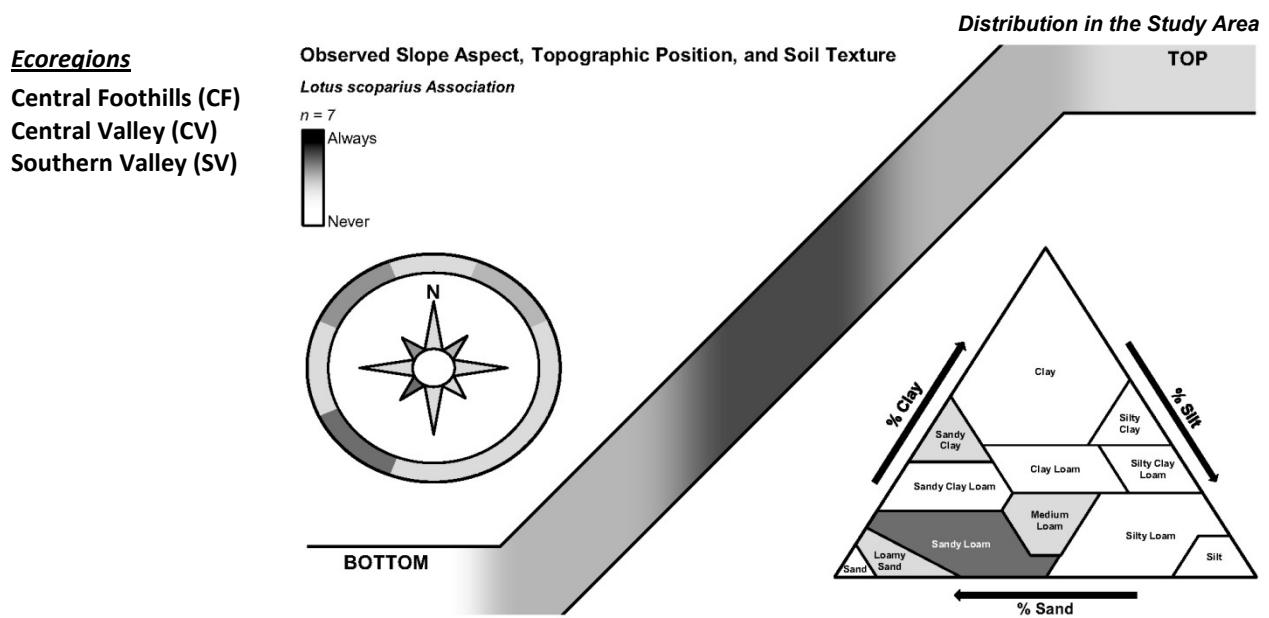
Lotus scoparius is a short-lived perennial subshrub that typically colonizes slopes after fires in chaparral and coastal sage scrub throughout much of California. The alliance is an indicator of post-fire (or occasionally other disturbance) conditions. Stands tend to persist for only a few years before other, longer lived woody species germinate or resprout, to form enough cover to establish longer persisting associations.

In general, the characteristics of this alliance include *L. scoparius* as the dominant or codominant in the shrub canopy, with *Adenostoma fasciculatum*, *Artemisia californica*, *Baccharis pilularis*, *Ephedra californica*, *Ericameria linearifolia*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *Hazardia squarrosa*, *Lessingia filaginifolia*, *Malacothamnus densiflorus*, *Prunus fremontii*, *Rhus ovata*, *Ribes quercetorum*, and *Salvia apiana* occurring as subdominants. Shrubs are usually < 2 m and the shrub canopy is open to intermittent and often two-tiered. The herbaceous layer may be sparse to intermittent.

In much of the study area, *L. scoparius* codominates after fires with larger resprouting shrubs such as *Malosma laurina*. In these instances, stands would be placed in the *Malosma laurina* Alliance. However, many stands of chaparral or coastal scrub that lack taller, resprouting shrubs are replaced by the *L. scoparius* Alliance following fire. If fires occur at very high frequencies, the seed banks of *L. scoparius* can be depleted, resulting in type conversion to associations dominated largely by nonnative annual grasses and herbs. Seven stands were sampled in this study, and all fall into the *L. scoparius* association, which is known from throughout much of Southern California.

4.32.1 [Lotus scoparius Association](#)

Lotus scoparius is dominant with an open shrub canopy, and often occurs with subdominant shrubs from various other shrublands. Subdominant shrubs include *Eriogonum fasciculatum*, *Artemisia californica*, *Hazardia squarrosa*, *Malacothamnus fasciculatus*, *Adenostoma fasciculatum*, *Ceanothus* spp., *Salvia* spp., and scrub oaks (*Quercus* spp.). Herb cover and diversity is also diverse and variable, and includes species such as *Calystegia macrostegia*, *Stylocline gnaphaloides*, *Pseudognaphalium* spp., and *Eucrypta chrysanthemifolia*. This association is considered early transitional, resulting from natural regeneration following fire.



Membership Rules

There are two possible ways to key to this association (both sclerophyllous, evergreen shrublands and soft-leaved, drought-deciduous shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Lotus scoparius* must account for at least 50 percent relative cover in the shrub canopy.

4.33 *Lycium californicum* Provisional Alliance

Lycium californicum is locally dominant on xeric, often saline coastal bluffs from the southern Channel Islands south to the coast of central Baja California. The thorny and drought-deciduous shrubs and commonly associated succulent species of this alliance indicate a relationship with the coastal desert vegetation of western Baja California. For this reason, these stands have been placed in the Coastal Baja California Norte maritime succulent scrub group.

In general, stands of this alliance have the following characteristics: *L. californicum* is dominant or codominant in the shrub layer, with *Artemisia californica*, *A. nesiotica*, *Bergerocactus emoryi*, *Coreopsis gigantea*, *Cylindropuntia prolifera*, *Encelia californica*, *Eriogonum giganteum*, *Opuntia oricola*, and/or *Rhus integrifolia* occurring as subdominants. Shrubs are generally < 4 m and the canopy is open to intermittent. The herbaceous layer may be open to continuous.

The northernmost stands of this alliance have been sampled at Palos Verdes Peninsula (CNPS 2010) and on Santa Catalina Island. Multiple stands were sampled on the Point Loma Peninsula (Klein and Keeler-Wolf 2010), while six more were sampled in this project. Prior to these recent efforts, this was considered a provisional alliance in California (Sawyer et al. 2009).

4.33.1 *Lycium californicum* Provisional Association

Lycium californicum occurs as a codominant or subdominant in open stands with *A. californica*, *E. fasciculatum*, *E. californica*, *Isocoma menziesii*, *C. californica*, *C. prolifera*, *Frankenia salina*, and *Yucca schidigera*. Herbaceous diversity and cover is low, and includes *Distichlis spicata*, *Cressa truxillensis*, *Monanthochloe littoralis*, and *Sporobolus airoides*. This association occupies sites ecologically similar to those occupied by the *A. californica*-*E. fasciculatum*-*O. littoralis*/*Dudleya (edulis)* Association.

Ecoregions

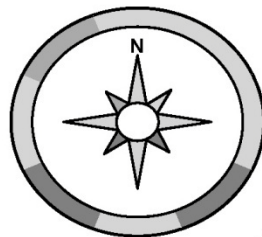
Central Coast (CC)
Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Lycium californicum Provisional Association

$n = 6$

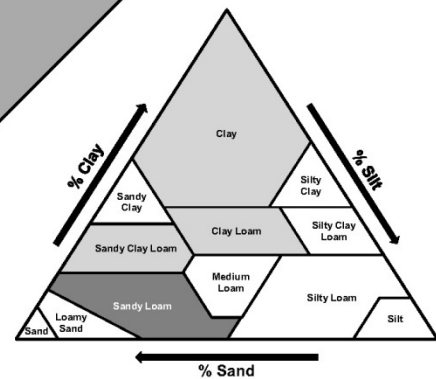
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Microphyllous, succulent, or drought-deciduous, soft-leaved species must account for at least 50 percent relative cover in the shrub canopy.
- *Lycium californicum* must account for at least 5 percent relative cover in the shrub canopy.

4.34 *Malacothamnus fasciculatus* Alliance

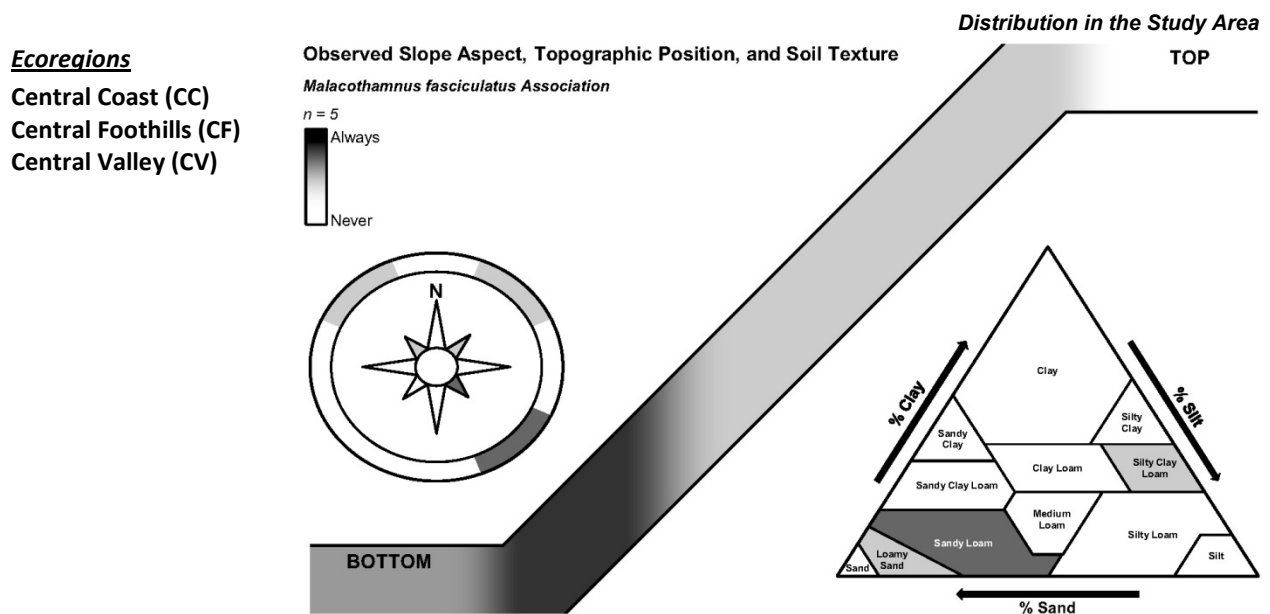
Malacothamnus fasciculatus and related species of *Malacothamnus* are short-lived perennial post-fire shrubs throughout much of cismontane California. They produce long-lived seed banks that, under favorable conditions, germinate abundantly following fires in chaparral and coastal scrub. They tend to grow taller than *Lotus scoparius* and have an open, scraggly canopy architecture.

In general, the alliance characteristics as defined throughout the state include the following: *M. fasciculatus* is dominant or codominant in the shrub canopy with *Adenostoma fasciculatum*, *Artemisia californica*, *Ceanothus* spp., *C. spinosus*, *Cercocarpus montanus*, *Encelia californica*, *Eriogonum fasciculatum*, *Hesperoyucca whipplei*, *Heteromeles arbutifolia*, *L. scoparius*, *Malosma laurina*, *Rhus ovata*, and/or *Salvia mellifera*. Emergent trees such as *Juglans californica*, *Platanus racemosa*, or *Quercus agrifolia* may be present. Shrubs are typically < 3 m and the canopy is open to intermittent and two-tiered. The herbaceous layer is usually sparse.

Five stands of this alliance were sampled in the study area, and all are assigned to a single association, as described below.

4.34.1 Malacothamnus fasciculatus Association

Malacothamnus fasciculatus is dominant or codominant in open stands with *Malosma laurina*, *Artemisia californica*, *Salvia* spp., *Ceanothus leucodermis*, *Adenostoma fasciculatum*, *Xylococcus bicolor*, *C. tomentosus*, *Eriogonum fasciculatum*, *Lotus scoparius*, and *Rhamnus* spp. Herbaceous cover and diversity is high, especially when stimulated by fire. These herbs include *Eriophyllum confertiflorum*, *Calystegia macrostegia*, *Helianthus gracilentus*, and nonnative grasses such as *Bromus* spp. and *Vulpia myuros*.



Membership Rules

There are two possible ways to key to this association (both sclerophyllous, evergreen shrublands and soft-leaved, drought-deciduous shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Malacothamnus fasciculatus* must account for at least 30 percent relative cover in the shrub canopy.

- *Artemisia californica* and *Malosma laurina* are diagnostically present (i.e., are not required to be present but are each expected to occur with a probability of 80 percent or greater).

4.35 *Malosma laurina* Alliance

Malosma laurina is a large evergreen, sclerophyllous shrub that occurs along the coast from Santa Barbara County south into northwestern Baja California. It is frost-sensitive and its presence generally signifies the warm coastal regions of Southern California. The shrub is a consummate resprouter, and can resprout from its deep rootcrown multiple times in short succession following fires.

In general, the characteristics of the alliance as sampled so far include *M. laurina* dominant or codominant in the shrub canopy, with *Artemisia californica*, *Ceanothus* spp., *Mimulus aurantiacus*, *Encelia californica*, *Eriogonum cinereum*, *E. fasciculatum*, *Heteromeles arbutifolia*, *Hesperoyucca whipplei*, *Keckiella antirrhinoides*, *Rhamnus ilicifolia*, *Rhus integrifolia*, *R. ovata*, *Salvia leucophylla*, *S. mellifera*, *Tetracoccus dioicus*, and/or *Toxicodendron diversilobum* occurring as subdominants. Emergent trees of *Juglans californica*, *Quercus agrifolia*, or *Platanus racemosa* may be present. Shrubs are usually < 5 m and the canopy is open to continuous. The herbaceous layer is generally sparse.

As a result of high-frequency fires in the past few decades, this alliance has become more common in many areas of western San Diego County. Stands commonly include *Lotus scoparius* and represent the most common association, sampled 36 times in the study area.

4.35.1 *Malosma laurina*-*Lotus scoparius* Association

Malosma laurina and *Lotus scoparius* are codominant in open stands with subdominant shrub species, such as *Artemisia californica*, *Ceanothus tomentosus*, *C. leucodermis*, *Salvia* spp., *Eriogonum fasciculatum*, *Rhamnus crocea*, and *Hesperoyucca whipplei*. Herbaceous cover and diversity is high, occurring in openings and stimulated by fire. Herbs include *Calystegia macrostegia*, *Chaenactis artemisiifolia*, *Marah macrocarpus*, *Mirabilis laevis*, *Pterostegia drymarioides*, *Achyrrachaena mollis*, *Daucus pusillus*, *Logfia gallica*, and *Lupinus* spp.

This association is often the result of post-fire regeneration, occurring as a transitional vegetation type while longer lived shrub species regain dominance. Of the 36 samples attributed to this association, 24 displayed evidence of recent fire (i.e., within the last 10 years).

Ecoregions

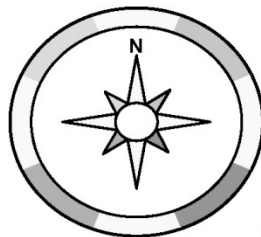
Central Foothills (CF)
Central Valley (CV)
Northern Foothills (NF)
Southern Foothills (SF)

Observed Slope Aspect, Topographic Position, and Soil Texture

Malosma laurina-*Lotus scoparius* Association

n = 36

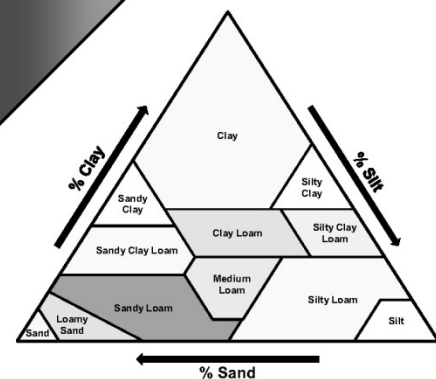
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

There are two possible ways to key to this association (both sclerophyllous, evergreen shrublands and soft-leaved, drought-deciduous shrublands), but both revolve around the same set of membership rules:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.

- The combined cover of *Malosma laurina* and *Lotus scoparius* must account for the highest percent relative cover in the shrub canopy versus any other single shrub genus (*L. scoparius* is often present with a higher cover than *M. laurina*).

4.36 *Pluchea sericea* Alliance

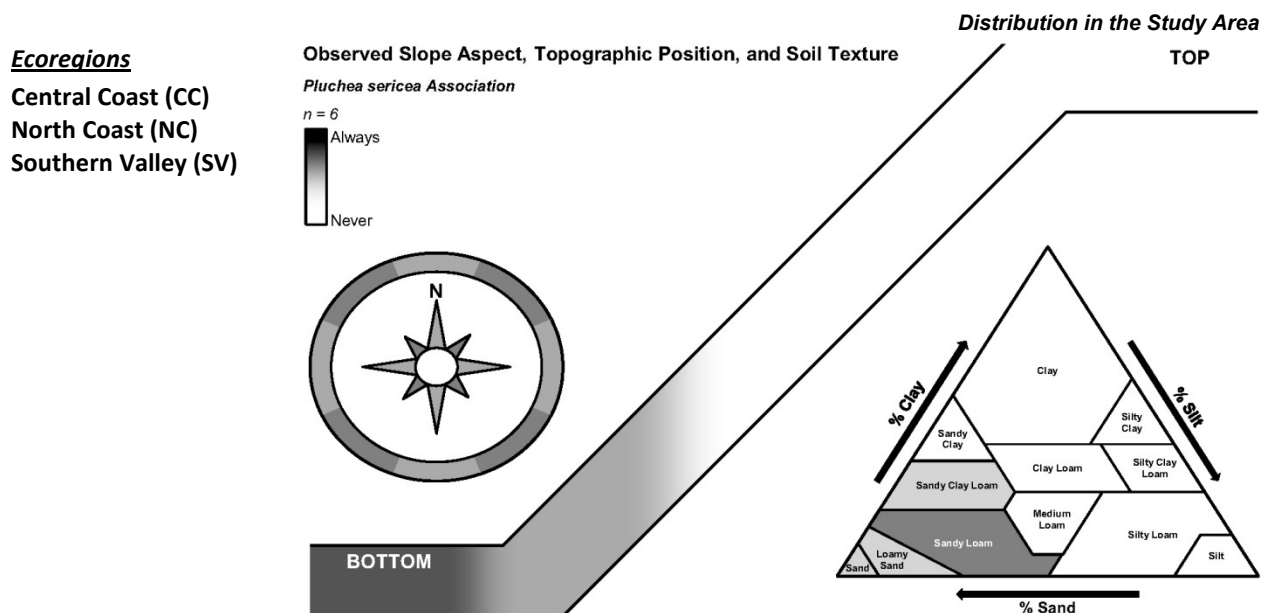
Arrow weed thickets are commonly observed at edges of desert springs and seeps, often with alkaline or saline water chemistry. Stands also occur adjacent to alkaline or saline seeps in cismontane Southern California and adjacent to salt marshes. Stands are usually characterized by dense poles of these clonal stands, which may often represent just one or a few individuals and are commonly less than 0.5 hectare in size. The clonal habit is advantageous in fluvial disturbance processes since root fragments can be easily dispersed and will re-root given a good establishment site.

In general, stands sampled in the state so far have the following characteristics: *Pluchea sericea* is dominant or codominant in the shrub canopy, with *Allenrolfea occidentalis*, *Atriplex canescens*, *A. lentiformis*, *A. torreyi*, *Baccharis salicifolia*, *B. sergiloides*, *Salix exigua*, *Suaeda moquinii*, and/or *Tamarix* spp. present. Emergent trees such as *Populus fremontii*, *P. balsamifera* ssp. *trichocarpa*, or *Prosopis glandulosa* may be present. The dominant shrubs are < 5 m and the canopy is intermittent to continuous. The herbaceous layer is sparse with seasonal annuals.

Six stands of the *P. sericea* Alliance have been sampled in the study area. Most of these are associated with the edges of coastal lagoons with some saline soil present. These have all been classified as members of a single widespread association, as described below.

4.36.1 *Pluchea sericea* Association

Pluchea sericea is dominant in typically dense stands with *Baccharis* spp. as a subdominant. Herbaceous cover consists of a diverse assemblage of wetland and upland plants, many of which are nonnative ruderal species. Native herbs include *Ambrosia psilostachya*, *Distichlis spicata*, and *Frankenia salina*. This association occurs on sites transitional to other wetland and riparian associations.



- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Pluchea sericea* must account for at least 75 percent relative cover in the shrub canopy.

4.37 *Quercus (berberidifolia, xacutidens)* Alliance

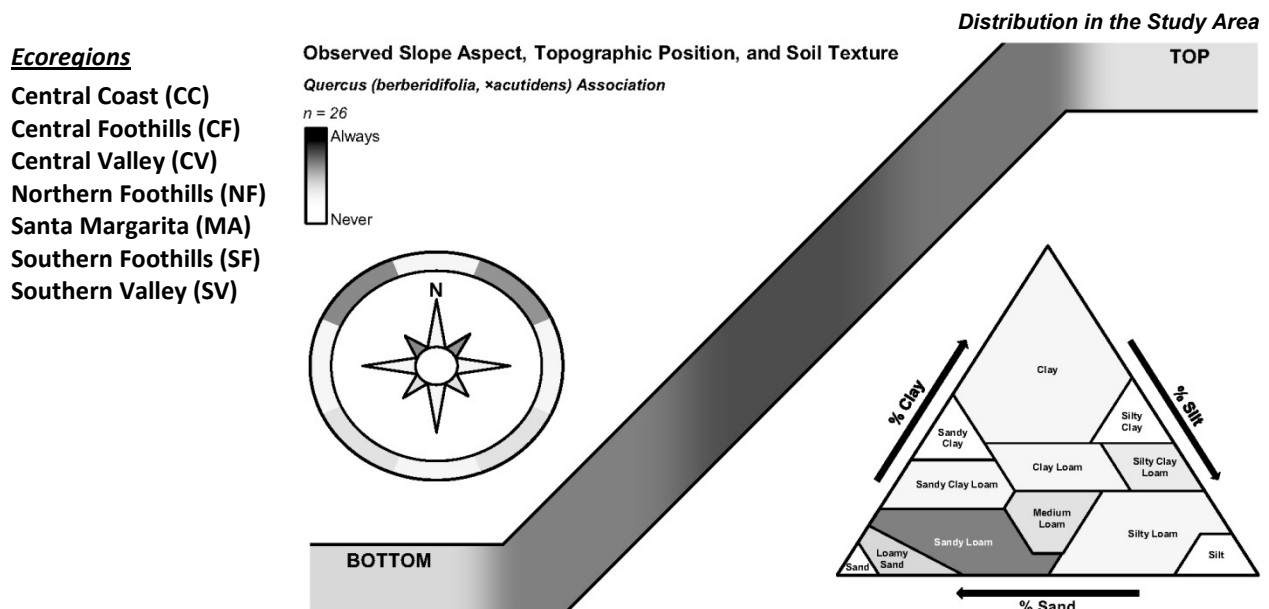
Scrub oak is a general term representing multiple taxa of largely evergreen oaks that do not typically attain tree size in California. Taxonomic confusion abounds with many of these species. In the past decade, most scrub oaks west of the desert margins have been called *Q. berberidifolia*. However, hybridization between *Q. engelmannii* and *Q. cornelius-mulleri*, normally found east of the study area, has lead to progeny (*Q. xacutidens*) that ecologically and somewhat physiognomically resemble *Q. berberidifolia*. In this report, all the stands of scrub-oak-characterized vegetation are treated as members of the *Q. berberidifolia* Alliance, fully acknowledging the taxonomic issues at hand. In deference to this, the associations are named with regard to the likely regular presence of these *Q. xacutidens* hybrids.

In general, stands of this alliance state-wide can be characterized by *Q. berberidifolia* dominant or codominant in the shrub canopy, with *Adenostoma fasciculatum*, *A. sparsifolium*, *Arctostaphylos glandulosa*, *A. glauca*, *Ceanothus leucodermis*, *C. greggii*, *C. thyrsiflorus*, *Frangula californica*, *Fraxinus dipetala*, *Heteromeles arbutifolia*, *Pickeringia montana*, *Prunus ilicifolia*, *Q. wislizeni*, *Rhamnus ilicifolia*, *Rhus ovata*, and/or *Toxicodendron diversilobum* occurring as subdominants. Emergent trees such as *Aesculus californica*, *Q. agrifolia*, *Juglans californica*, and *Pinus sabiniana* may be present. The shrub layer is generally < 6 m and the canopy is intermittent or continuous (especially in mature stands). The herbaceous layer is generally sparse.

The following three associations have been supported by data-gathering for this project. The *Quercus (berberidifolia, xacutidens)* Association is widespread in a variety of mesic chaparral settings, mostly away from the immediate coast. The *Quercus (berberidifolia, xacutidens)*-*Cercocarpus minutiflorus* Association is limited to ravines and steeper, shaded slopes generally at lower elevations in the study area. The *Quercus (berberidifolia, xacutidens)*-*Ceanothus leucodermis* Association is limited to mid and upper elevations and is better represented at higher elevations east of the study area.

4.37.1 *Quercus (berberidifolia, xacutidens)* Association

Quercus berberidifolia and *Q. xacutidens* are two of the most widespread scrub oaks within the study area. Due to taxonomic uncertainty, these two scrub oak species are included within the same association. These scrub oaks are dominant, usually with continuous cover and often as small inclusions within other shrublands. Subdominant shrub species include *Cercocarpus minutiflorus*, *Adenostoma fasciculatum*, *Arctostaphylos glandulosa*, *Xylococcus bicolor*, *Rhus integrifolia*, *Toxicodendron diversilobum*, *Ceanothus leucodermis*, *C. tomentosus*, and *C. crassifolius*. Herbaceous diversity and cover is relatively low, mostly occurring in openings and increasing in response to fire.

**Membership Rules**

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- Scrub oak (*Quercus berberidifolia*/*Q. xacutidens*) must account for at least 50 percent relative cover in the shrub canopy, or *Q. berberidifolia*/*Q. xacutidens* must account for the highest percent relative cover in the shrub canopy versus any other single shrub

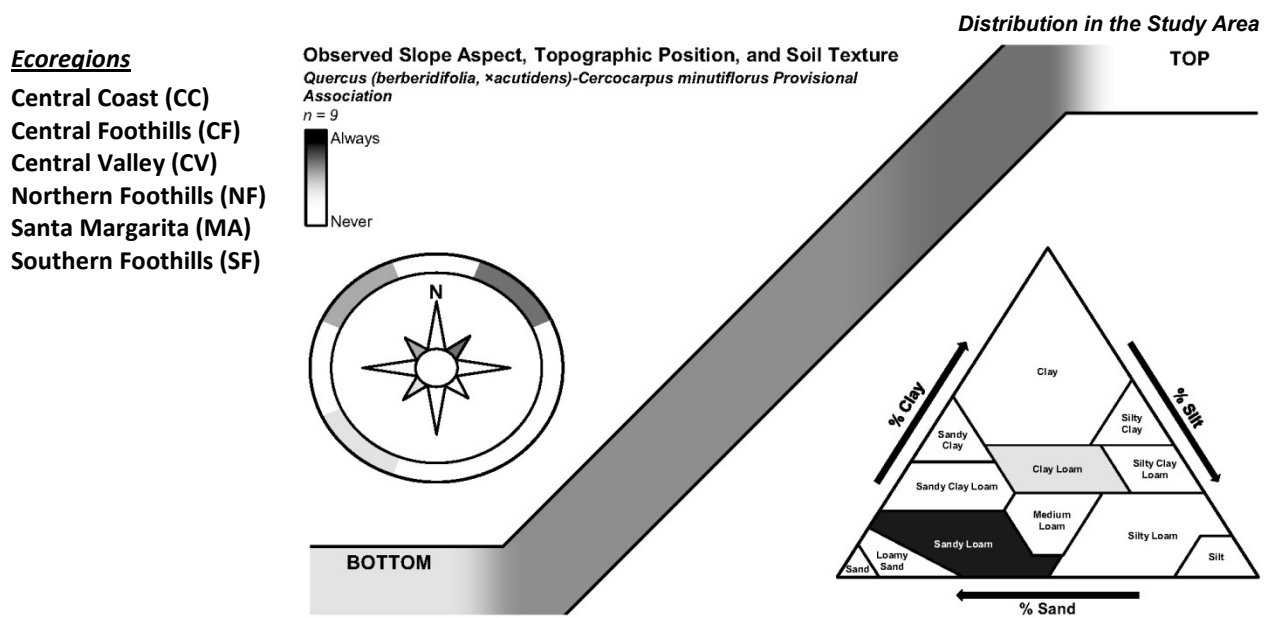
genus (except for *Adenostoma fasciculatum*, which may be present at a greater percent relative cover than *Quercus* spp.).

- If present, *A. fasciculatum* must account for less than 30 percent relative cover and must be lower in cover than *Quercus berberidifolia*/*Q. ×acutidens* (otherwise see *Quercus [berberidifolia, ×acutidens]-Adenostoma fasciculatum* Association).
- If present, *Xylococcus bicolor* must account for 1 percent relative cover or less (otherwise see *Adenostoma fasciculatum-Xylococcus bicolor-Quercus [berberidifolia, ×acutidens]* Association).
- *Ceanothus leucodermis* and *Cercocarpus* spp. must be absent (otherwise see respective associations with these species and *Quercus [berberidifolia, ×acutidens]*).

4.37.2 *Quercus (berberidifolia, xacutidens)*-*Cercocarpus minutiflorus* Association

[MCV Synonym: *Quercus berberidifolia*-*Cercocarpus montanus*]

Quercus berberidifolia, *Q. xacutidens*, and *Cercocarpus minutiflorus* are codominant, forming a continuous shrub canopy. Due to the taxonomic uncertainty of these scrub oaks, they are treated within the same association. Subdominant shrubs include *Toxicodendron diversilobum*, *Adenostoma fasciculatum*, *Xylococcus bicolor*, *Ceanothus leucodermis*, *C. tomentosus*, *C. verrucosus*, *Rhus integrifolia*, and *Mimulus aurantiacus* ssp. *aurantiacus*. Herbaceous diversity and cover is relatively low, mostly occurring in openings and increasing in response to fire.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- Scrub oak (*Quercus berberidifolia*/*Q. xacutidens*) must account for at least 50 percent relative cover in the shrub canopy, or *Q. berberidifolia*/*Q. xacutidens* must account for the highest percent relative cover in the shrub canopy versus any other single shrub genus (except for *Adenostoma fasciculatum*, *Cercocarpus* spp., and *Ceanothus* spp., which may be present at a greater percent relative cover than *Quercus* spp.).

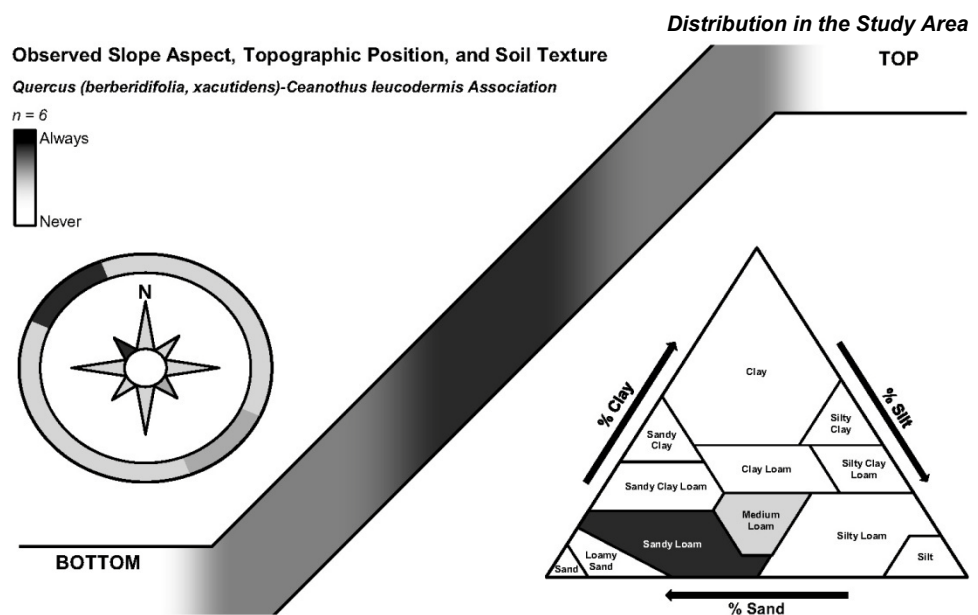
- If present, *Adenostoma fasciculatum* must account for less than 30 percent relative cover and have less cover than *Quercus berberidifolia*/Q. *×acutidens* (otherwise see *Quercus [berberidifolia, ×acutidens]-Adenostoma fasciculatum* Association).
- If present, *Xylococcus bicolor* must account for 1 percent relative cover or less (otherwise see *Adenostoma fasciculatum-Xylococcus bicolor-Quercus [berberidifolia, ×acutidens]* Association).
- *Cercocarpus* spp. must be present.
- If present, *Ceanothus leucodermis* must have less cover than *Cercocarpus* spp. (otherwise see *Quercus [berberidifolia, ×acutidens]-Ceanothus leucodermis* Association).

4.37.3 *Quercus (berberidifolia, xacutidens)*-*Ceanothus leucodermis* Association

Quercus berberidifolia, *Q. xacutidens*, and *Ceanothus leucodermis* are codominant, usually as a continuous shrub canopy. Due to the taxonomic uncertainty of these scrub oaks, they are treated within the same association. Subdominant shrubs include *Adenostoma fasciculatum*, *Cercocarpus minutiflorus*, *Xylococcus bicolor*, *C. tomentosus*, *C. verrucosus*, *C. crassifolius*, *Rhamnus ilicifolia*, *Malacothamnus fasciculatus*, *Rhus ovata*, and *Artemisia californica*. Herbaceous diversity and cover is relatively low, mostly occurring in openings and increasing in response to fire. There is a high shrub species diversity in this association since it spans coastal and inland areas.

Ecoregions

Central Foothills (CF)
Santa Margarita (MA)



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- Scrub oak (*Quercus berberidifolia*/*Q. xacutidens*) must account for at least 50 percent relative cover in the shrub canopy, or *Q. berberidifolia*/*Q. xacutidens* must account for the highest percent relative cover in the shrub canopy versus any other single shrub

genus (except for *Adenostoma fasciculatum*, *Cercocarpus* spp., and *Ceanothus* spp., which may be present at a greater percent relative cover than *Quercus* spp.).

- If present, *Adenostoma fasciculatum* must account for less than 30 percent relative cover and must have less cover than *Quercus berberidifolia*/Q. *×acutidens* (otherwise see *Quercus [berberidifolia, ×acutidens]-Adenostoma fasciculatum* Association).
- If present, *Xylococcus bicolor* must account for 1 percent relative cover or less (otherwise see *Adenostoma fasciculatum-Xylococcus bicolor-Quercus [berberidifolia, ×acutidens]* Association).
- *Ceanothus leucodermis* must be present.
- If present, *Cercocarpus* spp. must have a lower cover than *Ceanothus leucodermis* (otherwise see *Quercus [berberidifolia, ×acutidens]-Cercocarpus minutiflorus* Association).

4.38 *Quercus (berberidifolia, ×acutidens)*-*Adenostoma fasciculatum* Alliance

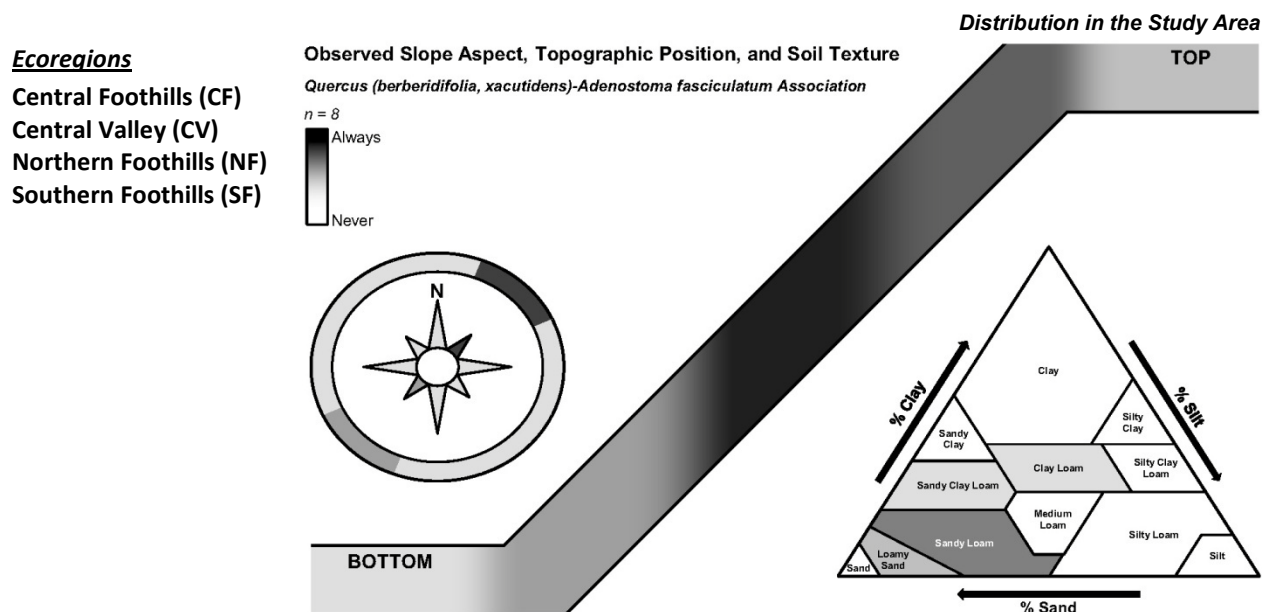
This alliance is related to the *Quercus berberidifolia* alliance, but tends to occupy mid- to upper slope positions and is transitional between xeric and mesic conditions. It covers extensive areas of the lower montane and foothill belt of the Transverse and Peninsular Ranges in Southern California.

Statewide, this alliance is generally characterized by *Q. berberidifolia* and *Adenostoma fasciculatum* as codominants in the shrub canopy, with *Arctostaphylos* spp., *Ceanothus crassifolius*, *C. greggii*, *C. leucodermis*, *Cercocarpus montanus*, *Heteromeles arbutifolia*, *Rhamnus ilicifolia*, and/or *Xylococcus bicolor* occurring as subdominants. Emergent *Q. agrifolia* or *Q. engelmannii* trees may be present. Typically, shrubs are relatively tall in mature stands, but usually < 6 m, and the canopy is open to continuous. The herbaceous layer is sparse under mature stands.

A single type, the *Quercus (berberidifolia, ×acutidens)*-*Adenostoma fasciculatum* Association, exists in the study area. This is analogous to the *Q. berberidifolia*-*A. fasciculatum* Association listed in Sawyer et. al. (2009) for much of Southern California. Due to the hybridization issues between *Q. engelmannii* and *Q. cornelius-mulleri*, or perhaps other scrub oaks mentioned in the *Q. berberidifolia* Alliance, the epithet “(*berberidifolia, ×acutidens*)” is used when referring to the local stands.

4.38.1 *Quercus (berberidifolia, xacutidens)*-*Adenostoma fasciculatum* Association

Quercus berberidifolia, *Q. xacutidens*, and *Adenostoma fasciculatum* are codominant, usually as a continuous shrub canopy. Due to the taxonomic uncertainty of these scrub oaks, they are treated within the same association. Associated shrubs include *Cercocarpus minutiflorus*, *Ceanothus tomentosus*, *C. leucodermis*, *C. verrucosus*, *C. crassifolius*, *Hesperoyucca whipplei*, *Salvia apiana*, *S. mellifera*, and *Xylococcus bicolor*. Herbaceous diversity and cover is relatively low, mostly occurring in openings and increasing in response to fire.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- Scrub oak (*Quercus berberidifolia*/*Q. xacutidens*) must account for at least 50 percent relative cover in the shrub canopy, or *Q. berberidifolia*/*Q. xacutidens* must account for the highest percent relative cover in the shrub canopy versus any other single shrub genus (except for *Adenostoma fasciculatum*, which may be present at a greater percent relative cover than *Quercus* spp.).
- *Adenostoma fasciculatum* must account for at least 30 percent relative cover.

- If present, *Xylococcus bicolor* must account for 1 percent relative cover or less (otherwise see *Adenostoma fasciculatum*-*Xylococcus bicolor*-*Quercus* [*berberidifolia*, *×acutidens*] Association).

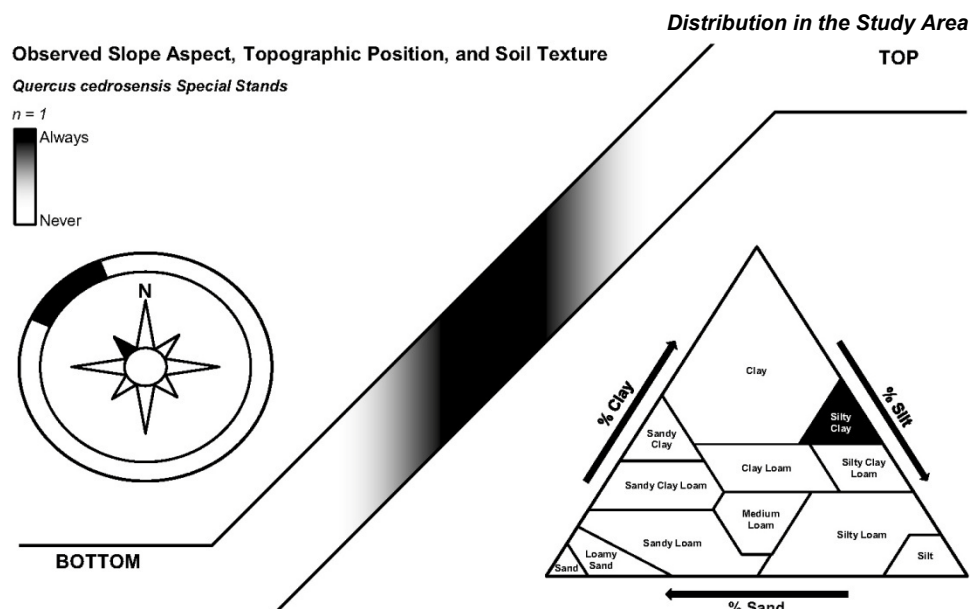
4.39.1 *Quercus cedrosensis* Special Stands

Quercus cedrosensis is a rare oak with small evergreen leaves that was originally described from Cedros Islands off the western coast of Baja California, approximately 300 miles south of the only stands sampled in the study area at Otay Mountain just north of the Mexican border. The Otay Mountain stand was small and surrounded by mesic chaparral of the *Adenostoma fasciculatum*-*Xylococcus bicolor* Alliance. The short (oak) shrubs resemble *Q. vaccinifolia* (huckleberry oak) of the Sierras and Northern California. Currently, there is no data on the extent of similar stands between Cedros Island and Otay Mountain, so this single stand is given “special stand” status.

Quercus cedrosensis is dominant in dense thickets with continuous canopy in the shrub/tree strata. It occurs on mesic chaparral sites with *Adenostoma fasciculatum*, *X. bicolor*, and *Callitropsis forbesii* (*Cupressus f.*). These special stands are very localized in southwest San Diego County, occurring at Otay Mountain, Marron Valley, Barrett Lake, Sycuan Peak, and Sycamore Canyon. Outlying populations have expanded the species’ range recently. Herbaceous diversity and cover is relatively low, mostly occurring in openings and increasing in response to fire.

Ecoregions

Southern Foothills (SF)



Membership Rules

There are two possible ways to key to this association (both tree and shrub stratum classes):

Option One:

- The tree canopy must be at least 5 percent absolute cover.
 - Note: If the tree canopy is between 5 and 10 percent absolute cover, the shrub canopy should not be continuous (otherwise see the Class B Key to Shrubland Vegetation).
- *Quercus cedrosensis* must account for at least 50 percent relative cover in the tree canopy.

Option Two:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Quercus cedrosensis* must account for at least 50 percent relative cover in the shrub canopy, or *Q. cedrosensis* must account for more relative shrub cover than any other single genus.

4.40 *Quercus dumosa* Alliance

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. Stands have been sampled at Point Loma (Klein and Keeler-Wolf 2010) and 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*.

As defined in California, this shrubland is characterized by an intermittent to continuous canopy of the diagnostic and dominant *Q. dumosa*. Subdominant shrubs include *Adenostoma fasciculatum*, *Cneoridium dumosum*, *Eriogonum fasciculatum*, *Lotus scoparius*, *Malosma laurina*, *Rhus integrifolia*, *Salvia mellifera*, and *Xylococcus bicolor*. Shrubs are <3 m, and the herbaceous layer is variable.

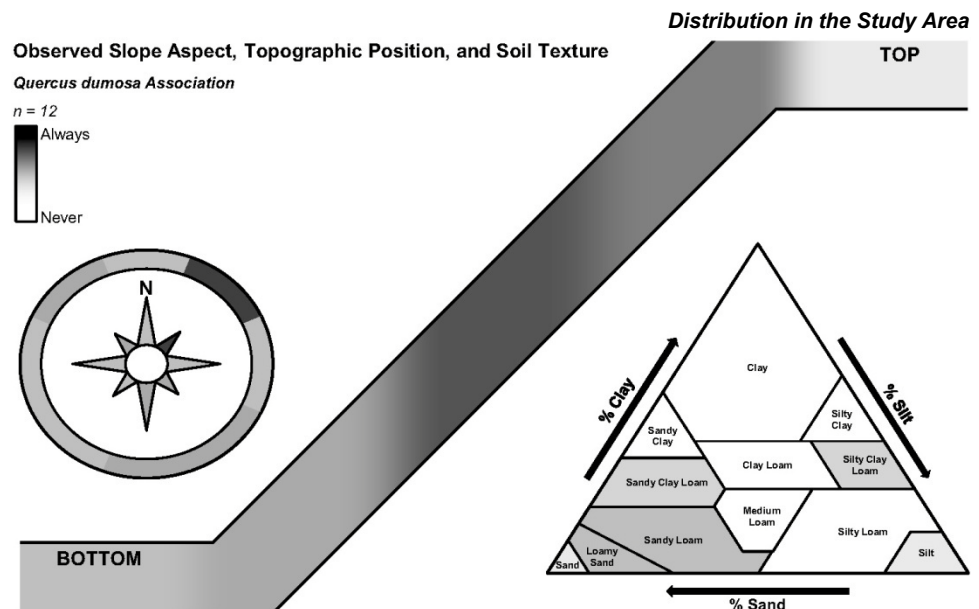
This alliance has only been recently defined and segregated from *Q. berberidifolia* and other scrub oak alliances as a result of analysis over the past 2 years from data recently collected in San Diego County. It likely continues farther south into northwestern Baja California. Only one association is described: the *Q. dumosa* Shrubland Association. Ecologically, it is similar to *Q. berberidifolia* in its preference for mesic sheltered locations. However, taxonomically, *Q. dumosa* is quite distinct from other Southern California scrub oaks.

4.40.1 Quercus dumosa Association

Quercus dumosa is dominant and forms a closed canopy, with *Rhus integrifolia*, *Cercocarpus minutiflorus*, *Adenostoma fasciculata*, *Xylococcus bicolor*, *Ceanothus verrucosus*, *C. tomentosus*, *Comarostaphylis diversifolia*, *Artemisia californica*, and *Salvia mellifera* occurring as subdominants. Herbaceous diversity and cover is variable, both increasing in response to fire.

Ecoregions

Central Coast (CC)
North Coast (NC)



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Sclerophyllous shrub species must account for at least 50 percent relative cover in the shrub canopy.
- *Quercus dumosa* must account for at least 50 percent relative cover in the shrub canopy, or *Q. dumosa* must account for more relative shrub cover than any other single genus.

4.41 *Rhamnus crocea* Provisional Alliance

Rhamnus crocea is a common shrub throughout much of Southern California. It is a common associate of many types of chaparral and coastal sage scrub, and fairly common as an understory species within upland *Quercus agrifolia* and other woodlands. Occasionally it dominates or codominates stands of scrub in the south coastal portion of California. These stands are often recently burned and may have supported *Artemisia californica*, *Salvia apiana*, *Adenostoma fasciculatum*, or other scrub alliances.

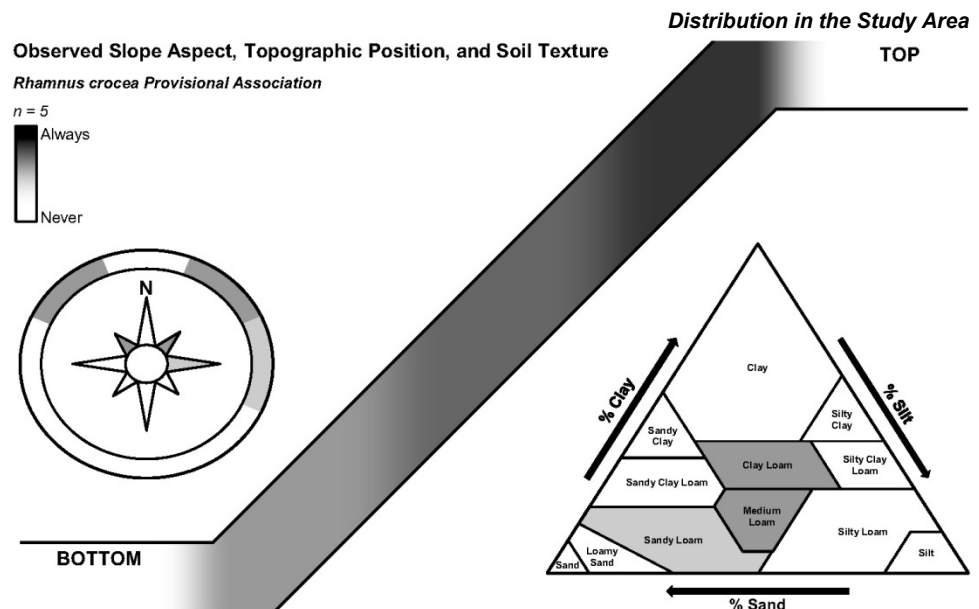
Rhamnus crocea is an excellent resprouter and, under certain conditions, may dominate stands that were previously other associations. It is uncertain if stands included in the *R. crocea* provisional alliance will ultimately be called this alliance. With further analysis and temporal resampling, it may become clear that this vegetation should be more reasonably assigned to another alliance, or alliances, depending on the associated species and ecological setting. In general, stands are often small, and only five stands were sampled. One subspecies of *R. crocea* is the larval host plant of the Hermes copper butterfly (*Hermelycaena* [*Lycaena*] *hermes*), a sensitive species.

4.41.1 *Rhamnus crocea* Provisional Association

Rhamnus crocea is dominant in an open shrub canopy. Codominants include *Malosma laurina*, *Salvia apiana*, *Artemisia californica*, *Heteromeles arbutifolia*, *Hazardia squarrosa*, and *Mimulus aurantiacus*. Inland stands may be more closely associated with chaparral associations. Diverse herbaceous cover is mostly in openings, and increases in response to fire.

Ecoregions

Central Valley (CV)
Southern Foothills (SF)



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Combined cover of *Rhamnus crocea* and *Malosma laurina* (if present) must account for at least 30 percent relative cover in the shrub canopy.

4.42 *Rhus integrifolia* Alliance

Rhus integrifolia is a widespread frost-intolerant species of the immediate coastal strip of Southern California. Studies at Cabrillo National Monument (Klein and Keeler-Wolf 2010), Santa Monica Mountains (Keeler-Wolf and Evens 2006), and elsewhere have shown that *R. integrifolia* is relatively useless as a diagnostic or differential species for vegetation classification largely because it is so ubiquitous within this general zone. Thus, the definition of an *R. integrifolia* Association is made with careful reference to other related stands where *R. integrifolia* is also found in high cover and constancy. An important characteristic of this alliance is that there are no other diagnostic species present at sufficient covers or constancies to circumscribe any other alliance/association. Stands within this alliance are strongly dominated by *R. integrifolia*, which casts dense shade and creates heavy litter build-up. As a result, species diversity is relatively low.

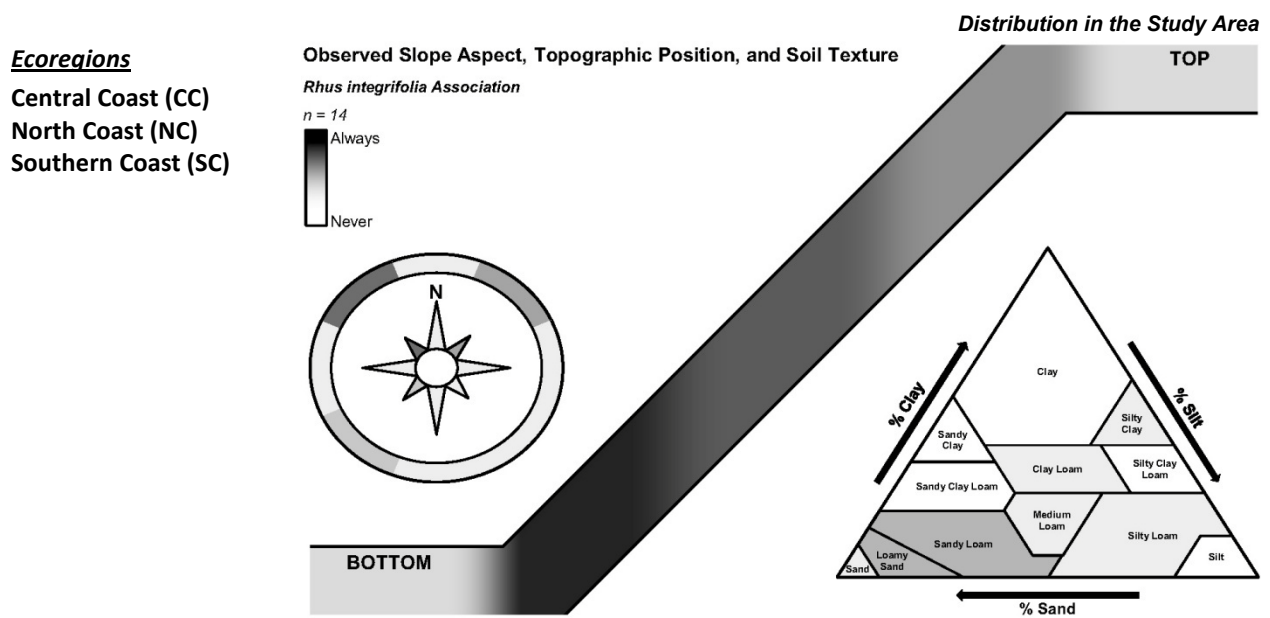
Rhus integrifolia is a consummate survivor and appears to be well adapted to current ecological conditions along the coast of Southern California. This is perhaps why several studies (e.g., Taylor 2004) have noted its apparent increase relative to *Artemisia californica* and other coastal scrub alliances in coastal Southern California. Photomonitoring would be an effective and valuable tool to assess the dynamics of this alliance.

As defined in California, *R. integrifolia* is the dominant species in the shrub canopy with an array of sclerophyll or drought-deciduous scrub subdominants, including *Adenostoma fasciculatum*, *A. californica*, *Mimulus 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 trees such as *Juglans californica*, *Quercus agrifolia*, *Pinus torreyana*, and *Schinus molle* may be present. Shrubs are generally <5 m, and the canopy is mostly intermittent to continuous and may be two-tiered. The herbaceous layer is open due to the usually dense shrub overstory.

A single association is defined for the study area. In addition to the 14 samples for this study, an additional 91 samples at Cabrillo National Monument and Point Loma Naval Station informed the classification of this alliance; however, these samples were not used in the data analysis defining this alliance.

4.42.1 *Rhus integrifolia* Association

Rhus integrifolia is dominant often as continuous shrub cover. Associated subdominants include *Adenostoma fasciculatum*, *Artemisia californica*, *Mimulus aurantiacus*, *Encelia californica*, *E. fasciculatum*, *Heteromeles arbutifolia*, *Malosma laurina*, *Rhamnus crocea*, *S. mellifera*, and *Xylococcus bicolor*. Herbaceous cover is usually low, and is primarily in openings. Although the distribution of *R. integrifolia* is ubiquitous throughout coastal sage scrub and chaparral, the sample data analysis indicates that it associates most closely with coastal sage scrub or those chaparral associations at the margins or ecotones with coastal sage scrub.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- *Rhus integrifolia* must account for at least 50 percent relative cover in the shrub canopy, or *R. integrifolia* must be present with greater than two times the cover of any other single shrub species.
 - Note: *R. integrifolia* can be a confounding species if it does not meet the cover threshold above. If the key is not cleanly indicating a shrub type and *R. integrifolia* is present, it is acceptable to attempt the key without considering *R.*

integrifolia (i.e., remove *R. integrifolia* from your dominance calculations, etc. and try the key again).

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.43 *Salvia apiana* Alliance

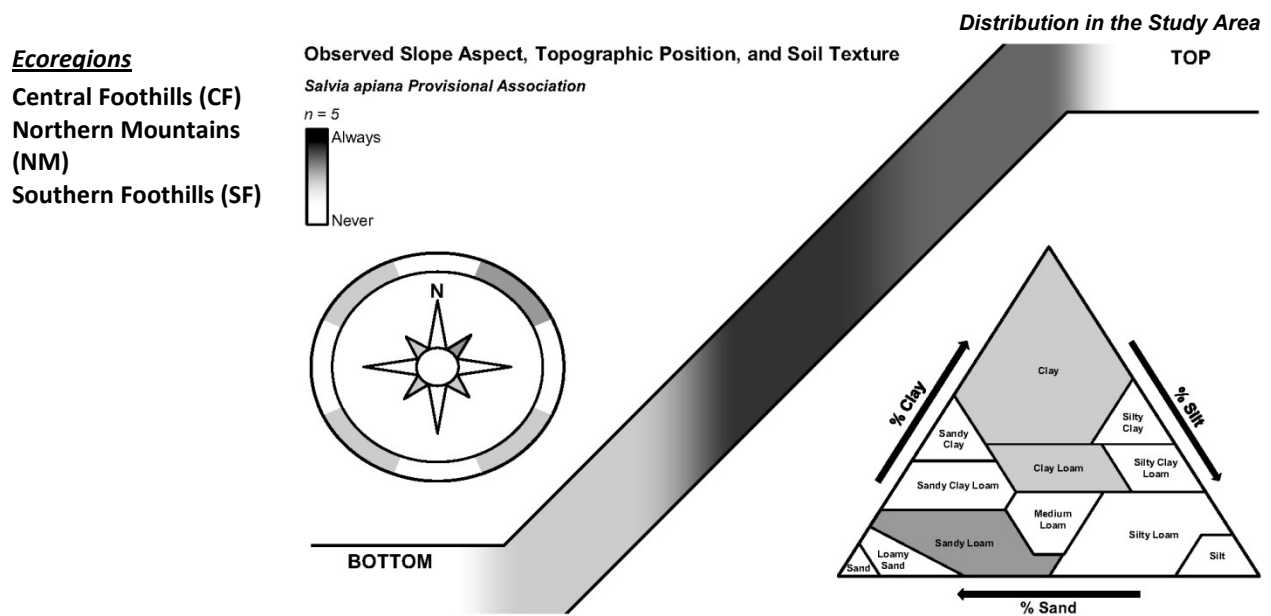
The *Salvia apiana* alliance occurs on coastal mountain slopes and benches, sometimes on alluvial fans, in inland locations in the Peninsular and Transverse ranges. The term “interior sage scrub” or Riversidian sage scrub have been used to categorize the vegetation commonly included this alliance. At semi-desert localities or extremely xeric, well-drained sites, stands shift to the *Eriogonum fasciculatum* Alliance and may also be associated with the *Encelia farinosa* Alliance.

In California, alliance stands generally have the following characteristics: *S. apiana* is dominant or codominant in the shrub canopy, with *Artemisia californica*, *Mimulus aurantiacus*, *E. farinosa*, *Ericameria* spp., *E. fasciculatum*, *Hesperoyucca whipplei*, *Isocoma menziesii*, *Malacothamnus fasciculatus*, *Malosma laurina*, and/or *Rhus* spp. occurring as subdominants. Although most shrubs are <2 m, some are < 0.5 m. The canopy is intermittent to continuous and often two-tiered. The herbaceous layer is variable.

Stands in western San Diego County are generally uncommon, occurring on the hottest exposures in inland localities. Two associations have been defined. The *S. apiana*-*A. californica* Association was sampled 14 times and is the most common association in the study area. The *S. apiana* Association was sampled five times.

4.43.1 Salvia apiana Provisional Association

Salvia apiana is dominant in an open shrub canopy. Subdominant shrubs include *Hazardia squarrosa*, *Hesperoyucca whipplei*, *Rhamnus crocea*, *Malosma laurina*, *Eriogonum fasciculatum*, *Adenostoma fasciculatum*, and *Artemisia californica*. Herb cover is well developed and diverse, and generally occurs in openings. This association can occur as a mix of chaparral and coastal sage scrub in mature stable shrub communities, or as an early transitional stage of other shrublands in response to fire or other disturbance.



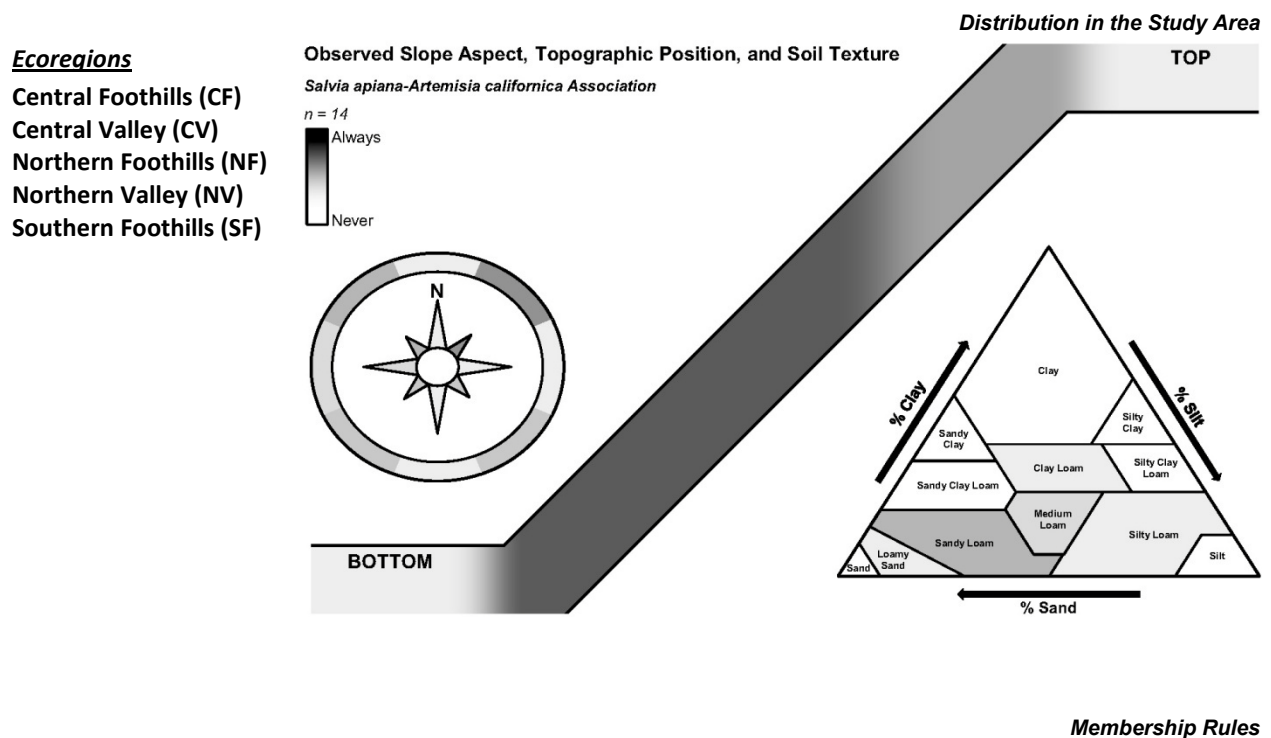
Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, and succulent species must account for more shrub cover than any other single shrub genus.
- *Salvia* spp. must be present with higher cover than *A. californica* and *E. fasciculatum* (do not combine the cover of *A. californica* and *E. fasciculatum* for this comparison).
- *S. apiana* must occur with higher percent cover than any other *Salvia* spp. present.
- If present, microphyllous, succulent, or drought-deciduous, soft-leaved species other than *S. apiana* must each account for less than 5 percent relative cover in the shrub canopy.

- The shrub canopy should be open to intermittent. If the shrub canopy is continuous and microphyllous, succulent, or drought-deciduous, soft-leaved species other than *S. apiana* are present in greater than trace amounts, see the *Salvia apiana-Artemisia californica* Association.

4.43.2 *Salvia apiana*-*Artemisia californica* Association

Salvia apiana and *Artemisia californica* occur as codominants in an open shrub canopy. Associated subdominant shrubs include *Hazardia squarrosa*, *Hesperoyucca whipplei*, *Rhamnus crocea*, *Malosma laurina*, and *Eriogonum fasciculatum*. Herb cover is well developed and diverse, and generally occurs in openings. This association can occur as a mix of chaparral and coastal sage scrub in mature stable shrub communities or as an early transitional stage of other shrublands in response to fire or other disturbance.



There are two possible ways to key this association:

Option One:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, and succulent species must account for more shrub cover than any other single shrub genus.

- *Salvia* spp. must be present with higher cover than *A. californica* and *E. fasciculatum* (do not combine the cover of *A. californica* and *E. fasciculatum* for this comparison).
- *S. apiana* must occur with higher percent cover than any other *Salvia* spp. present.
- *Artemisia californica* is diagnostically present (i.e., is not required to be present but is expected to occur with a probability of 80 percent or greater).
 - Note: If *A. californica* is absent but other soft-leaved, succulent, microphyllous, or broad-leaved shrub species are present, this association still applies.
- The shrub canopy should be continuous. If the shrub canopy is open and microphyllous, succulent, or drought-deciduous, soft-leaved species other than *S. apiana* are only present in trace amounts, see the *Salvia apiana* Provisional Association.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

Option Two:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica* and *Salvia apiana* must account for at least 50 percent relative cover in the shrub canopy.
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.44 *Salvia mellifera* Alliance

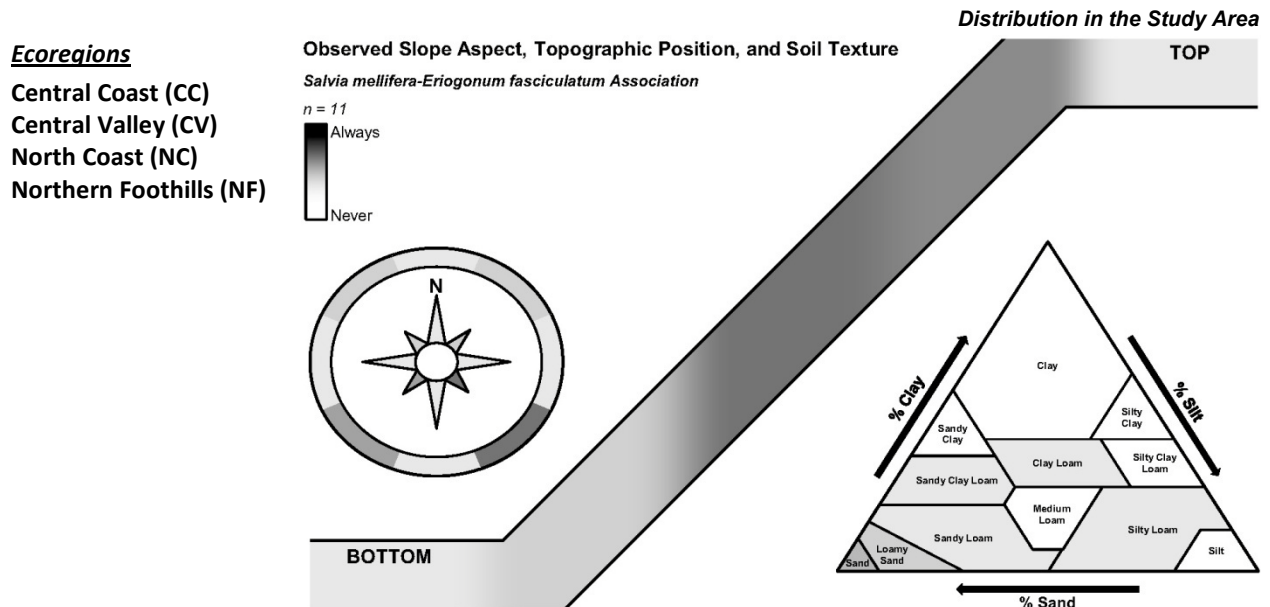
This alliance is found along California's outer central coast, south coast, and along the montane Transverse and Peninsular ranges. It may also occur in the northern portion of Baja California, Mexico. *Salvia mellifera* has the widest range of any of the shrubby *Salvia* Alliances of the coastal sage scrub.

In California, this alliance is characterized by *S. mellifera* as dominant or codominant in the shrub canopy, with *Adenostoma fasciculatum*, *Artemisia californica*, *Baccharis pilularis*, *Mimulus aurantiacus*, *Encelia californica*, *Eriogonum cinereum*, *E. fasciculatum*, *Hesperoyucca whipplei*, *Lotus scoparius*, *Malacothamnus fasciculatus*, *Malosma laurina*, *Opuntia littoralis*, and *S. apiana* occurring as subdominants (Sawyer et al. 2009). Emergent trees may be present at sparse cover. Shrubs are generally <2 m, the shrub canopy is continuous or intermittent, and the herbaceous layer is variable.

Two associations have been defined for the study area. In the *S. mellifera*-*E. fasciculatum* Association, the shrub layer is characterized by *S. mellifera* and *E. fasciculatum*. Either species can be dominant, codominant, or subdominant, but together they form the dominant canopy cover. *Artemisia californica* is either absent or subdominant. This association is scattered in xeric locations from the coast, inland. The *S. mellifera*-*M. laurina* Association is more common and includes taller *Malosma* shrubs that are evenly distributed throughout the stands.

4.44.1 *Salvia mellifera*-*Eriogonum fasciculatum* Association

Salvia mellifera and *Eriogonum fasciculatum* occur as codominants in an open shrub canopy. Associated shrubs include *Baccharis pilularis*, *Eriogonum fasciculatum*, *Artemisia californica*, *Malosma laurina*, *Cylindropuntia littoralis*, and *Rhus integrifolia*. Herbaceous cover is high and distributed mostly in openings.



Membership Rules

There are two possible ways to key to this association. The rule given first applies to both options:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.

Option One:

- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, and succulent species must account for more shrub cover than any other single shrub genus.
- *Salvia* spp. must be present with higher cover than *A. californica* and *E. fasciculatum* (do not combine the cover of *A. californica* and *E. fasciculatum* for this comparison).
- *S. mellifera* must occur with higher percent cover than any other *Salvia* spp. present.

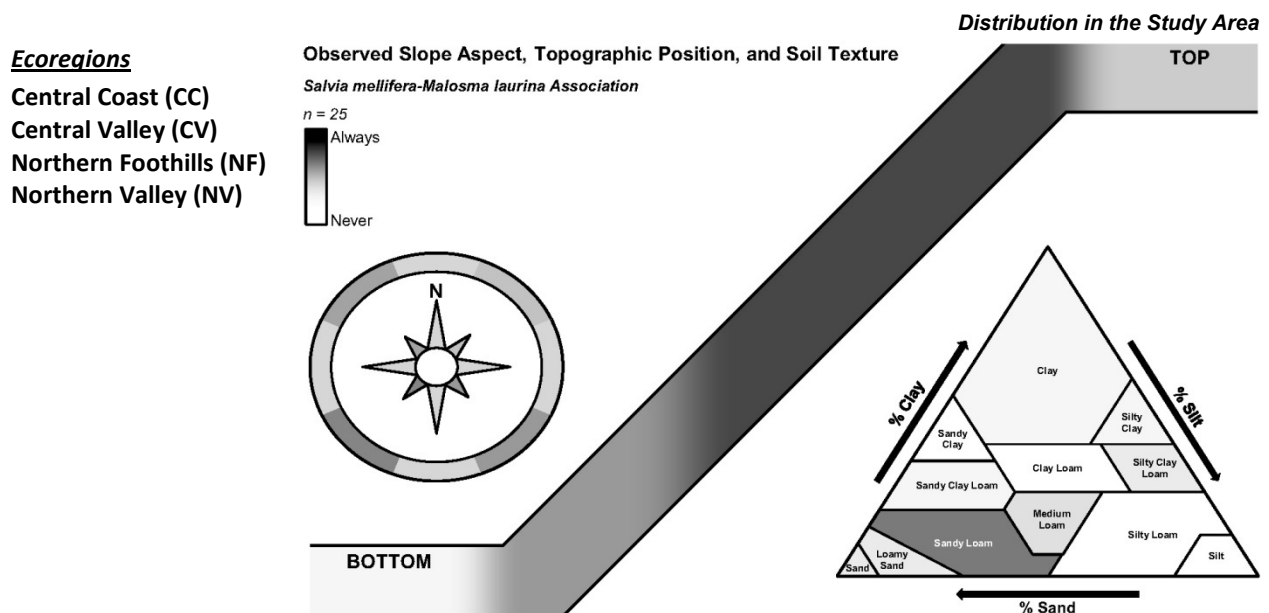
- *E. fasciculatum* must be present with at least 5 percent absolute cover (otherwise see *Salvia mellifera-Malosma laurina* Association).
- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis-Bahiopsis laciniata* Association or the *Bahiopsis laciniata-Artemisia californica-Eriogonum fasciculatum* Association).

Option Two:

- The combined cover of *Eriogonum fasciculatum* and *Salvia mellifera* must account for more shrub cover than any other single shrub genus.

4.44.2 *Salvia mellifera*-*Malosma laurina* Association

Salvia mellifera and *Malosma laurina* occur as codominants in an open shrub canopy. Subdominant shrubs include *Artemisia californica*, *Eriogonum fasciculatum*, *Mimulus aurantiacus*, *Rhus integrifolia*, *Ceanothus tomentosus*, *C. verrucosus*, *C. cyaneus*, *Heteromeles arbutifolia*, *Rhamnus crocea*, *Hesperoyucca whipplei*, *Adolphia californica*, and *Hazardia squarrosa*. Herbaceous cover is high and distributed mostly in openings.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- The combined cover of *Artemisia californica*, *Eriogonum fasciculatum*, *Salvia apiana*, *Salvia mellifera*, and succulent species must account for more shrub cover than any other single shrub genus.
- *Salvia* spp. must be present with higher cover than *A. californica* and *E. fasciculatum* (do not combine the cover of *A. californica* and *E. fasciculatum* for this comparison).
- *S. mellifera* must occur with higher percent cover than any other *Salvia* spp. present.
- *Malosma laurina* must be present.
- If present, *E. fasciculatum* must occur with less than 5 percent absolute cover (otherwise see *Salvia mellifera*-*Eriogonum fasciculatum* Association).

- *Simmondsia chinensis* and *Bahiopsis laciniata* must either be absent or present with less than 5 percent relative cover in the shrub canopy (otherwise see the *Simmondsia chinensis*-*Bahiopsis laciniata* Association or the *Bahiopsis laciniata*-*Artemisia californica*-*Eriogonum fasciculatum* Association).

4.45 *Simmondsia chinensis* Alliance

Simmondsia chinensis is a widespread desert shrub of the Sonoran Desert that ranges into southwestern California in Riverside and San Diego counties. Prior to this study, this alliance was considered provisional in California, with the only known association described from western Riverside County (Klein and Evens 2006). However, additional stands were identified in the study area, and these differ from those in Riverside County.

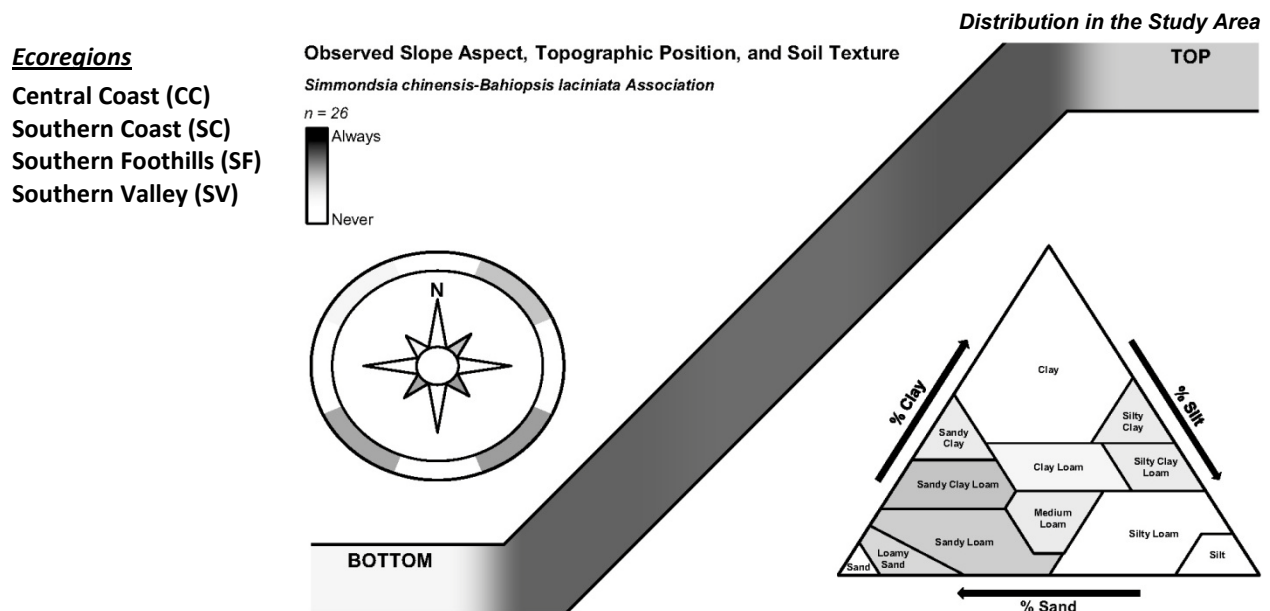
In California, this alliance is generally characterized by *S. chinensis* as dominant or codominant in the shrub canopy, with *Artemisia californica*, *Cylindropuntia californica*, *Echinocereus engelmannii*, *Encelia virginensis* ssp. *actonii*, *E. farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. Shrubs < 5 m and the shrub canopy is open to intermittent and two-tiered. The herbaceous layer cover is open.

In San Diego County, this alliance differs from stands in western Riverside County in the inclusion of *Bahiopsis laciniata* as a diagnostic species. In addition, a number of subdominant succulent species differ between the two areas (e.g., *Ferocactus viridescens* and *Cylindropuntia* spp.). For these reasons, the San Diego County stands fall into the newly described *Simmondsia chinensis*-*B. laciniata* Association, based on results of this study.

4.45.1 *Simmondsia chinensis*-*Bahiopsis laciniata* Association

[MCV Synonym: *Simmondsia chinensis*-*Viguiera laciniata*]

Simmondsia chinensis and *Bahiopsis laciniata* are dominant or codominant in an open shrub canopy, with *Artemisia californica*, *Cylindropuntia californica*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* occurring as subdominants. Herb diversity and cover are relatively low and distributed primarily in openings. This association occupies sites ecologically similar to the *A. californica*-*E. fasciculatum*-*Opuntia littoralis*/*Dudleya (edulis)* Association, and occurs south of Mission Valley in southern coastal San Diego County.



Membership Rules

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.
- Microphyllous, succulent, or drought-deciduous, soft-leaved species must account for at least 50 percent relative cover in the shrub canopy.
- *Simmondsia chinensis* must account for at least 5 percent relative cover in the shrub canopy, or if *Bahiopsis laciniata* is present with at least 5 percent relative cover in the shrub canopy, *S. chinensis* may be present in any amount.

- *B. laciniata* is not required to be present, but may be present. This species was added to the association name to differentiate this vegetation type from the larger, statewide *Simmondsia chinensis* Association.

4.46 *Toxicodendron diversilobum* Alliance

Statewide, the alliance is generally characterized by *Toxicodendron diversilobum* dominant in the shrub canopy, with *Artemisia californica*, *Baccharis pilularis*, *Mimulus aurantiacus*, *Heteromeles arbutifolia*, *Keckiella cordifolia*, *Malosma laurina*, *Rhamnus ilicifolia*, *Rubus parviflorus*, *Salvia leucophylla*, *S. mellifera*, and/or *Sambucus nigra* occurring as subdominants. Emergent trees such as *Juglans californica* and *Quercus agrifolia* may be present. Shrubs are generally < 4 m and the canopy is intermittent to continuous and may be two-tiered. The herbaceous layer is variable.

Most of the Southern California stands exist close to the coast within the maritime summer fog zone on sheltered slopes.

4.46.1 *Toxicodendron diversilobum*-*Artemisia californica*/*Leymus condensatus* Association

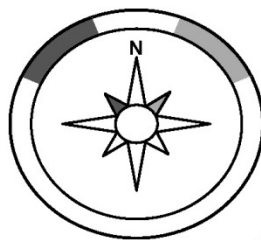
Toxicodendron diversilobum and *Artemisia californica* together are dominant with continuous shrub cover, with *Leymus condensatus*, *Sambucus nigra* ssp. *caerulea*, and *Malosma laurina* occurring as subdominants. Herbaceous diversity and cover is low, occurs in openings, and may include *A. palmeri*. This association often covers mesic, often north-facing slopes of canyons such as Mission Valley, Sycamore Canyon, and Rose Canyon.

Ecoregions

Central Coast (CC)

Observed Slope Aspect, Topographic Position, and Soil Texture
Toxicodendron diversilobum-*Artemisia californica*/*Leymus condensatus*
 Association
 n = 3

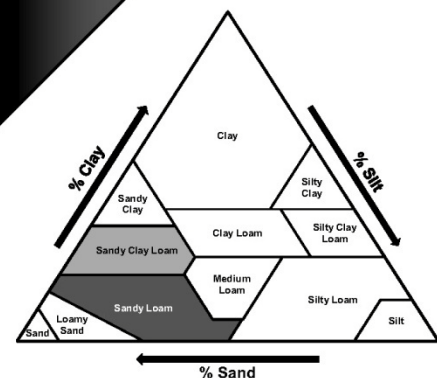
Always
 Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

There are two possible ways to key to this association. The rule given first applies to both options:

- The tree canopy must be absent or less than 5 percent absolute cover, or the tree canopy may be present with 5 to 10 percent absolute cover as long as the shrub canopy is continuous.

Option One:

- The combined cover of *A. californica* and *T. diversilobum* must account for at least 50 percent relative cover in the shrub canopy.

Option Two:

- *T. diversilobum* must account for at least 50 percent relative cover in the shrub canopy.
- If present, *Encelia californica*, *Mimulus aurantiacus*, combined cover of *Keckiella antirrhinoides*/*Malosma laurina*, and combined cover of *Salvia apiana*/*S. mellifera* must all be less than the cover of *T. diversilobum* (otherwise see respective associations with *A. californica*).

CHAPTER 5.0
VEGETATION DOMINATED BY HERBS

5.1 *Ambrosia chamissonis*-*Abronia maritima* Alliance

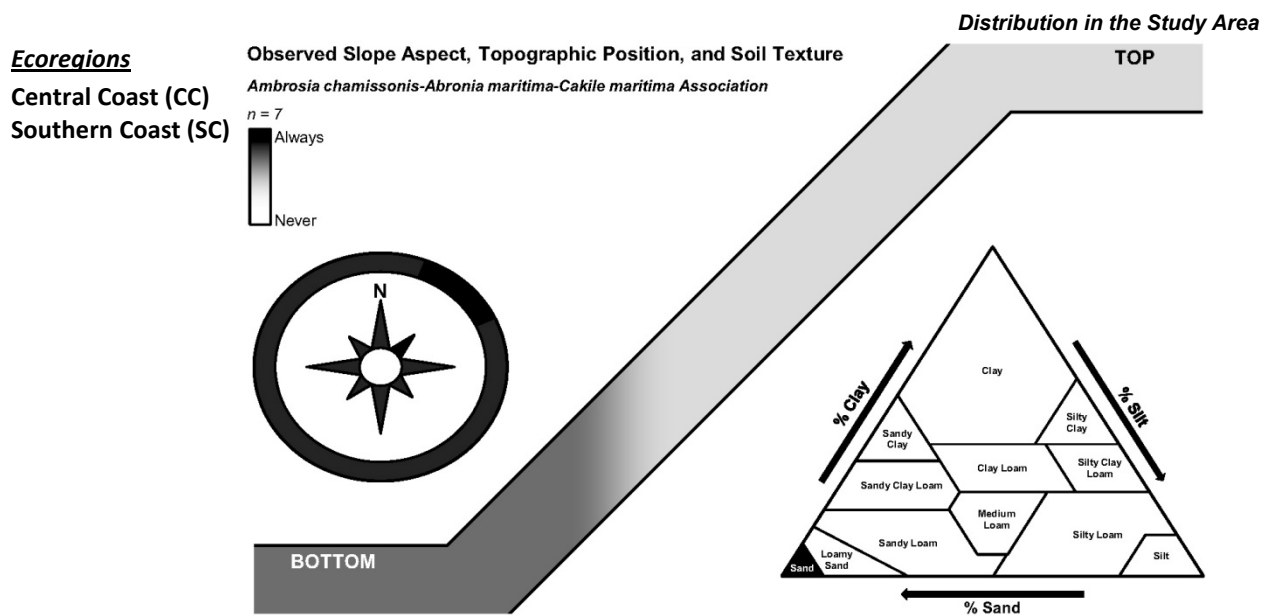
[MCV Synonym: *Abronia latifolia*-*Ambrosia chamissonis*]

This alliance occurs widely up and down the Pacific coastal strand of California. As defined statewide, *Abronia latifolia* and/or *Ambrosia chamissonis* mix with other perennial herbs, grasses, and low shrubs to form a low herbaceous canopy. Depending upon the location, stands may include *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. The herbaceous layer is usually < 50 cm tall and the canopy is usually sparse but can occasionally be intermittent or continuous.

Stands of the *A. latifolia*-*A. chamissonis* Herbaceous Alliance are restricted to coastal dunes and beaches. The small acreage of this habitat and the typical high impact from recreational use restricts the acreage of all associations within the alliance. Stands in coastal San Diego County are highly localized. The most extensive stands occur from Silver Strand State Beach to the Tijuana River mouth. All stands sampled have been assigned to a single association with the diagnostic species *A. maritima* and *A. umbellata*, replacing *A. latifolia*. Restoration of this vegetation has been done in several areas.

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

Ambrosia chamissonis is present often with *Abronia maritima* or *A. umbellata* and/or *Cakile maritima* as dominants in a low herbaceous canopy. Associated subshrubs include *Camissonia cheiranthifolia*, *Frankenia* spp., *Eriogonum fasciculatum*, *E. parviflorum*, *Isocoma menziesii*, *Croton californicum*, *Nemacaulis denudata*, and *Atriplex leucophylla*. Associated herbs include *Abronia* spp., *Lotus nuttallianus*, *Distichlis spicata*, *Calystegia soldanella*, and often *Carpobrotus* spp. This vegetation type is limited to coastal dune habitats throughout San Diego County.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Ambrosia chamissonis* must be present.
- *Abronia* spp. (*A. maritima*, *A. umbellata*) are often present but are not required to be present.
- This association occurs on coastal dunes.

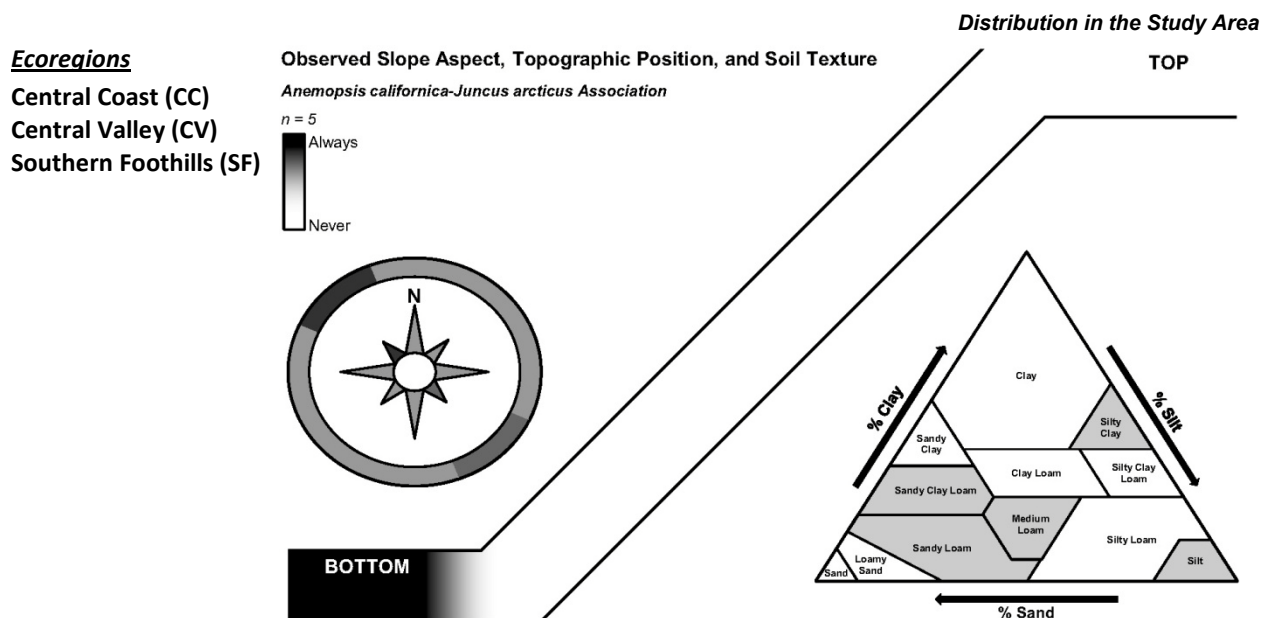
5.2 *Anemopsis californica* Alliance

Anemopsis californica is a clonal stoloniferous wetland species with compound flowers subtended by white petal-like bracts. It forms small stands often in a fine scale matrix with other wetland vegetation. Stands have not been well sampled throughout the state but general characteristics include *A. californica* dominant or codominant in the herbaceous layer with other species such as *Ambrosia psilostachya*, *Bromus hordeaceus*, *Carex praegracilis*, *Carpobrotus edulis*, *Cirsium occidentale*, *Distichlis spicata*, *Euthamia occidentalis*, *Holocarpha virgata*, *Hordeum leporinum*, *Juncus acutus*, *J. arcticus*, *J. cooperi*, *J. rugulosus*, *Lactuca serriola*, *Leymus triticoides*, *Lolium perenne*, *Medicago polymorpha*, *Rumex crispus*, *Schoenoplectus americanus*, *Sisyrinchium bellum*, and *Sporobolus airoides*. The herb layer is intermittent to continuous and is generally < 1 m tall.

The *Anemopsis californica* Alliance is restricted to saline or alkaline areas throughout the arid southwestern portion of North America. It occupies warm temperate or desert areas in Southern California north to the inner south Coast Ranges and the southern San Joaquin Valley. In western San Diego County stands are associated with upper edges of salt marshes where fresh or brackish water seeps occur and in some cases occur farther upstream adjacent to largely freshwater seeps and stream channels. In the latter settings, these stands may be associated with mafic or alkaline substrates.

5.2.1 *Anemopsis californica*-*Juncus arcticus* Association

Anemopsis californica and *Juncus arcticus* is dominant or codominant in the herbaceous layer with other herbaceous species including *Ambrosia psilostachya*, *Carex praegracilis*, *Distichlis spicata*, *Euthamia occidentalis*, *Juncus rugulosus*, *J. acutus*, *J. arcticus*, *J. cooperi*, *Leymus triticoides*, and *Schoenoplectus* spp. This vegetation type is associated with trees and shrubs of many riparian associations.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Anemopsis californica* must account for at least 50 percent relative cover in the herb stratum, or *Anemopsis californica* may be present with lower cover if the vegetation does not fit other defined types in the Group 2 herbaceous key (see Group 2: Hydrophytic Herbaceous Vegetation).

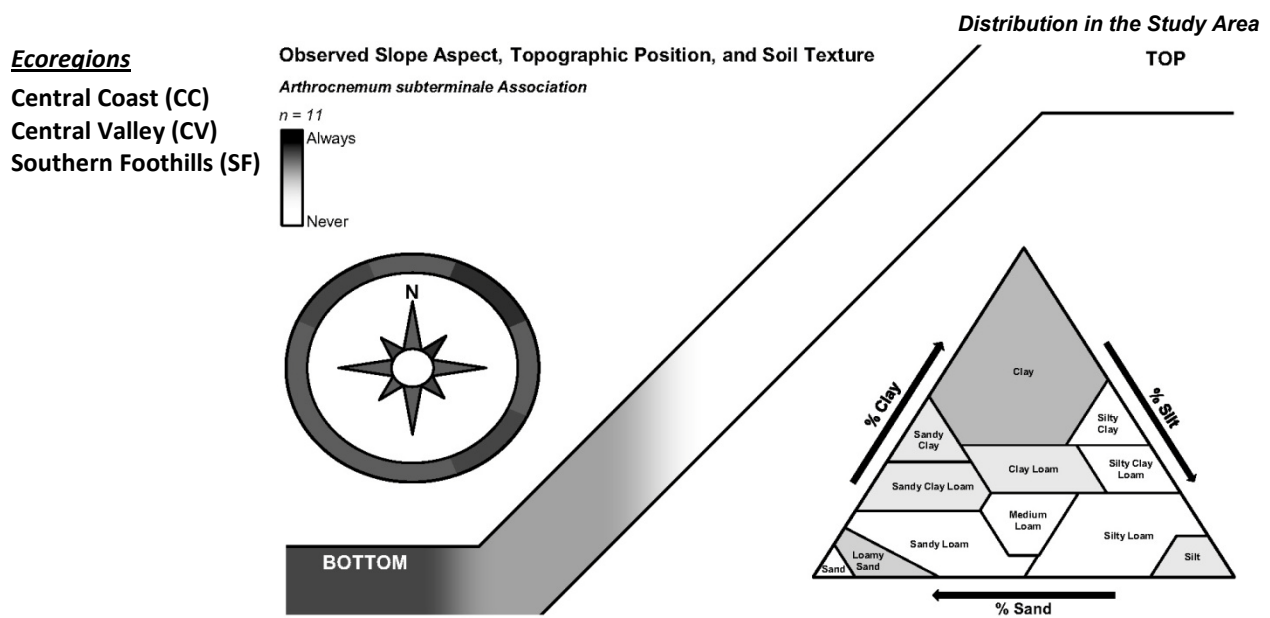
5.3 *Arthrocnemum subterminale* Alliance

Arthrocnemum subterminale is a low perennial stem succulent of upper salt marshes. It resembles *Sarcocornia pacifica* but has a tighter habit and is usually brighter green. It forms stands in saline or alkaline conditions from the Central Valley south well into Mexico. It occurs in coastal salt marshes up and down the Southern California coast but is restricted to a narrow belt above the mean high tide line. In such stands, *Arthrocnemum subterminale* is dominant or codominant in the subshrub and herbaceous layers including *Atriplex patula*, *A. prostrata*, *Batis maritima*, *Cotula coronopifolia*, *Cressa truxillensis*, *Cuscuta salina*, *Distichlis spicata*, *Frankenia salina*, *Grindelia stricta*, *Jaumea carnosa*, *Limonium californicum*, *Monanthochloe littoralis*, *Sarcocornia pacifica*, *Suaeda esteroa*, and *S. taxifolia*. Shrubs and herbs are generally < 30 cm and the canopy is open to intermittent.

In San Diego County two associations have been defined, one that is strongly dominated by *A. subterminale*, and the other mixing with *Sarcocornia pacifica*. The first association is typically in a higher marsh position than the other, and both may co-occur in the same salt marsh.

5.3.1 *Arthrocnemum subterminale* Association

Arthrocnemum subterminale is dominant in the herb canopy often associated with several other halophytic herbs as codominant or subdominant including *Monanthochloe littoralis*, *Parapholis incurva*, *Cressa truxillensis*, *Amblyopappus pusillus*, *Distichlis spicata*, *Batis maritima*. Nonnative invasives often present include *Bromus* spp., *Salsola tragus*, *Rumex* spp., and *Polypogon monspeliensis*. This vegetation type most often occurs as discontinuous cover with shrubs of the upper salt marsh as it transitions from *Sarcocornia pacifica* dominated cover to *Frankenia salina*, *Isocoma menziesii*, and *Limonium* spp.



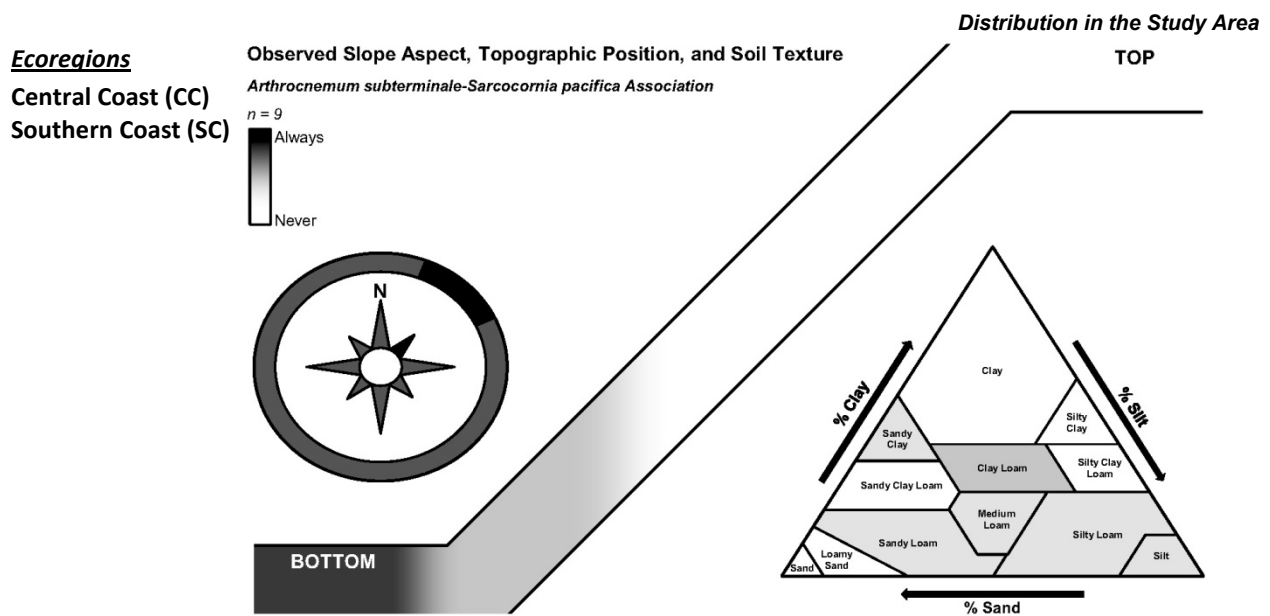
Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Arthrocnemum subterminale* must account for at least 5 percent relative cover in the herb stratum.
- If present, *Sarcocornia pacifica* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale*-*Sarcocornia pacifica* Association).
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).

- If present, *Frankenia* spp. must account for less than 30 percent relative cover in the herb stratum (otherwise see *Frankenia* spp. Associations).
- If present, *Monanthochloe littoralis* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Sarcocornia pacifica*-*Monanthochloe littoralis* Special Stands).
- If present, *Bolboschoenus maritimus* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Bolboschoenus maritimus* Association).
- If *Juncus acutus* ssp. *leopoldii* present, combined cover of *J. acutus* ssp. *leopoldii* and *Jaumea carnosa* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Juncus acutus* Provisional Alliance).

5.3.2 *Arthrocnemum subterminale*-*Sarcocornia pacifica* Association

Arthrocnemum subterminale, together with *Sarcocornia pacifica*, is codominant, *Sarcocornia pacifica* being dominant with many other halophytic herbs including *Monanthochloe littoralis*, *Distichlis spicata*, *Cuscuta salina*, and *Jaumea carnosa*. This vegetation type typically occurs in the lower salt marsh with or adjacent to salt panne below the *A. subterminale* Association, having less cover from shrubs such as *Isocoma menziesii*, *Limonium* spp. and nonnative upland *Bromus* spp. and *Polypogon monspeliensis*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Arthrocnemum subterminale* must account for at least 5 percent relative cover in the herb stratum.
- *Sarcocornia pacifica* must account for at least 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale* Association). In this association, *Sarcocornia pacifica* is often present with greater cover than *Arthrocnemum subterminale*.
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).

- If present, *Frankenia* spp. must account for less than 30 percent relative cover in the herb stratum (otherwise see *Frankenia* spp. Associations).
- If present, *Monanthochloe littoralis* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Sarcocornia pacifica*-*Monanthochloe littoralis* Special Stands).
- If present, *Bolboschoenus maritimus* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Bolboschoenus maritimus* Association).
- If *Juncus acutus* ssp. *leopoldii* present, combined cover of *J. acutus* ssp. *leopoldii* and *Jaumea carnosa* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Juncus acutus* Provisional Alliance).

5.4 *Arundo donax* Semi-Natural Stands

Arundo donax is an aggressive, large, introduced perennial grass. The roots are extensive and densely matted. Plants can form dense, floating mats in riparian areas, along low-gradient streams, ditches, and coastal marshes. The rhizomes and culms that detach from clumps are the major method of propagation. Active *Arundo* removal efforts have been undertaken throughout much of south coastal California.

Stands are simple due to the rapid dominance by the species. Typically *A. donax* is strongly dominant in the herbaceous layer. Emergent trees may occur at low cover. Stands may be up to 8 m, and the mature stand canopy is continuous. Only one stand was sampled in the study area.

Arundo donax dominates all canopies of a variety of riparian associations to the exclusion of many native trees, including *Salix* spp. *Arundo donax* is less prominent in the drier riparian systems usually dominated by *Baccharis salicifolia*, *B. pilularis*, *B. sarothroides*, *Pluchea sericea*, and often *S. lasiolepis* where it frequently occurs more as an isolated infestation possibly where vegetation reproduction is less promoted by flood scour.

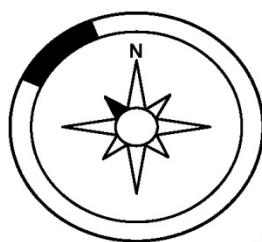
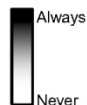
Ecoregions

Central Valley (CV)

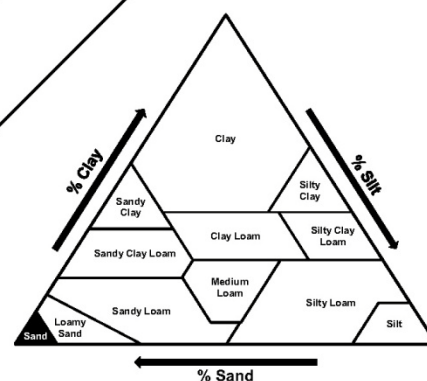
Observed Slope Aspect, Topographic Position, and Soil Texture

Arundo donax Semi-Natural Stands

$n = 1$



Distribution in the Study Area
TOP



Membership Rules

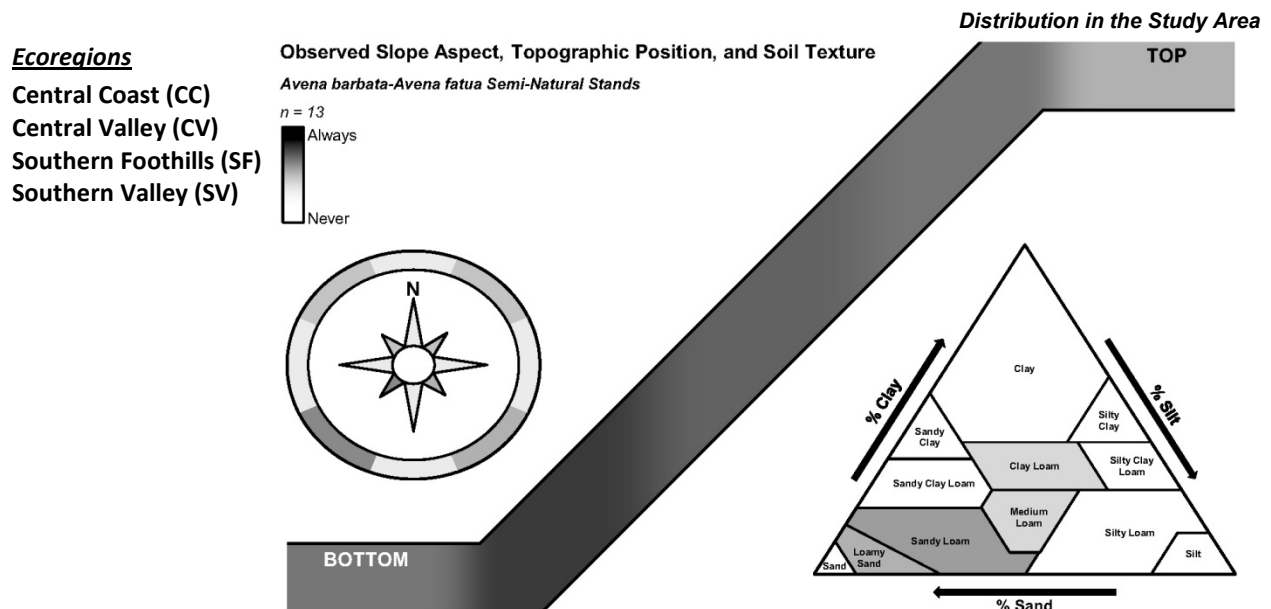
- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Arundo donax* must account for at least 75 percent relative cover

5.5 *Avena (barbata, fatua) Semi-Natural Stands*

Stands strongly dominated by nonnative *Avena* spp. are common in waste places, rangelands, openings in woodlands, and type-converted chaparral or coastal scrub throughout Cismontane California. *Avena barbata* or *A. fatua* is dominant or codominant in the herbaceous layer. Emergent trees and shrubs may be present at low cover. Herbs are < 1.2 m and the cover is open to continuous.

Avena spp. stands have some ecological distinctions from those dominated by the annual bromes. Tall *Avena* spp. stands dominate grasslands with years of accumulated thatch (Reiner 2007). The oats grow more slowly and produce less seed under high-frequency clipping (or grazing) regimes than do the shorter, nonnative *Bromus rubens* and *Vulpia* spp.

Stands in San Diego County often contain *Bromus diandrus*, *B. hordeaceus*, and other nonnative grasses and herbs. Natives in the genera *Clarkia* spp., *Dichelostemma* spp., *Galium* spp., *Lupinus* spp., *Plagiobothrys* spp., and *Trifolium* spp. if they exist in the stands are of substantially lower cover than the nonnatives. Many *Avena* spp. stands occur on moderate to steep slopes formerly occupied by scrub alliances, apparently the result of type-conversion from high-frequency fires. It is unknown whether these will be ultimately replaced by shrub alliance stands.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation must not fit any of the native herbaceous associations/alliances of the Group 1 herbaceous key (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for at least 50 percent relative cover in the herb stratum.
- *Avena* spp. must account for at least 30 percent relative cover in the herb stratum.
- *Avena* spp. must occur with a higher cover than *Bromus* spp. and *Brachypodium distachyon*. (For this comparison, do not combine *Bromus* spp. and *Brachypodium distachyon*.)

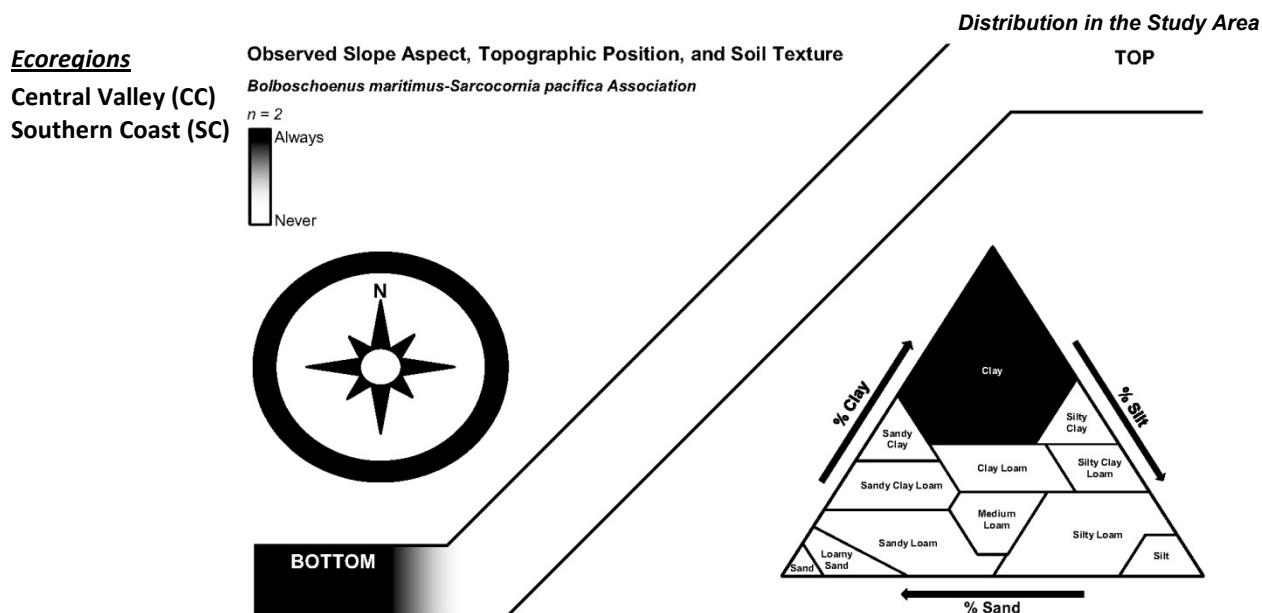
5.6 *Bolboschoenus maritimus* Alliance

Bolboschoenus maritimus is a widespread species in North America and worldwide. Stands of *B. maritimus* occur in tidal marshes with seasonal flooding at intermediate tidal elevations and relatively high salinity. Diagnostic features of the alliance statewide include *B. maritimus* dominant or codominant in the herbaceous layer with a number of other herbs associated such as *Agrostis stolonifera*, *Argentina egedii*, *Atriplex prostrata*, *B. robustus*, *Chenopodium foliosum*, *Cotula coronopifolia*, *Distichlis spicata*, *Eleocharis macrostachya*, *Lemna minuscula*, *Sarcocornia pacifica*, *Sesuvium verrucosum*, *Spergularia salina*, and/or *Typha latifolia*. The herbaceous layer is < 1.5 m tall, and the canopy may be intermittent to continuous.

Bolboschoenus maritimus usually dominates in tidal brackish to subsaline marshes and ditches, including early successional sites of diked marshes within relict swales and depressions. The corms and seeds are highly favored by wintering waterfowl. Two stands in San Diego County were sampled in brackish coastal lagoons and are members of the *B. maritimus*-*Sarcocornia pacifica* Association, also known from the San Francisco Bay area and Suisun Marsh.

5.6.1 *Bolboschoenus maritimus*-*Sarcocornia pacifica* Association

Bolboschoenus maritimus is dominant in the herbaceous canopy often with *Sarcocornia pacifica*. This association occurs in wetlands with high salinity as well as in nontidal freshwater sites. Other associate species include *Baccharis salicifolia*, *Frankenia salina*, *Atriplex prostrata* (*A. triangularis*), and *Pluchea odorata*. Freshwater sites may have many other potential associates including *Typha* spp. and many other plants of emergent wetlands.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Bolboschoenus maritimus* must account for at least 50 percent relative cover in the herb stratum.

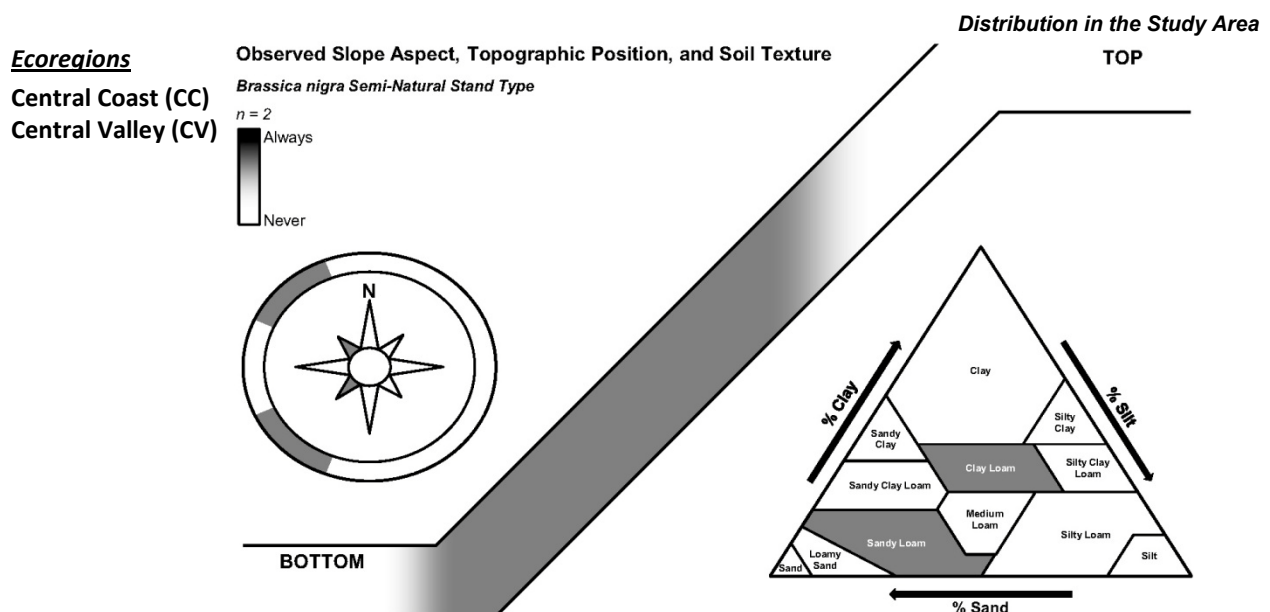
5.7 *Brassica (nigra)* and Other Mustards Semi-Natural Stands

Stands of nonnative annual mustards occupy fallow fields, grasslands, roadsides, levee slopes, disturbed scrublands, riparian areas, and waste places throughout California.

These mustards are treated as a singular type of semi-natural vegetation based on their ecological similarities. They form dense colonies that overtop most other plants whether they are native or nonnative. All respond positively to regular frequent disturbance, whether it be fire, disking, intermittent flooding, or heavy grazing. *B. nigra* was one of the early invaders and has been a part of the California landscape for over 200 years. Depending upon the part of the state and the type and intensity of disturbance, *B. nigra*, *B. rapa*, *B. tournefortii*, *Hirschfeldia incana*, *Isatis tinctoria*, or *Raphanus sativus* may be dominant in the herbaceous layer. Emergent shrubs and trees may be present at low cover. Herbs are generally < 3 m with the canopy ranging from open to continuous. Most stands in western San Diego County are dominated by *B. nigra* near the coast and *H. incana* farther inland. The two stands sampled are representative of the variety of these coastal stands.

5.7.1 *Brassica nigra* Semi-Natural Stand Type

Brassica nigra (or other nonnative mustard, including *B. rapa*, *B. tournefortii*, *Hirschfeldia incana*, or *Raphanus sativus*) are dominant often as a continuous herbaceous canopy in the herbaceous layer. *Brassica nigra*, which exists in dense colonies and can exceed 2 m, tends to shade out other herbaceous plants and can also dominate a shrub canopy. In contrast to other weedy mustards, *B. nigra* is adept at invading otherwise intact native associations that occupy clay soils. Its distribution is restricted to coastal areas. *B. tournefortii* although widespread on the coast is most prominent in desert areas, where it can also invade otherwise intact habitat. The origins if its initial expansion are thought to have been from agriculture. Other weedy mustards are often associated with soil disturbance and, being of lower stature, often occur as subdominant with other vegetation types.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation does not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for less than 50 percent relative cover in the herb stratum.

- Combined cover of taxa within the family Brassicaceae must account for at least 50 percent relative cover in the herb stratum.
 - If *Brassica nigra* accounts for at least 50 percent relative cover in the herb stratum, the vegetation should be attributed to *Brassica nigra* Semi-Natural Stands (a subset of *Brassica [nigra]* and Other Mustards Semi-Natural Stands).
 - If *Brassica nigra* does not account for at least 50 percent relative cover in the herb stratum, the vegetation should be attributed to *Brassica [nigra]* and Other Mustards Semi-Natural Stands.

5.8 *Bromus (diandrus, hordeaceus)-Brachypodium distachyon* Semi-Natural Stands

Throughout Cismontane California nonnative bromes and related “false” bromes have become abundant and tend to dominate strongly in areas where the natural ecology of vegetation has been altered by high fire frequency, deposition, deep tilling of soils, and or intensive grazing. Depending on the setting, many stands with *Bromus diandrus*, *B. hordeaceus*, or *Brachypodium distachyon* are dominant or codominant with nonnatives in the herbaceous layer. Sometimes emergent trees and shrubs may be present at low cover. The herb layer is typically < 75 cm and cover is intermittent to continuous.

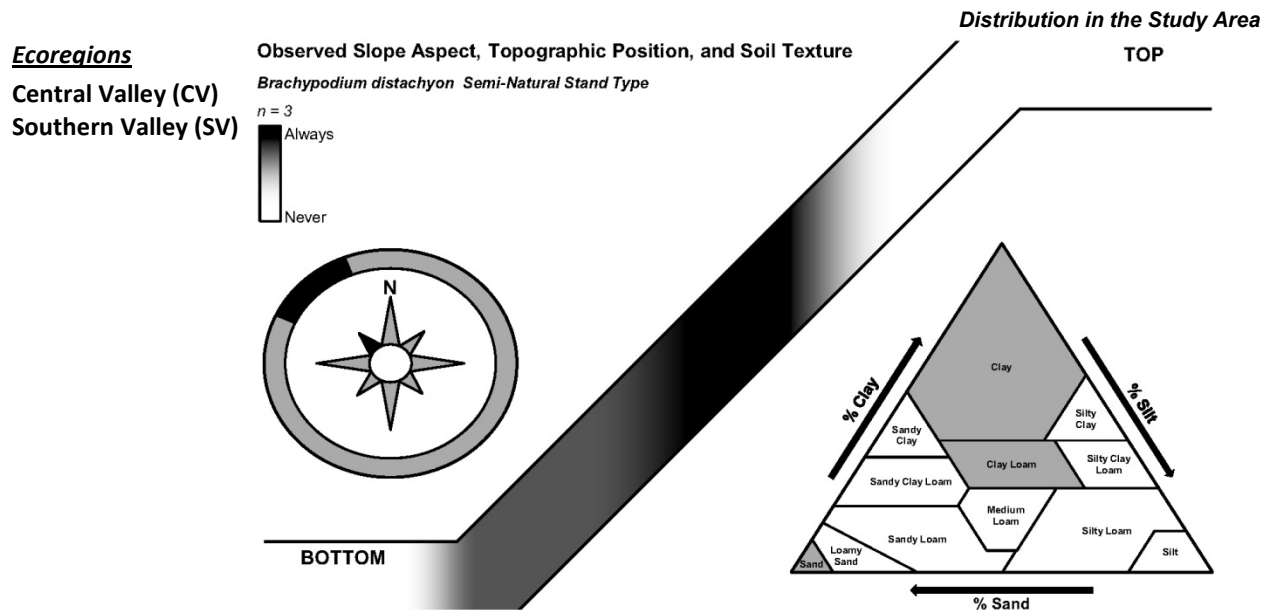
Two stand types have been sampled in western San Diego County, as described below. Where the type cannot be determined, it is appropriate to assign a classification at this hierarchical level.

Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species are present, vegetation does not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for at least 50 percent relative cover in the herb stratum.
- Combined cover of *Bromus* spp. and *Brachypodium distachyon* must account for at least 50 percent relative cover in the herb stratum.
- Cover of *Bromus* spp. and/or *Brachypodium distachyon* must be greater than cover of *Avena* spp. (For this comparison, do not combine *Bromus* spp. and *Brachypodium distachyon*.)

5.8.1 *Brachypodium distachyon* Semi-Natural Stand Type

Brachypodium distachyon dominates the herbaceous canopy invading other herbaceous vegetation types and in dense patches precluding the germination and growth of native herbaceous species. Although widespread in many sites, it is most dominant on clay soils, many of which may support listed or sensitive plant species.



Membership Rules

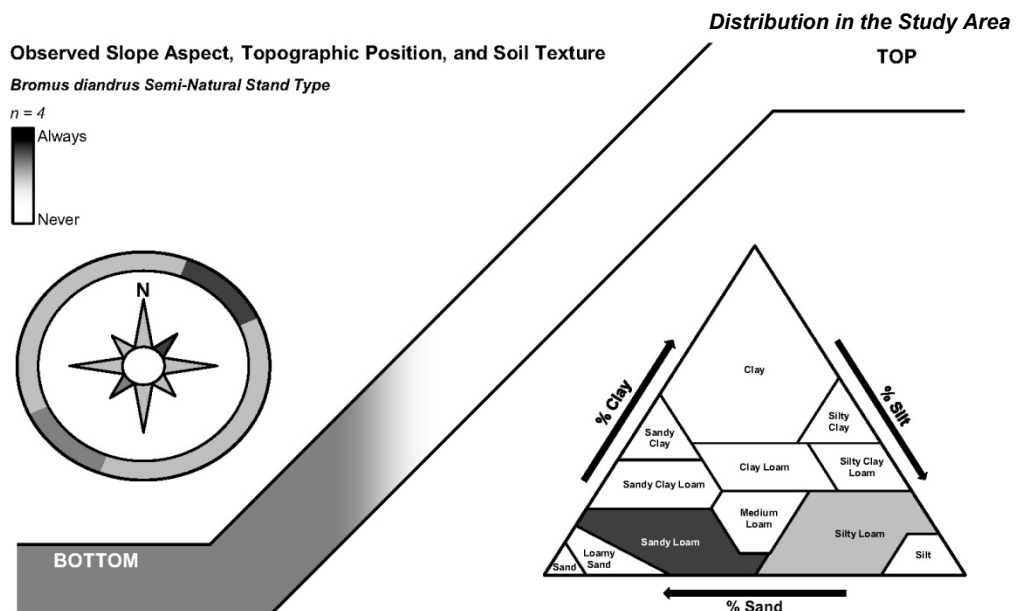
- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation does not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for at least 50 percent relative cover in the herb stratum.
- Combined cover of *Bromus* spp. and *Brachypodium distachyon* must account for at least 50 percent relative cover in the herb stratum.
- Cover of *Bromus* spp. and/or *Brachypodium distachyon* must be greater than cover of *Avena* spp. (For this comparison, do not combine *Bromus* spp. and *Brachypodium distachyon*.)
- *Brachypodium distachyon* must have the highest percent cover of nonnative grass species present.

5.8.2 *Bromus diandrus* Semi-Natural Stand Type

Bromus diandrus dominates the herbaceous canopy of many vegetation types especially as a result of disturbance. This brome is most prominent at dominating native grasslands, the understory of oak woodlands, and other vegetation types. It invades low areas with deeper soils creating dense cover and biomass that create dense perpetual thatch. *B. hordeaceus* is more often subdominant with many other weedy plant species, often not in continuous stands.

Ecoregions

Central Foothills (CF)
Central Valley (CV)
Southern Coast (SC)



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- Nonnative grass species must account for at least 50 percent relative cover in the herb stratum.
- If native species present, vegetation does not fit any of the native associations/alliances (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Combined cover of *Bromus* spp. and *Brachypodium distachyon* must account for at least 50 percent relative cover in the herb stratum.
- Cover of *Bromus* spp. and/or *Brachypodium distachyon* must be greater than cover of *Avena* spp. (For this comparison, do not combine *Bromus* spp. and *Brachypodium distachyon*.)
- *Bromus diandrus* must have the highest percent cover of nonnative grass species present.

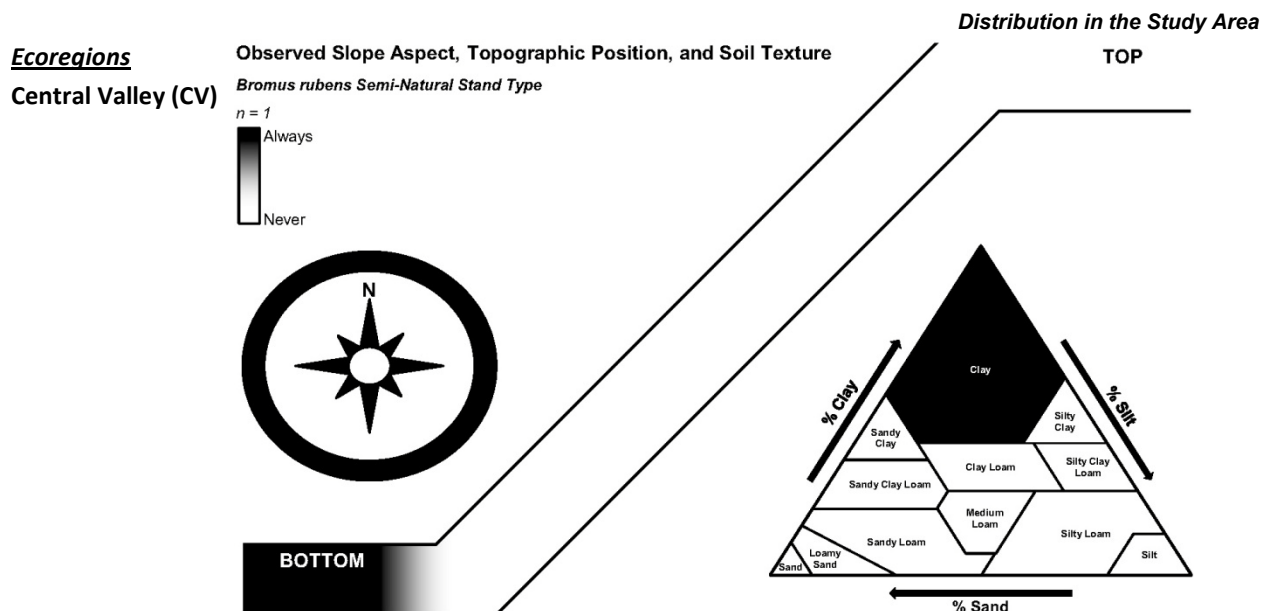
5.9 *Bromus rubens*-*Schismus* (*arabicus*, *barbatus*) Semi-Natural Stands

Bromus rubens and *Schismus barbatus* have become significant components of the winter and early spring annual flora in the warmer parts of Central and Southern California and they both have the capacity to prevent native ephemerals from sprouting through competitive interactions. Most stands in the study area are dominated by *B. rubens*. The abundance of these species in this and the *B. hordeaceus*-*B. diandrus*-*Brachypodium distachyon* type may be both precipitation and temperature driven. *Bromus rubens* and *Schismus* spp. occur in areas where the other bromes do not grow. They invade native desert and semi-desert stands, and convert them to semi-natural grasslands with frequent fire.

Characteristics of stands in this semi-natural group are *B. rubens*, *S. barbatus*, or *S. arabicus* is *B. rubens*, *S. barbatus*, and/or *S. arabicus* are dominant or codominant with other nonnatives in the herbaceous layer. Emergent shrubs may be present at low cover. Herbs are generally < 75 cm and the cover is intermittent to continuous.

5.9.1 *Bromus rubens* Semi-Natural Stand Type

Bromus rubens dominates a continuous to open herbaceous canopy. Nonnative herbs including *Erodium* spp., *Bromus* spp., *Centaurea melitensis*, *Hirschfeldia incana*, *Silene gallica*, and *Hypochaeris glabra* are often subdominant to codominant. Native herb may be subdominant. Emergent native shrubs trace. The type occupies areas with drier site conditions and poorer soils than areas supporting *B. diandrus*, *Brachypodium distachyon* and *Brassica nigra*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation does not fit any of the native associations/alliances (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for at least 50 percent relative cover in the herb stratum.
- Combined cover of *Bromus* spp. and *Brachypodium distachyon* must account for at least 50 percent relative cover in the herb stratum.
- Cover of *Bromus* spp. and/or *Brachypodium distachyon* must be greater than cover of *Avena* spp. (For this comparison, do not combine *Bromus* spp. and *Brachypodium distachyon*.)
- *Bromus rubens* (*B. madritensis* ssp. *r.*) must have the highest percent cover of nonnative grass species present.

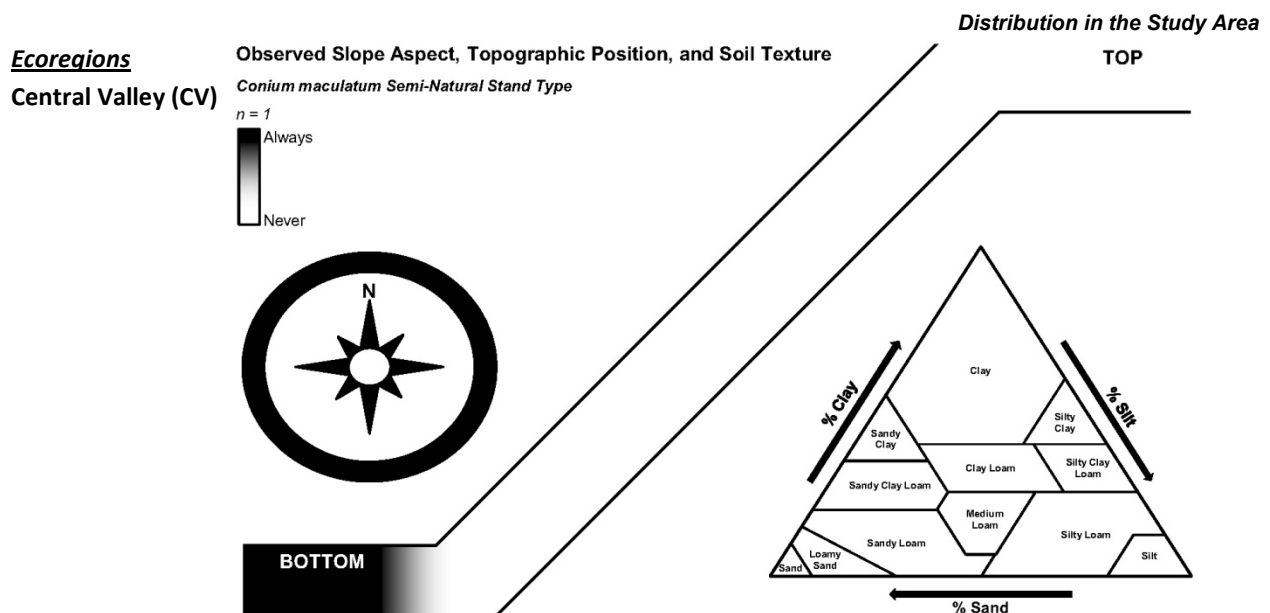
5.10 *Conium maculatum*-*Foeniculum vulgare* Semi-Natural Stands

Both *Conium maculatum* and *Foeniculum vulgare* are tall nonnative biennial herbs that occupy relatively mesic weed patches throughout the coastal parts of California. The first-year plants produce ground-level rosettes and deep taproots. Plants in the second growing season send up tall stems, which flower, fruit, and die. Both species have slightly different niches with *C. maculatum* dominating in heavy soils in bottomlands or mesic settings while *F. vulgare* occurs on better-drained, often steeper slopes. Both stands occur in western San Diego County; however, only one stand of *C. maculatum* was sampled in this study. Because both *C. maculatum* and *F. vulgare* have specific semi-natural stand types associated under this vegetation type, both semi-natural stand types have been included in the key even though the *F. vulgare* variant was not sampled in this study.

In general, the characteristics of the stands include the following: *C. maculatum*, *F. vulgare*, or other nonnative invasive plants of the *Apiaceae* are dominant or codominant with other nonnative plants in the herbaceous layer. Emergent trees such as *Quercus* spp. and shrubs such as *Baccharis pilularis* may be present. Herbs are < 2 m tall and the canopy is open to continuous.

5.10.1 *Conium maculatum* Semi-Natural Stand Type

Conium maculatum dominates, often forming a continuous herbaceous canopy in riparian and other mesic sites. These stands frequently occur in the understory of *Salix* spp., *Populus* spp., and *Platanus racemosa*, where the site has been artificially disturbed. Dominant stands tend to be self-perpetuating and outcompeting native flora, creating dominant shade and profuse seed that readily germinates and seed storage with long dormancy.



Membership Rules

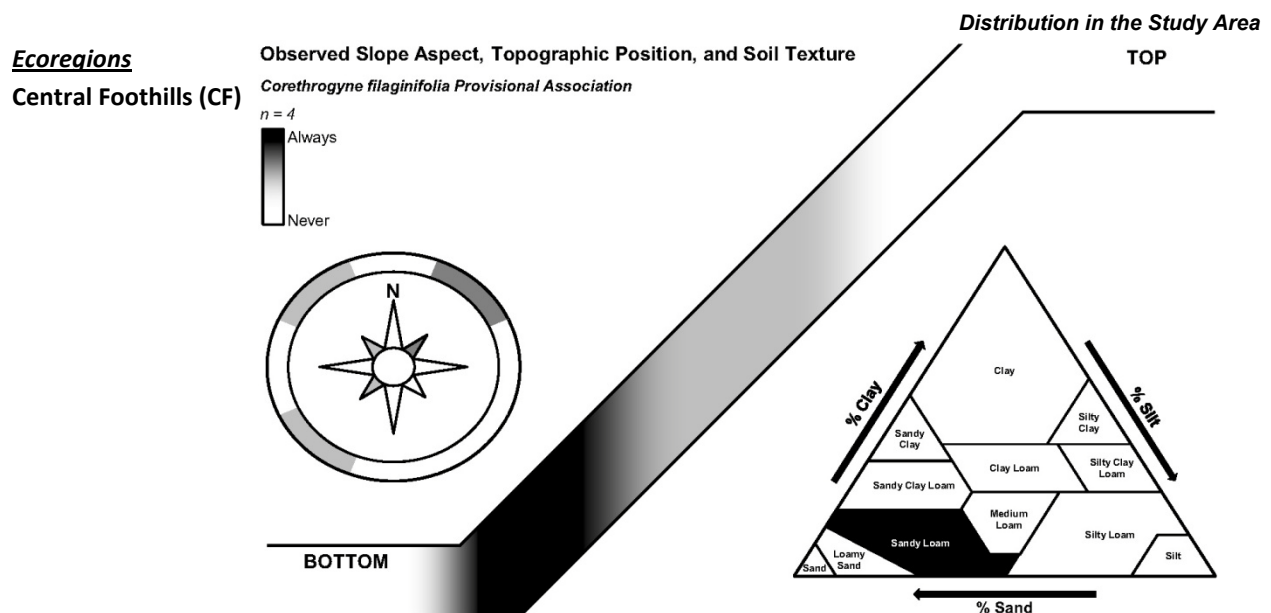
- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation must not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for less than 50 percent relative cover in the herb stratum.
- Combined cover of *Conium maculatum* and *Foeniculum vulgare* must account for at least 50 percent relative cover in the herb stratum.
- *C. maculatum* must be present; if present, *F. vulgare* must account for less herb cover than *C. maculatum*.

5.11 *Corethrogyne filaginifolia* Provisional Alliance

Corethrogyne filaginifolia is a perennial herb characteristic of relatively dry settings on slopes throughout much of California. It has been classified into several forms and subspecies, but is currently considered in Jepson as a single variable taxon. It is particularly common in the south coastal regions where it forms open stands with mixtures of native and nonnative herbs at the margins of post-fire-recovering coastal scrub and chaparral stands, often adjacent to grasslands or other openings. In some parts of the state the species has a similar niche to other short-lived herbaceous perennial *Eriogonum* species such as *E. nudum* or *E. elongatum*. Most stands are less than 1 hectare in size. The single provisional association is described below for the first time based on four samples collected and analyzed in this study. Further sampling of such stands will be necessary to validate the existence of this association and alliance elsewhere.

5.11.1 *Corethrogyne filaginifolia* Provisional Association

Corethrogyne filaginifolia is codominant to subdominant in open stable ecotonal areas mostly at the dry margins of intact native shrublands. A large diversity of shrubs and herbs is associated including *Deinandra* spp., *Erodium* spp., *Spergularia* spp., *Cardionema ramosissima*, *Gutierrezia sarothrae*, *Lotus* spp., *Cryptantha* spp., *Stylocline gnaphaloides*, *Lupinus* spp., and *Eriophyllum confertiflorum*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Corethrogyne filaginifolia* must account for at least 5 percent relative cover in the herb stratum.
- If native grass species are present, vegetation must not fit any of the native grassland associations/alliances of Group 1 (see Section B of the key for Group 1: Upland Herbaceous Vegetation).

5.12 *Cressa truxillensis*-*Distichlis spicata* Alliance

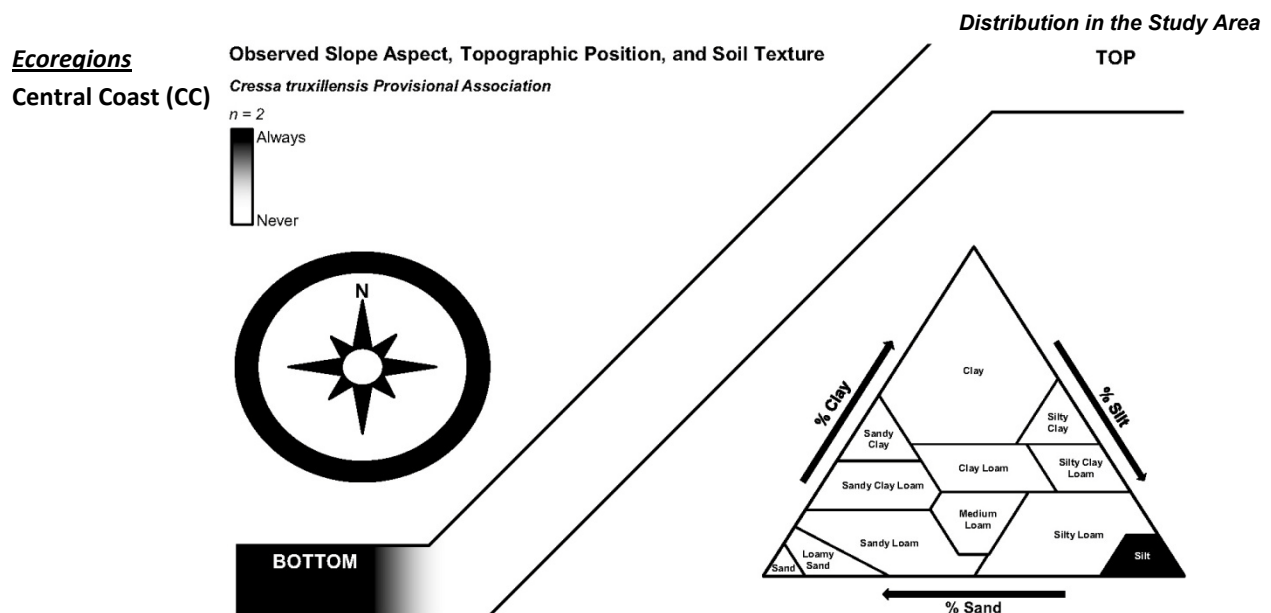
Cressa truxillensis is a tufted, much-branched perennial herb or subshrub that occurs on alkaline/saline soils across western North America. *Distichlis spicata* is a rhizomatous, warm-season grass that occurs across most of temperate North America. Its physiological adaptations allow it to occupy saline environments.

This alliance has been sampled most thoroughly in alkaline vernal pool settings in the California Central Valley. Many stands dominated by *C. truxillensis* and/or *D. spicata*, but lacking vernal pool diagnostic species, are also common in managed wetlands in the alkaline soils of the San Joaquin Valley and several have been inventoried in south coastal California at the upper edges of salt marshes near coastal lagoons from Los Angeles to San Diego County.

In general, the characteristics of the alliance as defined in California as follows: *C. truxillensis* and *D. spicata* are characteristically present and *Crypsis schoenoides* may be dominant or codominant with *Atriplex* spp., *Bolboschoenus maritimus*, *Downingia insignis*, *Eleocharis macrostachya*, *Eryngium aristulatum*, *Eryngium vaseyi*, *Frankenia salina*, *Malvella leprosa*, *Marsilea vestita*, *Orcuttia pilosa*, *Phyla nodiflora*, *Polypogon maritimus*, *Psilocarphus brevissimus*, and *Tuctoria mucronata*. Herbs and subshrubs are < 50 cm and the cover is open to continuous.

5.12.1 *Cressa truxillensis* Provisional Association

Cressa truxillensis is dominant to subdominant in the herb canopy in both natural herbaceous vegetation types with other halophytes and as a disturbance-related adventive. Associated shrubs and herbs include *Distichlis spicata*, *Mesembryanthemum crystallinum*, *M. nodiflorum*, *Sarcocornia pacifica*, and many other associated plants of salt marshes. Some associates of disturbed sites are *Malvella leprosa* and *Cynodon dactylon*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Cressa truxillensis* must account for at least 5 percent relative cover in the herb stratum.
- Vegetation must not fit any of the herbaceous associations/alliances in Sections A.1 through A.9 of the Group 2 key (see the key for Group 2: Hydrophytic Herbaceous Vegetation).

5.13 *Deinandra fasciculata* Alliance

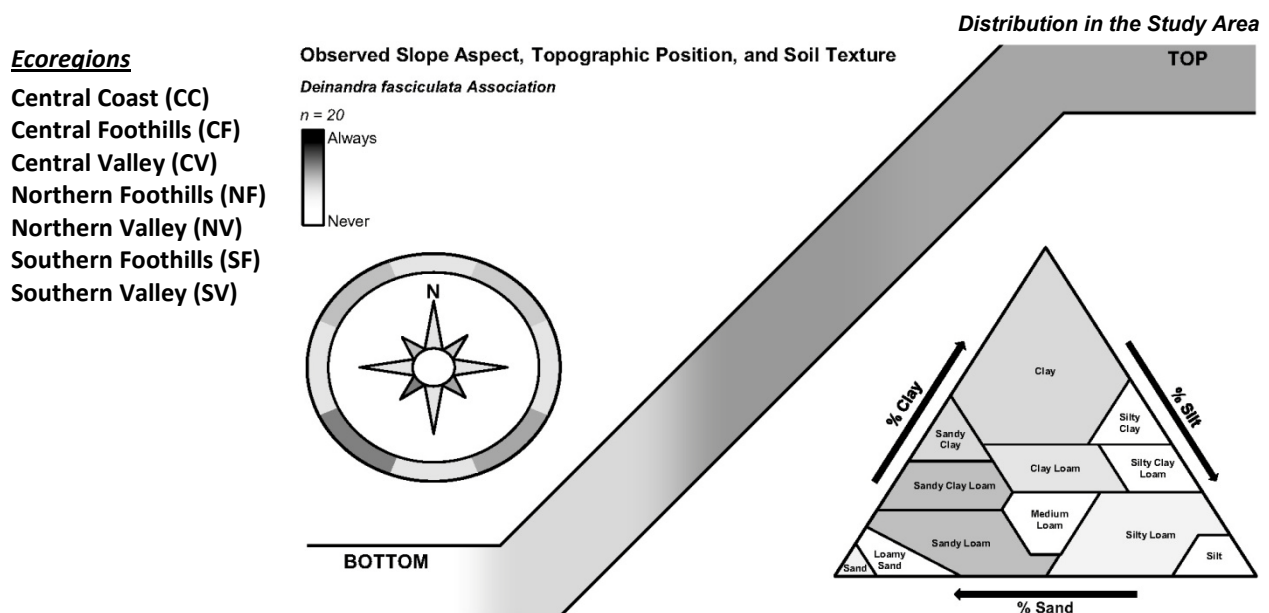
Deinandra fasciculata is a late-flowering summer annual that germinates in the spring, and blooms and fruits after many of the spring annuals have gone to seed. In Southern California it characterizes stands of herbaceous vegetation in heavy or poor soils where nonnative grasses are less able to successfully compete. These may occur in saline or alkaline settings on sea terraces, edges of salt marsh, or heavy soils on xeric exposures within larger stands of coastal sage scrub or chaparral.

In general, the characteristics of the alliance include *D. fasciculata* as a codominant or conspicuous species in the herbaceous layer with *Amsinckia menziesii*, *Atriplex argentea*, *A. coronata* var. *notatior*, *Centaurea melitensis*, *C. solstitialis*, *Cressa truxillensis*, *Deschampsia danthonioides*, *Erodium cicutarium*, *Hirschfeldia incana*, *Hordeum depressum*, *H. murinum*, *H. intercedens*, *Lasthenia californica*, *L. fremontii*, *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 are < 1 m and the cover is open to continuous.

Prior to this study this alliance was mostly defined from vernal flats and pool margins in western Riverside County (Klein and Evens 2006), but additional stands were sampled in western San Diego County from the coast to the interior margins of the study area. This alliance seems to locally replace the widespread California *L. californica*-*Vulpia microstachys*-*Plantago erecta* Alliance in the study area currently exemplifying the most resistant native annual herbaceous vegetation.

5.13.1 *Deinandra fasciculata* Association

Deinandra fasciculata occurs most often with sparse to trace cover in herb-dominated openings within in many shrub-dominated vegetation types. As an association it can occur as a codominant or conspicuous species in the herbaceous layer in a complex mosaic of shrublands with grassland and vernal pool associations. Dominant stands of *D. fasciculata* are readily replaced in disturbed situations by nonnative grasses and broadleaf plants. Shrubs and herbs that are associated are therefore highly diverse, representing these differing vegetation types rather than edaphically similar associated species. Some of these co-occurring plants that are more typical of the intact *D. fasciculata* Association include *Nassella* spp., *Castilleja* spp., *Osmadenia tenella*, *Holocarpha virgata* ssp. *elongata*, *Lasthenia gracilis*, *Corethrogyne filaginifolia*, *Hordeum intercedens*, *Layia platyglossa*, *Chlorogalum* spp., *Allium* spp. *Bloomeria* spp., *Brodiaea* spp., and *Dichelostemma capitata*. *Avena* spp. are usually present though usually not codominant except on disturbed often clayey sites.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Deinandra fasciculata* must be present, with at least one of the following corollaries being true:

- *D. fasciculata* accounts for at least 5 percent relative cover in the herb stratum.
- *D. fasciculata* co-occurs with at least one of the following indicators: clay soils, cryptogamic crust, *Selaginella cinerascens*, and/or bulbiferous native species (e.g., *Allium*, *Brodiaea*, *Calochortus*, *Chlorogalum*, *Dodecatheon*, etc.).
- If native grass species are present, vegetation must not fit any of the native grassland associations/alliances of Group 1 (see Section B of the key for Group 1: Upland Herbaceous Vegetation).

5.14 *Distichlis spicata* Alliance

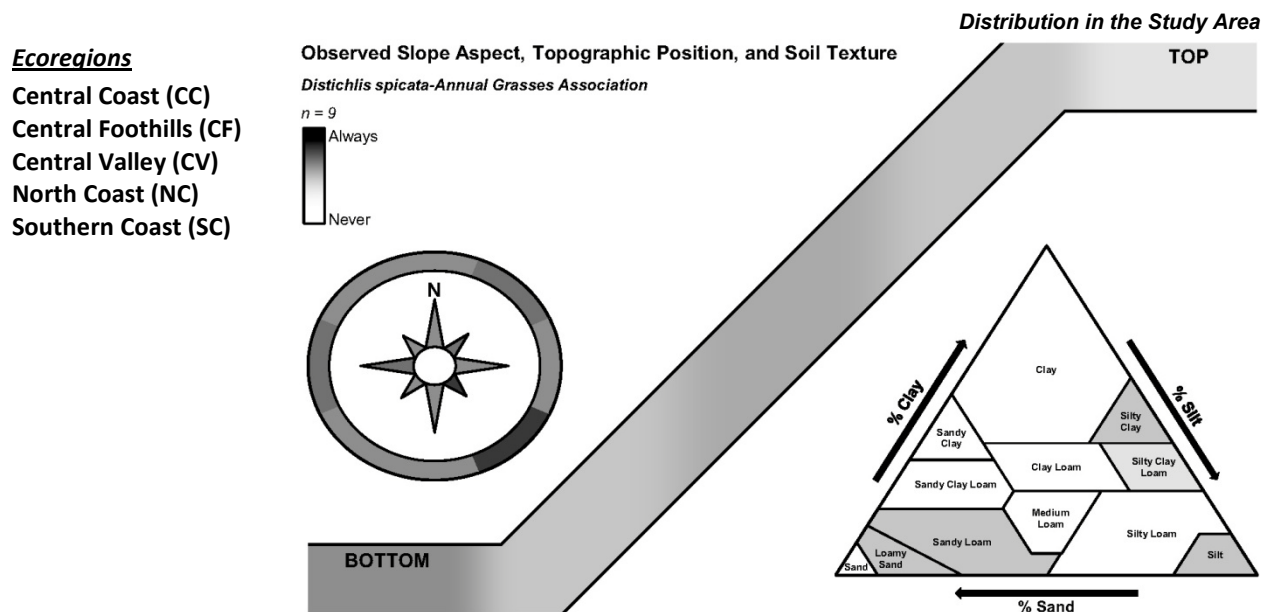
Distichlis spicata forms stands in inland alkaline settings such as around playa edges and springs in the desert, as well as in upper coastal salt marshes. In the study area it overlaps ecologically with the *Cressa truxillensis*-*D. spicata* Alliance and the ecological relationships between the two are not clearly understood.

The general characteristics of this widespread alliance include the following: *D. spicata* is dominant or codominant in the herbaceous layer with *Agrostis viridis*, *Ambrosia chamissonis*, *Anemopsis californica*, *Atriplex prostrata*, *Batis maritima*, *Bromus diandrus*, *Cotula coronopifolia*, *Eleocharis palustris*, *Frankenia salina*, *Hordeum brachyantherum*, *H. murinum*, *Jaumea carnosa*, *Juncus arcticus*, *J. cooperi*, *Lepidium latifolium*, *Leymus triticoides*, *Limonium californicum*, *Muhlenbergia asperifolia*, *Parapholis incurva*, *Poa secunda*, *Sarcocornia pacifica*, *Sporobolus airoides*, and *Triglochin maritima*. Emergent shrubs, such as *Atriplex* spp., *Ericameria palmeri*, and *Suaeda moquinii*, may be present at low cover. Herb layer is < 1 m and the canopy is open to continuous.

Locally, a single association distinguished by the presence of several nonnative annual grasses has been defined.

5.14.1 *Distichlis spicata*-Annual Grasses Association

Distichlis spicata is dominant in the herbaceous canopy and nonnative annual grasses occur usually as subdominant cover. Associated herbs include *Ambrosia psilostachya*, *Leymus triticoides*, *Nassella pulchra*, *Corethrogyne filaginifolia*, *Spergularia* spp., and *Amblyopappus pusillus*. Associated shrubs comprise open cover, including *Sarcocornia pacifica*, *Jaumea carnosa*, *Isocoma menziesii*, *Eriogonum fasciculatum*, and *Baccharis pilularis*.



Membership Rules

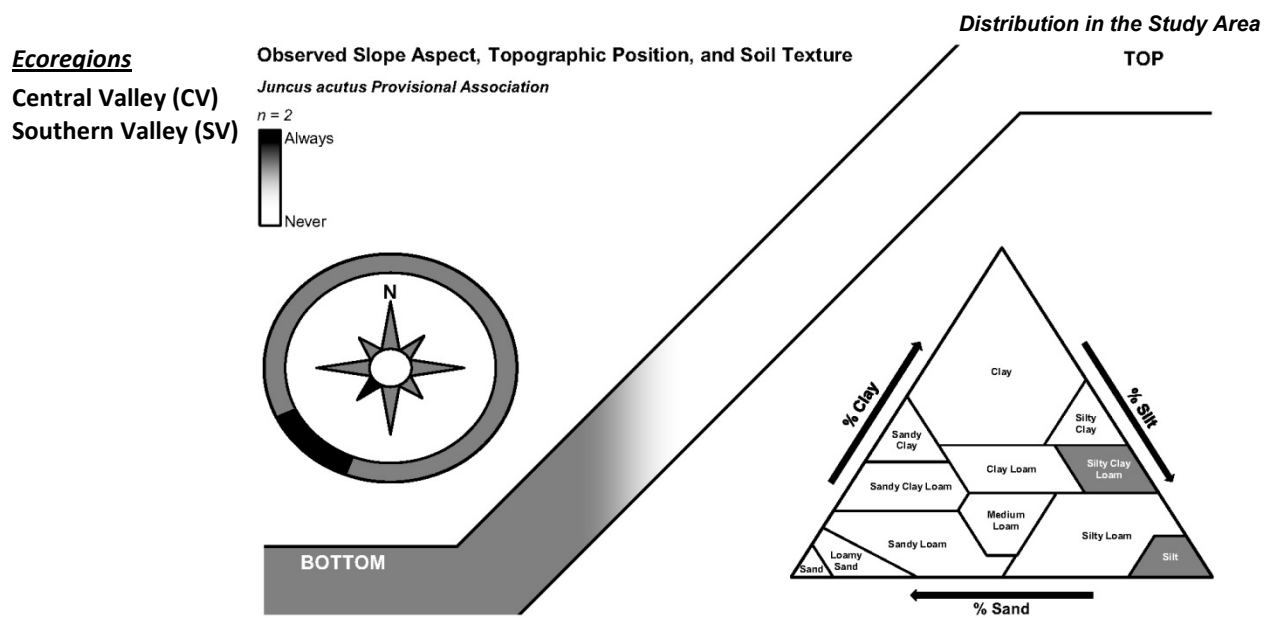
- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Distichlis spicata* must account for at least 5 percent relative cover in the herb stratum.
- If present, *Nassella lepida* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Nassella lepida* Association).
- If present, *Nassella pulchra* must account for less than 1 percent absolute cover in the herb stratum (otherwise see *Nassella pulchra* Association).
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).

5.15 *Juncus acutus* Provisional Alliance

Juncus acutus ssp. *leopoldii* is a robust tufted perennial rush with very sharp apical tips. Stands are associated with seeps at the upper edges of salt marshes, or occasionally farther up streams and rivers where marshy seeps or saturated ground exists. Stands are generally small, with some exceptions, such as those near the mouth of the San Diego River south of Mission Bay. Most stands form a narrow margin between salt marsh and uplands, usually less than 10 m wide. The understories of some stands reflect this salt marsh setting and contain *Jaumea carnosa* and other halophytic wetland species. A smaller number of stands was more directly associated with freshwater and did not contain salt marsh species. Thus, two provisional associations are described below, one with *J. carnosa* as the main herbaceous associate and the other simply called the *J. acutus* ssp. *leopoldii* Association, indicative of freshwater seeps and creek sides. Further sampling will be required to substantiate the true relationships between these and other similar wetland stands.

5.15.1 *Juncus acutus* Provisional Association

Juncus acutus ssp. *leopoldii* occurs as a dominant mostly in an open canopy with other shrubs including *Baccharis* spp. and *Isocoma menziesii*. Herbaceous cover occurs as codominant or in sparse association, including *Iva hayesiana*, *Distichlis spicata*, *Leymus triticoides*, *Anemopsis californica*, *Artemisia palmeri*, and *Schoenoplectus americanus*. This vegetation type is designated to describe its freshwater expression of the *J. acutus* Alliance as it extends upslope into freshwater systems.

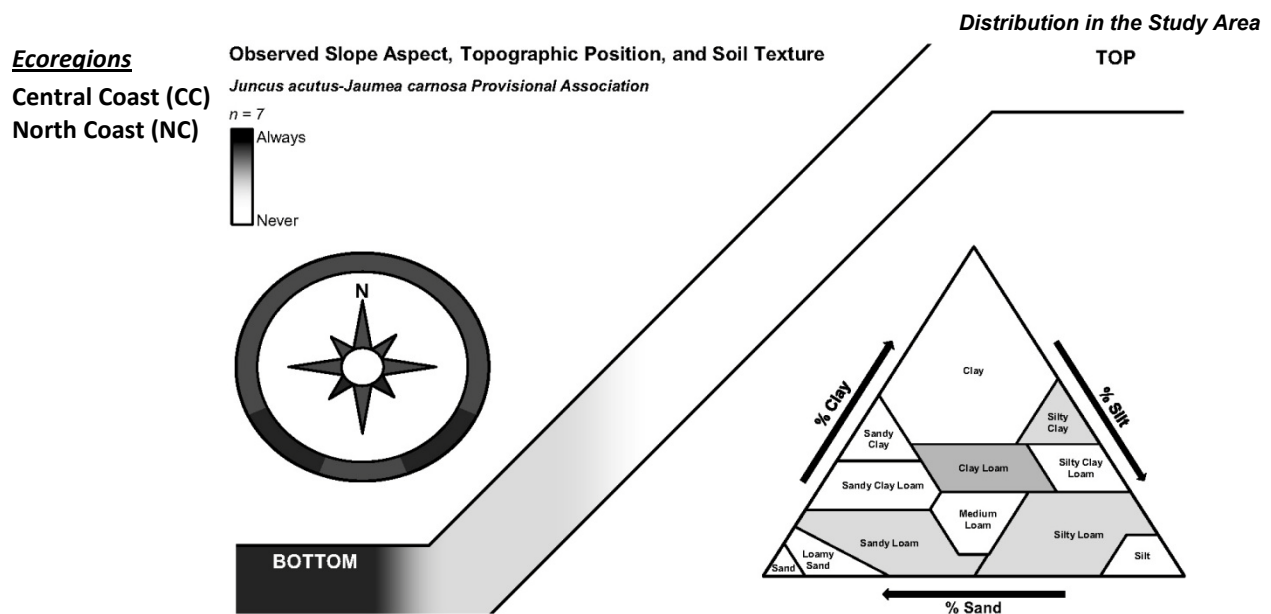


Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Juncus acutus* must account for at least 30 percent relative cover in the herb stratum.
- *Jaumea carnosa* must be absent.

5.15.2 *Juncus acutus*-*Jaumea carnosa* Provisional Association

Juncus acutus ssp. *leopoldii* and *Jaumea carnosa* occur dominants or codominants in an open shrub canopy. Associated shrubs and herbs include *Frankenia salina*, *Sarcocornia pacifica* (*Salicornia virginica*), *Isocoma menziesii*, *Distichlis spicata*, *Iva hayesiana*, and *Cuscuta salina*. This vegetation type is designated to describe the halophytic expression of the *Juncus acutus* Alliance.



Membership Rules

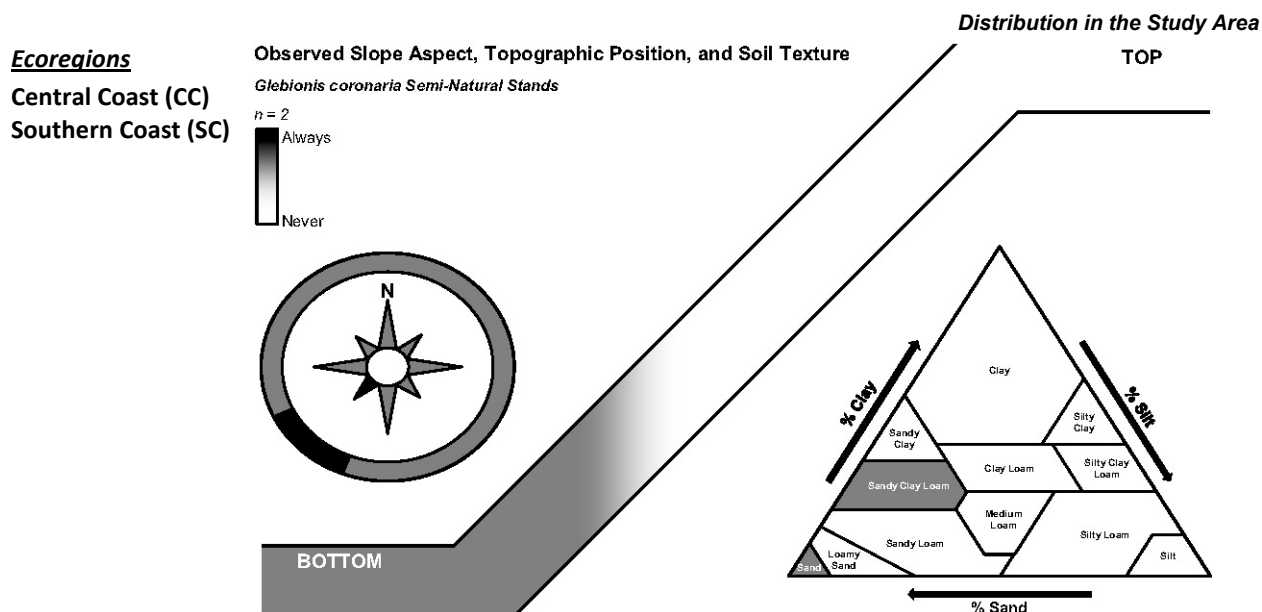
- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Juncus acutus* must account for at least 30 percent relative cover in the herb stratum, or combined cover of *Juncus acutus* and *Jaumea carnosa* must account for at least 50 percent relative cover in the herb stratum.
- *Jaumea carnosa* must be present.

5.16 *Glebionis coronaria* Semi-Natural Stands

Glebionis coronaria, formerly considered a member of the genus *Chrysanthemum*, is a showy annual horticultural escape that has become dominant in waste places such as dredge tailings and land fill adjacent to harbors, and coastal bays and lagoons. Stands have been mapped at Ballona Wetlands Ecological Preserve in Los Angeles County and have been sampled adjacent to Mission Bay at the mouth of the San Diego River within the study area. They are strongly dominated by *Glebionis* and contain many other weedy species. They also usually contain some natives including *Baccharis pilularis*, and coastal psammophytes such as *Camissonia cheiranthifolia*.

5.16.1 *Glebionis coronaria* Semi-Natural Stands

Glebionis coronaria is dominant or codominant in the herbaceous canopy at disturbed sites that may be on the margins but are not usually closely associated with native vegetation type. Associated herbs include many nonnative plants frequently in coastal areas, including *Mesembranthemum* spp., *Raphanus* spp., *Bromus* spp., *Salsola tragus*, *Melilotus* spp., *Erodium cicutarium*, and *Centaurea melitensis*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation must not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for less than 50 percent relative cover in the herb stratum.
- *Glebionis coronaria* must account for at least 30 percent relative cover in the herb stratum.

5.17 *Lepidium latifolium* Semi-Natural Stands

Lepidium latifolium is a pugnacious weed of freshwater to brackish wetlands, and a native of Europe. It has invaded reservoir margins, riparian corridors, seeps, and other low-lying moist areas throughout much of California from San Diego to Siskiyou counties. Stands in the study area are found in riparian corridors and have been sampled in the San Dieguito River watershed and observed elsewhere. They are considered semi-natural stands when no woody overstory is present but also dominate the understory of some *Salix gooddingii* and other willow stands in the study area. The general characteristics of these stands as understood statewide include *Lepidium latifolium* as the dominant in the herbaceous layer. Emergent trees and shrubs may occur at low cover. Herbs are the dominant layer and are generally < 2 m tall. The canopy is intermittent to continuous.

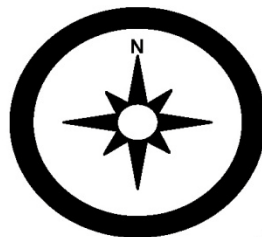
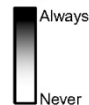
Ecoregions

Northern Valley (NV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Lepidium latifolium Semi-Natural Stands

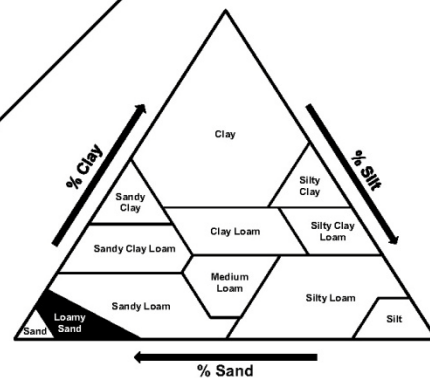
$n = 1$



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation must not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).

- Nonnative grass species must account for less than 50 percent relative cover in the herb stratum.
- *Lepidium latifolium* must account for at least 75 percent relative cover in the herb stratum.

5.18 *Leymus condensatus* Alliance

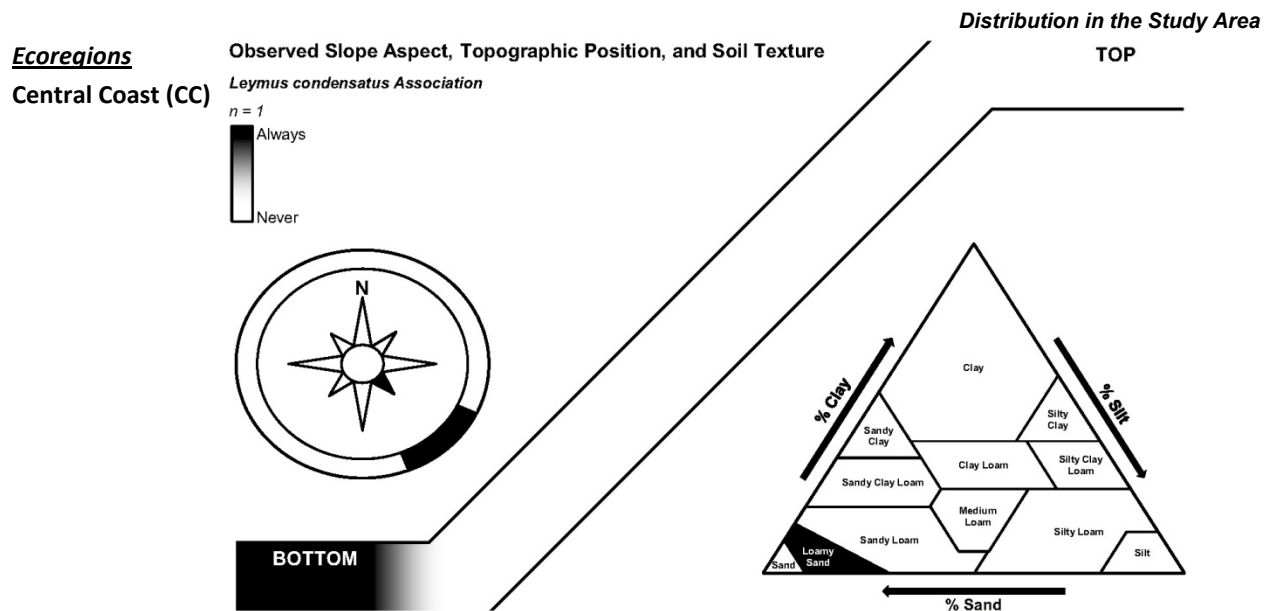
Leymus condensatus is a stout rhizomatous perennial grass that is commonly associated with stands of coastal sage scrub and other coastal vegetation from central to south coastal California. The best developed stands tend to be associated with somewhat mesic slopes (north-facing or concave) in the western Transverse Ranges where fire frequency is high enough to suppress shrub colonization.

The general characteristics of the alliance as described primarily from the Santa Monica Mountains of Ventura and Los Angeles counties is as follows: *L. condensatus* is dominant or codominant in the herbaceous layer with *Avena fatua*, *Brassica nigra*, *Bromus diandrus*, *Centaurea melitensis*, *Hirschfeldia incana*, and *Malacothrix saxatilis*. Emergent trees such as *Juglans californica* and *Quercus agrifolia*, or shrubs such as *Artemisia californica*, *Baccharis salicifolia*, and *Salvia leucophylla* may be present at low cover. The herb layer is < 3 m and cover ranges from open to intermittent.

Only a single small stand was sampled in the study area and it occupied the actively eroding banks of an intermittent stream channel in the northern unit of Torrey Pines State Reserve surrounded by coastal scrub.

5.18.1 *Leymus condensatus* Association

Leymus condensatus is dominant or codominant in the herbaceous canopy and typically interspersed with trees and shrublands. The herbaceous canopy often includes *Marah macrocarpus*, *Leymus triticoides*, *Bromus* spp., and *Silybum marianum*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Leymus condensatus* must account for at least 50 percent relative cover in the herb stratum.

5.19 *Leymus triticoides* Alliance

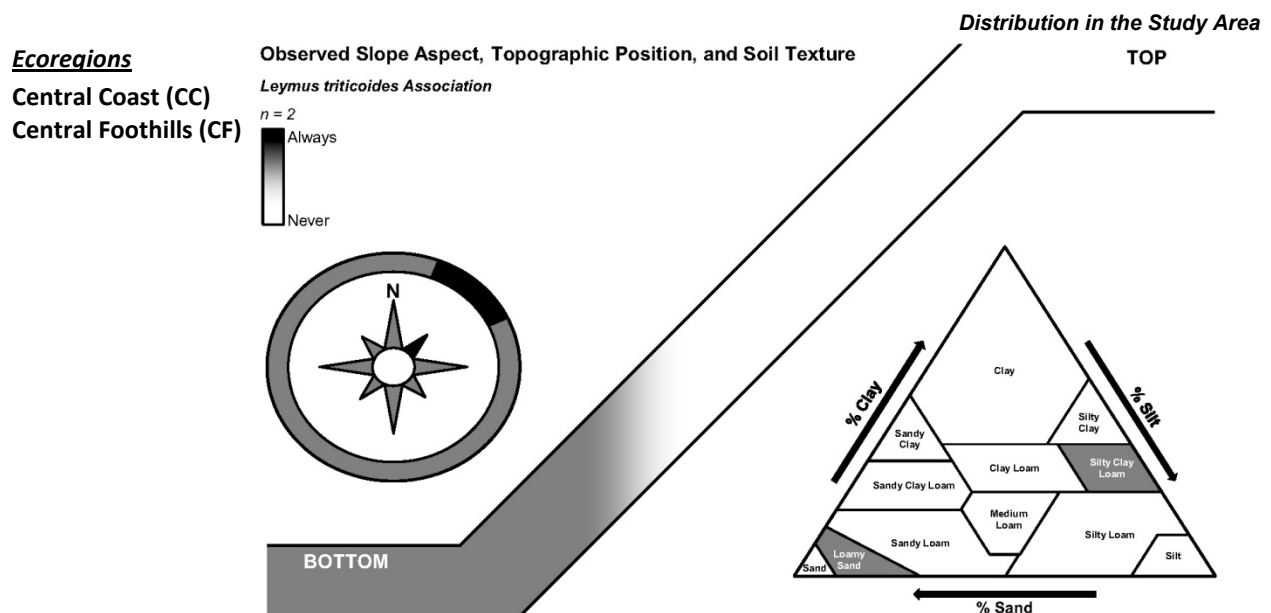
Leymus triticoides is a common native sod-forming grass in the western United States. It is tolerant of somewhat saline to alkaline soils and prefers moist conditions. Stands often form in moist areas at the upper edges of salt marshes or in bottomland riparian terraces. Some stands occupy sea bluffs along foggy parts of the coast of California. This species was thought to have formed large stands in the pre-European lowlands of the Central Valley.

In general, California stands are characterized by *L. triticoides* as the dominant or codominant in the herbaceous layer with *Ambrosia psilostachya*, *Anemopsis californica*, *Aristida purpurea*, *Avena fatua*, *Bromus* spp., *Danthonia unispicata*, *Distichlis spicata*, *Elymus elymoides*, *Hordeum* spp., *Lolium perenne*, *Juncus arcticus*, *Poa secunda*, and/or *Triglochin maritima*. Emergent shrubs or trees may be present at low cover. The herb layer is < 1 m and cover may be open to continuous.

In the study area, stands were found adjacent to lagoons and salt marshes and were identified as part of a single widespread association.

5.19.1 *Leymus triticoides* Association

Leymus triticoides is dominant or codominant with other grasses and herbaceous wetland affiliates, including *Ambrosia psilostachya*, *Anemopsis californica*, *Bromus* spp., *Distichlis spicata*, *Elymus elymoides*, *Lolium perenne*, and *Juncus arcticus*. Emergent shrubs or trees may be present at low cover and clonal stands of *L. xmultiflorus* may be present.



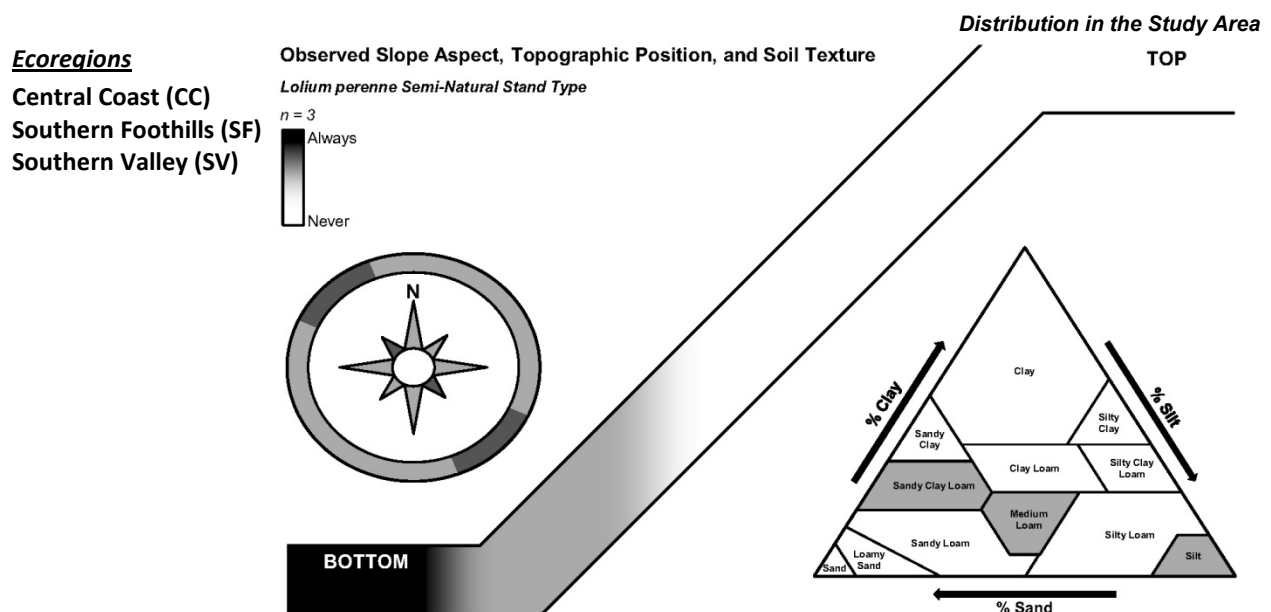
Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Leymus triticoides* must account for at least 50 percent relative cover in the herb stratum.

5.20 *Lolium perenne* Semi-Natural Stands

Lolium perenne (including *L. multiflorum*) is a common nonnative grass that is typically annual or short-lived perennial. It has become very widespread in low-lying heavy soils adjacent to marshes or in swales throughout much of California and tends to form a thick thatch that is resistant to colonization by native herbs and grasses.

In general these semi-natural stands, as defined in the state, have the following characteristics: *L. perenne* is dominant or codominant with other nonnatives in the herbaceous layer with *Agrostis stolonifera*, *Alopecurus aequalis*, *Asclepias fascicularis*, *Avena fatua*, *Brassica nigra*, *Bromus diandrus*, *B. hordeaceus*, *Cirsium vulgare*, *Cryptantha flaccida*, *Euphorbia spathulata*, *Festuca arundinacea*, *Holcus lanatus*, *Hordeum brachyantherum*, *Hordeum marinum*, *Cynodon dactylon*, *Leymus triticoides*, *Lotus corniculatus*, *Microseris douglasii*, *Nassella pulchra*, *Phalaris aquatica*, *Plantago erecta*, *Poa pratensis*, *Rorippa nasturtium-aquaticum*, *Rumex crispus*, and/or *Trifolium* spp. Emergent trees and shrubs may be present at low cover. Herbs are generally < 1 m tall and the canopy ranges from intermittent to continuous.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation does not fit any of the native herbaceous associations/alliances of Groups 1 and 2 (see Sections A, B, and C of the key for Group 1:

Upland Herbaceous Vegetation and Sections A and B.1 of the key for Group 2: Hydrophytic Herbaceous Vegetation).

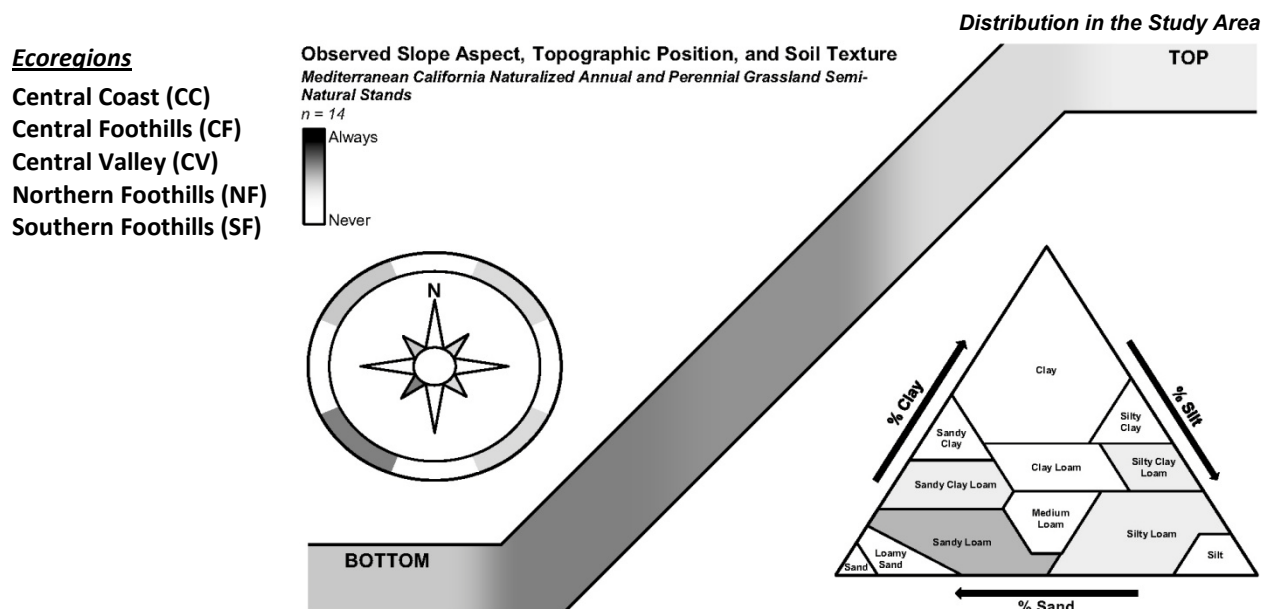
- *Lolium perenne* (*L. multiflorum*) must account for at least 30 percent relative cover in the herb stratum.

5.21 Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands

Unlike the other descriptions in this classification, this description is based on the group level, which is the hierarchical level above the alliance. The group level is a useful classification where distinction cannot be made to the alliance or association level. This group level classification may be applied in cases where nonnative grasses and forbs are dominant over native species, and where none of the following nonnative species are clearly dominant or codominant: *Avena* spp., *Bromus* (*diandrus*, *hordeaceus*, *rubens*), *Brachypodium distachyon*, *Lolium* (*perenne*, *multiflorum*, *temulentum*), *Pennisetum* spp., *Brassica nigra*, *Conium maculatum*, *Glebionis coronaria*.

Any of the species above may be present without dominance in a mixed association that may include many other naturalized ruderal species, including *Agrostis* (*avenacea*, *desertorum*, *stolonifera*, *viridis*), *Festuca arundinacea*, *Digitaria* spp., *Salsola* spp., *Erodium* spp., *Sorghum* spp., *Centaurea* spp., *Cynodon* spp., *Schismus* spp., and *Silybum marianum*. This vegetation type is widespread and highly variable, representing generalized situations where ruderal floras have replaced native types through a history of repeated soil disturbance and the introduction of nonnative plant species.

Alternatively, this classification may be applied in cases where the phenology of the species present precludes an identification to the alliance or association level.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- Vegetation does not fit any of the other herbaceous, Group 1 vegetation types (see the key for Group 1: Upland Herbaceous Vegetation).

5.22 *Muhlenbergia rigens* Alliance

Muhlenbergia rigens is an attractive large tufted perennial bunchgrass of moist areas occurring throughout much of California. It was widely used for basket making by native Californian tribes and was tended in beds often associated with nearby village sites. Stands tend to be small (< 0.5 ha) and scattered across the landscape in swales, edges of creeks, or near seeps.

In general, stands of this alliance sampled in California have the following characteristics: *M. rigens* is dominant or codominant in the herbaceous layer with *Aira caryophyllea*, *Artemisia dracunculus*, *Bromus diandrus*, *B. hordeaceus*, *B. rubens*, *Carex* spp., *Logfia gallica*, *Galium parisiense*, *Hypericum perforatum*, *Hypochaeris glabra*, *Juncus* spp., *Leymus triticoides*, *Lolium perenne*, *Lotus purshianus*, *Petrorhagia dubia*, *Senecio flaccidus*, *Solidago californica*, *Trifolium hirtum*. Emergent shrubs of *Eriogonum fasciculatum*, *Rubus armeniacus*, or *Toxicodendron diversilobum* may be present at low cover. Herbs are typically < 2 m and the canopy is intermittent to continuous.

Two stands were sampled in the fieldwork for this project. Both are below a typical minimum mapping unit size. Both are considered members of the *M. rigens* Association.

5.22.1 Muhlenbergia rigens Association

Muhlenbergia rigens is codominant to dominant in the herbaceous canopy in open stands. Associated subdominants include *Sidalcea malviflora*, *Thalictrum fendleri*, *Geranium spp.*, *Stachys spp.*, *Urtica dioica*, *Artemisia dracuncululus*. This vegetation type occurs at the edges of streams, intermittent streams, and wet meadows.

Ecoregions

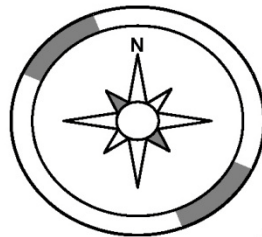
Central Foothills (CF)
Northern Foothills (NF)

Observed Slope Aspect, Topographic Position, and Soil Texture

Muhlenbergia rigens Association

$n = 2$

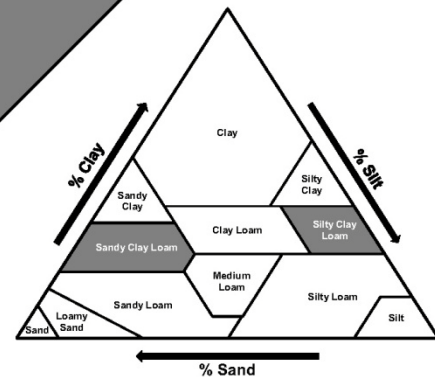
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Muhlenbergia rigens* must account for at least 5 percent relative cover in the herb stratum.
- If present, *Nassella lepida* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Nassella lepida* Association).
- If present, *Nassella pulchra* must account for less than 1 percent absolute cover in the herb stratum (otherwise see *Nassella pulchra* Association).
- If present, *Distichlis spicata* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Distichlis spicata*-Annual Grasses Association).

5.23 *Nassella lepida* Provisional Alliance

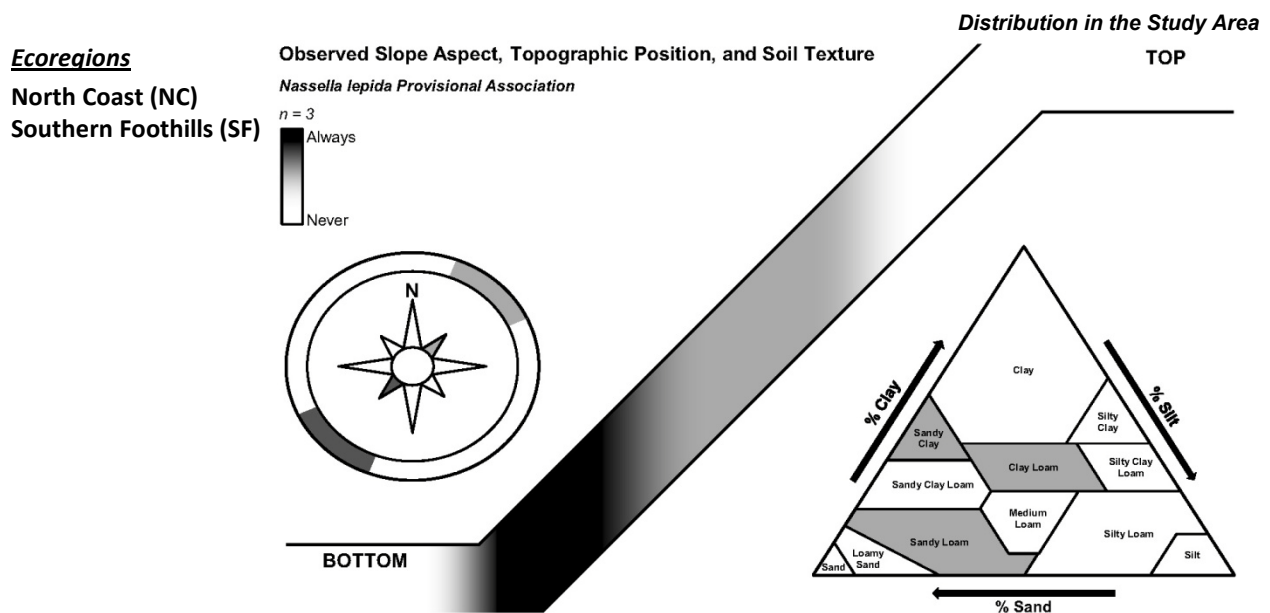
Although the range of *Nassella lepida* is extensive, stands have not been widely reported or sampled throughout California. This perennial grass is often associated with the understory of stands of coastal sage scrub from central to south coast California and the few stands dominated by this species have been found in small openings commonly surrounded by *Artemisia californica*, *Salvia mellifera*, and other coastal sage scrub alliances, sometimes where soils are distinctly heavier or the topography is locally less steep.

Based on the existing samples from other parts of the state, general characteristics of the provisional alliance include the following: *Nassella lepida* is dominant in the herbaceous layer with *Bromus hordeaceus*, *Calamagrostis koelerioides*, *Festuca californica*, *Melica californica*, *M. torreyana*, *Nassella pulchra*, and *Poa secunda*. Emergent shrubs of *Eriogonum cinerea*, *Malosma laurina*, *Rhus integrifolia*, and *Salvia mellifera* may be present at low cover. Herbs are < 1 m and the canopy is open.

5.23.1 *Nassella lepida* Provisional Association

Nassella lepida is codominant in an open herbaceous canopy. Associated herbaceous flora includes *Bloomeria* spp., *Dichelostemma capitatum*, *Allium* spp., *Fritillaria biflora*, *Brodiaea* spp., *Calochortus* spp., *Lasthenia* spp., *Plantago* spp., *Melica imperfecta*, *Porophyllum gracile*, *Dodecatheon clevelandii*, *Crassula connata*, *Selaginella* spp., and *Sisyrinchium bellum*.

This vegetation type is most often mixed with other herbaceous native flora in openings of shrublands. It is less extensive than *Nassella pulchra*, which is more prominent in native grassland vegetation types of more loamy soils.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Nassella lepida* must account for at least 5 percent relative cover in the herb stratum.
- If *Nassella pulchra* accounts for greater than 1 percent absolute cover in the herb stratum, *N. lepida* must account for more cover than *N. pulchra* (otherwise see *Nassella pulchra* Association).

5.24 *Nassella pulchra* Alliance

Nassella pulchra, the state grass of California, is a widespread bunchgrass that is representative of many native herbaceous stands west of the higher mountains and the desert. Stands in Southern California are well distributed from the immediate coast to the inland foothill and lower mountain valleys. They commonly occur on heavy soils of lower slopes and valleys or on clay-rich upland soils. Most well-developed stands have no history of tilling or other major cultivation activities.

In general, characteristics of the alliance statewide include the following: *N. pulchra* is dominant or characteristically present in the herbaceous layer with other perennial grasses, including *Elymus glaucus*, *Festuca californica*, *Hordeum brachyantherum*, *Koeleria macrantha*, *Lolium perenne*, *Melica californica*, *M. imperfecta*, *N. lepida*, *N. cernua*, and *Poa secunda*; and with perennials, such as *Calochortus* spp., *Calystegia* spp., *Sanicula* spp., and *Sisyrinchium bellum*. Annual herbs, including *Astragalus* spp., *Avena barbata*, *A. fatua*, *Bromus hordeaceus*, *B. rubens*, *Clarkia* spp., *Cryptantha* spp., *Croton setigerus*, *Erodium* spp., *Hirschfeldia incana*, *Holocarpha virgata*, *Lasthenia* spp., *Lepidium nitidum*, *Lupinus* spp., *Plantago* spp., and *Trifolium* spp., are common. Emergent *Artemisia californica*, *Eriogonum fasciculatum*, *Hazardia squarrosa*, and other shrubs and trees may be present at cover. Herbs are < 1 m and the cover is open to continuous.

5.24.1 *Nassella pulchra* Association

Nassella pulchra is codominant to sparse in the herbaceous canopy of grasslands, grassland-shrubland complexes, or Engelmann oak woodland. This type is often proximally associated with vernal pools. Associated herbs include *Deinandra* spp., *Chlorogalum* spp., *Grindelia hirsutula*, *Osmadenia tenella*, *Brodiaea* spp., *Clarkia purpurea*, *Dichelostemma capitatum*, *Corethrogyne filaginifolia*, *Nassella cernua*, and *Sisyrinchium bellum*. Nonnative annual grasses and broadleaf plant species including *Bromus* spp., and *Centaurea melitensis* often subdominant. This association shows resilience to fire and may be enhanced with infrequent fire by the suppression for invasive annuals.

Ecoregions

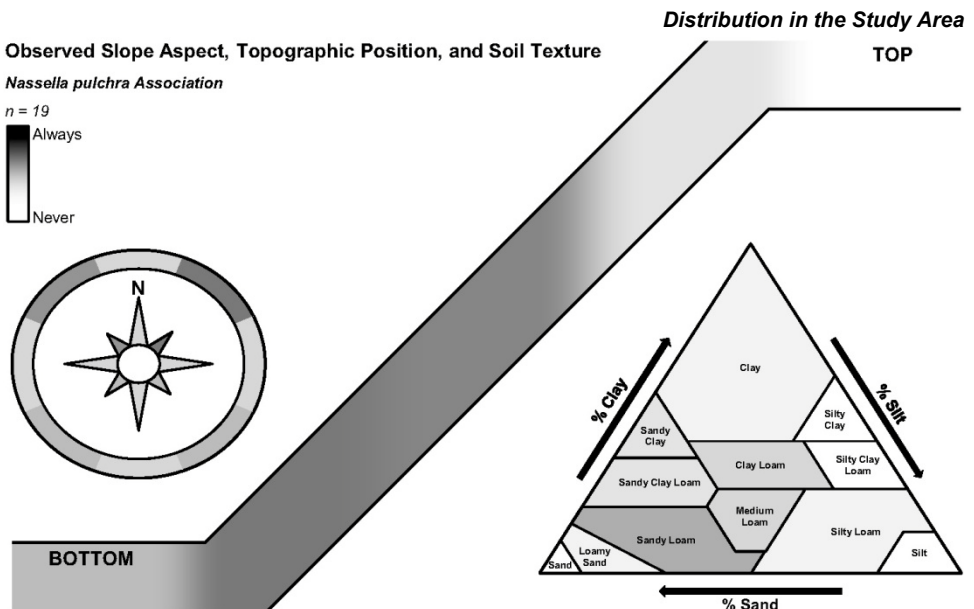
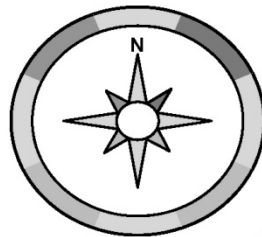
Central Coast (CC)
Central Foothills (CF)
Central Valley (CV)
North Coast (NC)
Northern Foothills (NF)
Southern Foothills (SF)
Southern Valley (SV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Nassella pulchra Association

$n = 19$

Always
Never



Membership Rules

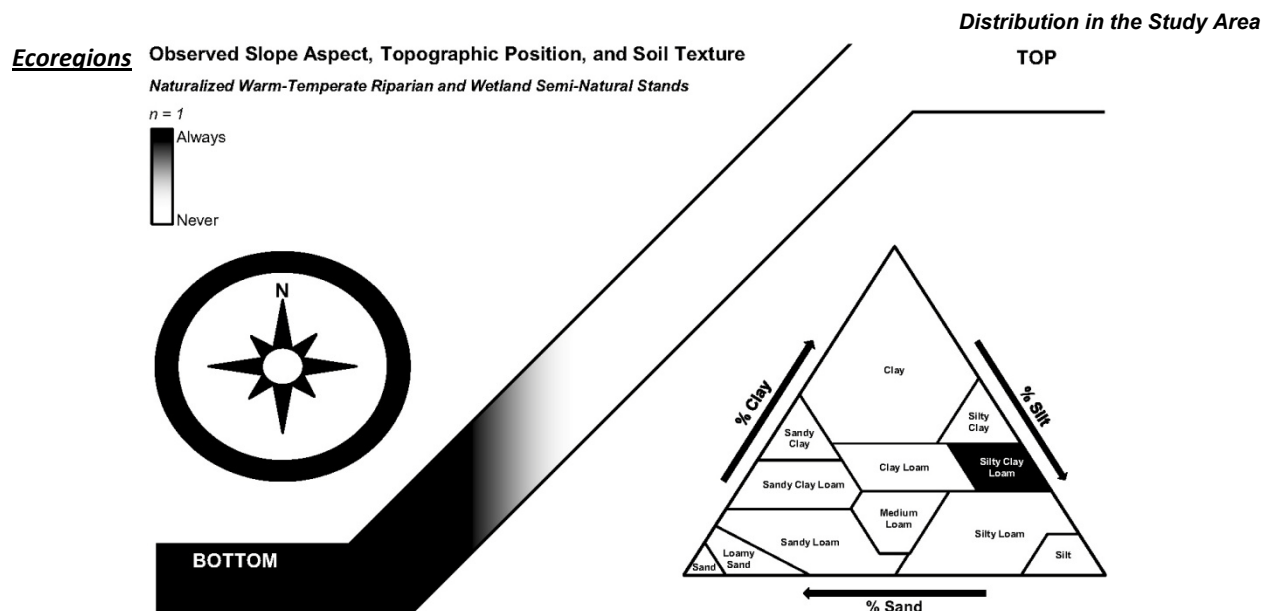
- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Nassella pulchra* must be present with greater than 1 percent absolute cover.
- If *Nassella lepida* accounts for greater than 5 percent relative cover in the herb stratum, *N. pulchra* must account for more cover than *N. lepida* (otherwise see *Nassella lepida* Association).

5.25 Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands

Unlike the other descriptions in this classification, this description is based on the group level, which is the hierarchical level above the alliance. The group level is a useful classification where distinction cannot be made to the alliance or association level. This group level classification may be applied in cases where nonnative grasses and forbs are dominant over native species, and where none of the following nonnative species are clearly dominant or codominant: *Arundo donax*, *Lepidium latifolium*, and *Lolium perenne* (*L. multiflorum*).

Any of the species above may be present without dominance in a mixed association that may include many other native and/or naturalized species, including *Carex* spp., *Cynodon* spp., *Cyperus* spp., *Eleocharis* spp., *Helminthotheca echioides*, *Polypogon* spp., and *Rumex* spp. This vegetation type is widespread and highly variable throughout drainage channels and other areas of low topographic relief, representing generalized situations where native species diversity is low or ruderal floras have replaced native types through a history of repeated soil disturbance and the introduction of nonnative plant species.

Alternatively, this classification may be applied in cases where the phenology of the species present precludes an identification to the alliance or association level.



- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.

- Vegetation does not fit any of the other herbaceous, Group 2 vegetation types (see the key for Group 2: Hydrophytic Herbaceous Vegetation).

5.26 *Pennisetum setaceum* Semi-Natural Stands

Pennisetum setaceum is an invasive perennial bunchgrass native to southern Africa that was introduced for horticultural purposes and for bank stabilization. It has taken over many steep eroded banks and slopes from coastal Southern California to the desert margins over the past few decades. It generally grows in close stands that have a tendency to crowd out native species of similar steep erosive settings. It also burns readily and regenerates from rootstalks and from seed prolifically.

In general, the characteristics of the stands as defined in the state so far include the following: *P. setaceum* or other *Pennisetum* species are dominant or codominant with other nonnative species in the herbaceous layer. Emergent shrub and tree layers may occur with low cover. The herb layer is < 1.5 m and depending on the maturity or substrate conditions, and the canopy may be open to continuous.

5.26.1 *Pennisetum setaceum* Semi-Natural Stands

Pennisetum setaceum occurs as a dominant in the herbaceous canopy of disturbed or naturally dry, barren sites adjacent to or within various shrublands. Large or significant stands are occasional along the coast and foothill area within the study area. *Milinis repens* (*Rhynchelytrum r.*) often invades similar habitats.

Ecoregions

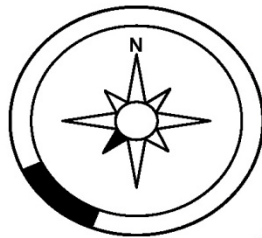
Central Valley (CV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Pennisetum setaceum Semi-Natural Stands

$n = 1$

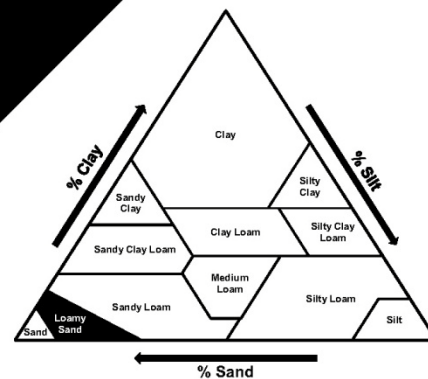
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If native species present, vegetation does not fit any of the native herbaceous associations/alliances of Group 1 (see Sections A, B, and C of the key for Group 1: Upland Herbaceous Vegetation).
- Nonnative grass species must account for at least 50 percent relative cover in the herb stratum.
- *Pennisetum setaceum* must account for at least 30 percent relative cover in the herb stratum.

5.27 *Sarcocornia pacifica* (*Salicornia depressa*) Alliance

Sarcocornia pacifica is the most characteristic salt marsh plant throughout coastal California. This species ranges from coastal marshes to inland alkaline seeps. The annual *Salicornia depressa* and another related species, *Salicornia bigelovii*, grow in salt marshes of Southern California. Although these species may form segregated stands, the three species are considered members of the same alliance by Sawyer et al. (2009) because of overlapping ecological settings. Stands in the study area may include all three species.

In general, stands of this alliance are characterized by *Sarcocornia pacifica* or *Salicornia depressa* as dominant or codominant in the subshrub and herbaceous layers with *Atriplex patula*, *A. prostrata*, *Batis maritima*, *Bolboschoenus maritimus*, *Cotula coronopifolia*, *Crypsis schoenoides*, *Cuscuta salina*, *Distichlis spicata*, *Echinochloa crus-galli*, *Frankenia salina*, *Grindelia stricta*, *Jaumea carnosa*, *Juncus* spp., *Lepidium latifolium*, *Limonium californicum*, *Monanthochloe littoralis*, *Persicaria lapathifolia*, *Sesuvium verrucosum*, *Spartina foliosa*, *Suaeda esteroa*, *S. taxifolia*, *Triglochin maritima*, *Xanthium strumarium*, and algae. Plants are usually <1.5 m and the canopy is intermittent to continuous.

Several associations have been defined in the salt marshes of the study area. In general, these marshes are the most ecologically well partitioned with the highest diversity of native halophytic species of any in the state. They include the *Salicornia bigelovii* Association where *S. bigelovii* is dominant or characteristic, the *Sarcocornia pacifica* Association, characterized by sole dominance of *S pacifica*; the *Sarcocornia pacifica*-*Frankenia salina* Association of higher marsh positions, the *Sarcocornia pacifica*-*Jaumea carnosa* Association of mid to lower marsh positions, the *Sarcocornia pacifica*-*Jaumea carnosa*-*Batis maritima* Association of more open mudflats in the middle marsh, and the *Sarcocornia pacifica*-*Monanthochloe littoralis* Association of the upper marsh often adjacent to *Arthrocnemum subterminale* Alliance stands.

5.27.1 *Salicornia bigelovii* Provisional Association

Stands are characterized by *Sarcocornia pacifica* or *Salicornia depressa* as a dominant or codominant with cover of *Salicornia bigelovii* in a generally continuous cover herbaceous canopy. Associated species may include *Atriplex* spp., *Batis maritima*, *Cuscuta salina*, *Frankenia salina*, *Jaumea carnosa*, *Monanthochloe littoralis*, *Suaeda* spp., and *Spartina foliosa*.

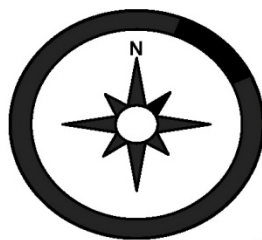
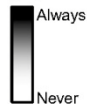
Ecoregions

Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Salicornia bigelovii Provisional Association

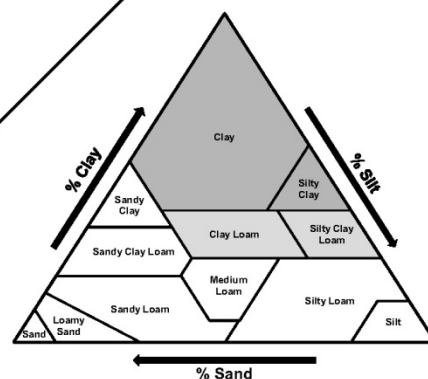
$n = 7$



BOTTOM

Distribution in the Study Area

TOP

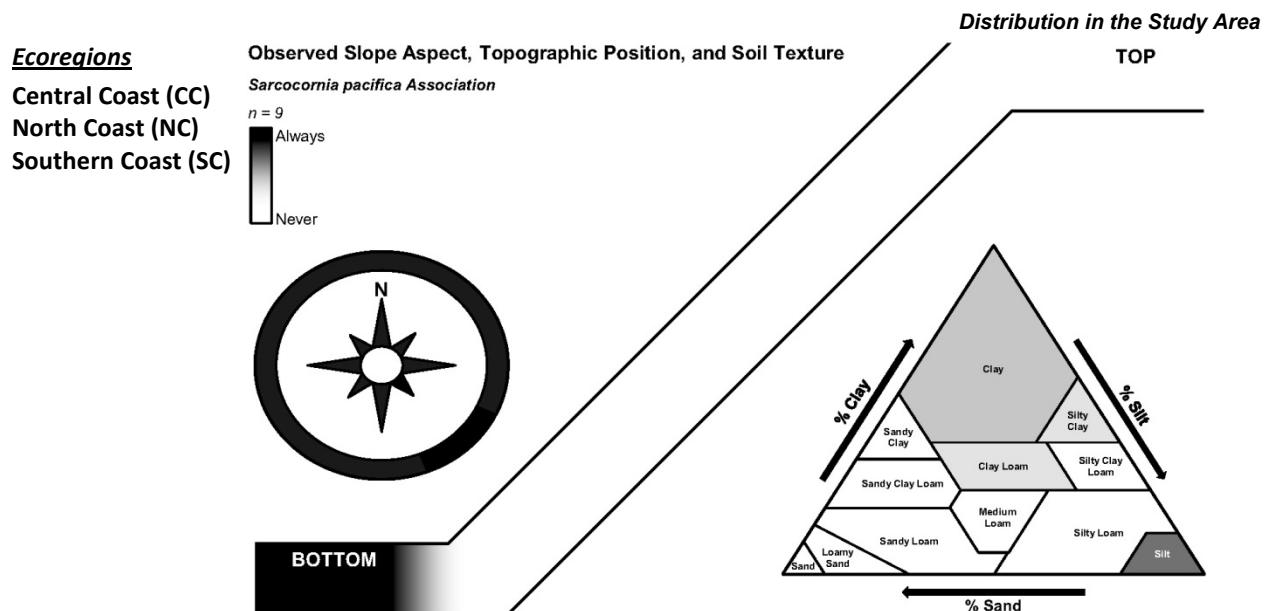


Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).
- If present, *Frankenia* spp. must account for less than 30 percent relative cover in the herb stratum (otherwise see *Frankenia* spp. Associations).
- If present, *Arthrocnemum subterminale* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale* Alliance).
- Combined cover of *Salicornia* spp. and/or *Sarcocornia* spp. must account for at least 30 percent relative cover in the herb stratum.
- *Salicornia bigelovii* must account for at least 5 percent relative cover in the herb stratum.

5.27.2 *Sarcocornia pacifica* Association

Sarcocornia pacifica dominates the herbaceous canopy forming mostly continuous vegetative cover in large uniform tidal flats, incised by tidal channels along which open muddy banks may support the annual pickle weeds (*Salicornia bigelovii*, *S. depressa*, and *Batis maritima*) and emergent stands of *Spartina foliosa*.

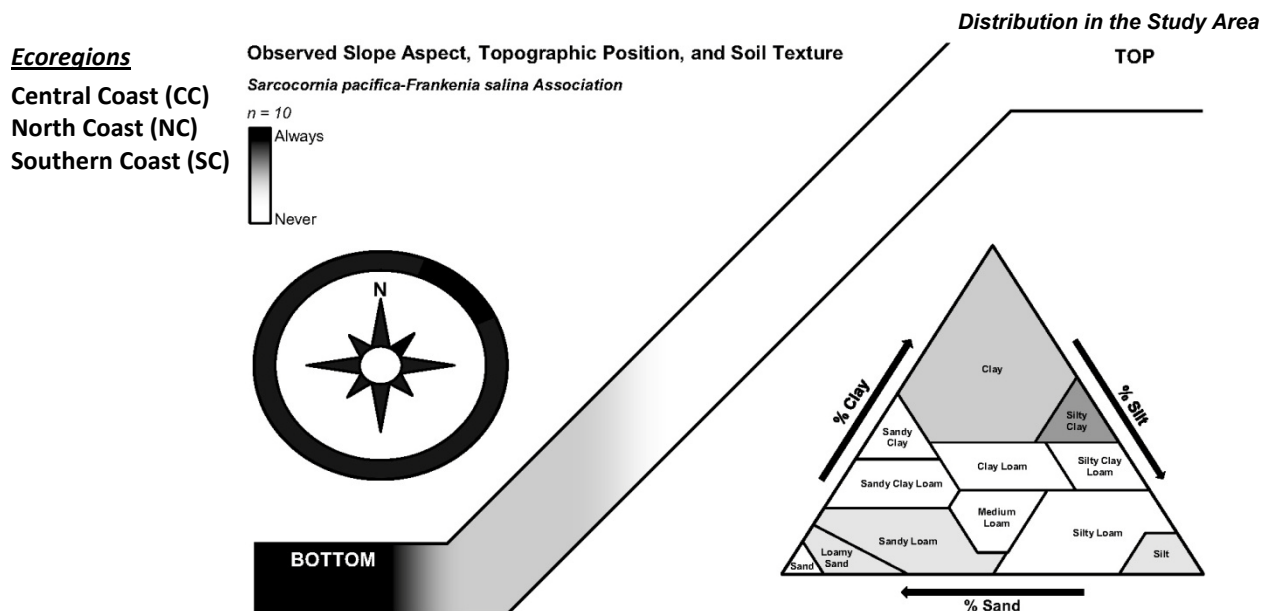


Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).
- *Frankenia salina* must be absent.
- If present, *Arthrocnemum subterminale* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale* Alliance).
- Combined cover of *Salicornia* spp. and/or *Sarcocornia* spp. must account for at least 30 percent relative cover in the herb stratum.
- *Jaumea carnosa* must be absent.
- If present, *Salicornia bigelovii* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Salicornia bigelovii* Association).

5.27.3 *Sarcocornia pacifica*-*Frankenia salina* Association

Sarcocornia pacifica is dominant with *Frankenia salina* codominant in a generally continuous canopy on terraces and upper portions of tidal flats. Associated shrubs and herbs include *Isocoma menziesii*, *Malvella leprosa*, *Pluchea odorata*, *Distichlis spicata*, *Atriplex prostrata*, and *Bolboschoenus maritimus*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).
- *Frankenia salina* must be present, but *Frankenia* spp. must account for less than 30 percent relative cover in the herb stratum (otherwise see *Frankenia* spp. Associations).
- Combined cover of *Salicornia* spp. and/or *Sarcocornia* spp. must account for at least 5 percent relative cover in the herb stratum.
- If present, *Arthrocnemum subterminale* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale* Alliance).

- If present, *Monanthochloe littoralis* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Sarcocornia pacifica*-*Monanthochloe littoralis* Special Stands).
- If present, *Bolboschoenus maritimus* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Bolboschoenus maritimus* Association).
- If *Juncus acutus* ssp. *leopoldii* present, combined cover of *J. acutus* ssp. *leopoldii* and *Jaumea carnosa* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Juncus acutus* Provisional Alliance).
- If present, *Jaumea carnosa* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Sarcocornia pacifica*-*Jaumea carnosa* Associations).
- If present, *Salicornia bigelovii* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Salicornia bigelovii* Association).

5.27.4 *Sarcocornia pacifica*-*Jaumea carnosa* Association

Sarcocornia pacifica and *Jaumea carnosa* are codominant forming continuous cover in the herbaceous canopy in portions of the upper salt marsh. Associated shrubs and herbs include *Frankenia salina*, *Juncus acutus* ssp. *leopoldii*, *Arthrocnemum subterminale*, *Isocoma menziesii*, *Limonium* spp., *Distichlis spicata*, and *Atriplex prostrata*.

Ecoregions

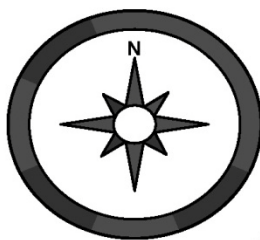
Central Coast (CC)
North Coast (NC)
Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Sarcocornia pacifica-*Jaumea carnosa* Association

n = 10

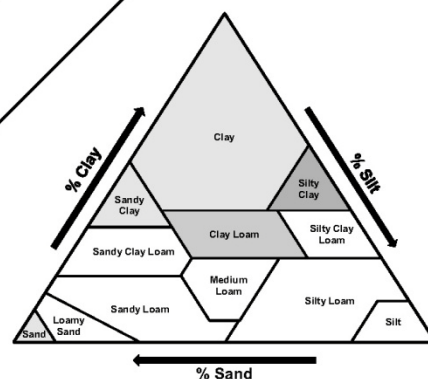
Always
Never



BOTTOM

Distribution in the Study Area

TOP



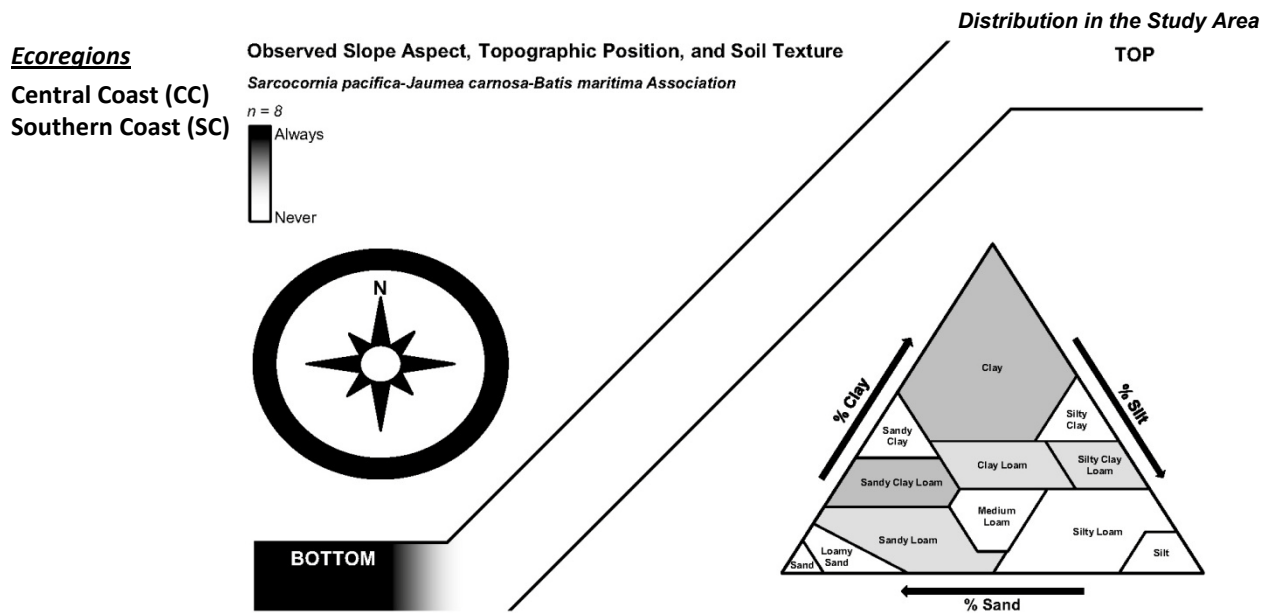
Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).
- *Frankenia salina* must be absent.
- If present, *Arthrocnemum subterminale* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale* Alliance).
- Combined cover of *Salicornia* spp. and/or *Sarcocornia* spp. must account for at least 30 percent relative cover in the herb stratum.
- *Jaumea carnosa* must account for at least 5 percent relative cover in the herb stratum.

- *Batis maritima* must be absent (otherwise see *Sarcocornia pacifica*-*Jaumea carnosa*-*Batis maritima* Association).
- If present, *Salicornia bigelovii* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Salicornia bigelovii* Association).
- If present, *Monanthochloe littoralis* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Sarcocornia pacifica*-*Monanthochloe littoralis* Special Stands).
- If present, *Bolboschoenus maritimus* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Bolboschoenus maritimus* Association).
- If *Juncus acutus* ssp. *leopoldii* present, combined cover of *J. acutus* ssp. *leopoldii* and *Jaumea carnosa* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Juncus acutus* Provisional Alliance).

5.27.5 *Sarcocornia pacifica*-*Jaumea carnosa*-*Batis maritima* Association

Sarcocornia pacifica, *Jaumea carnosa*, and *Batis maritima* codominate to form generally continuous herbaceous cover. Associated shrubs and herbs include *Distichlis spicata*, *Limonium* spp., *Suaeda* spp., *Frankenia salina*, *Monanthochloe littoralis*, and *Spartina foliosa*.



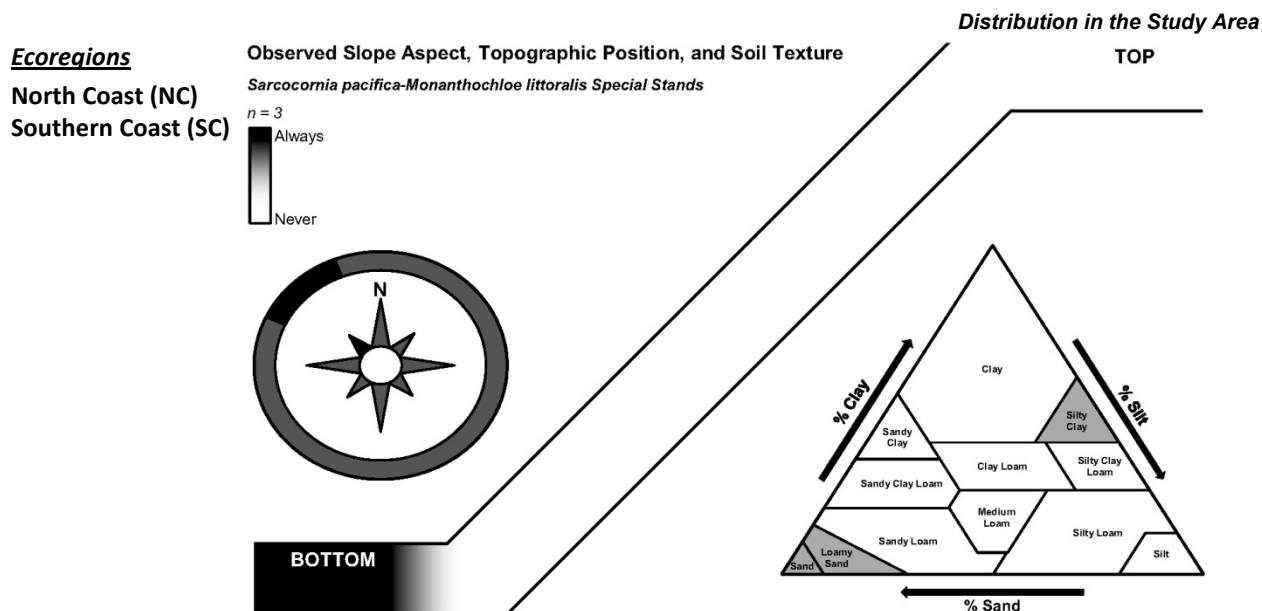
Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- If present, *Spartina foliosa* must account for less than 50 percent relative cover in the herb stratum and must have less than 10 percent absolute cover (otherwise see *Spartina foliosa* Association).
- *Frankenia salina* must be absent.
- If present, *Arthrocnemum subterminale* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Arthrocnemum subterminale* Alliance).
- Combined cover of *Salicornia* spp. and/or *Sarcocornia* spp. must account for at least 30 percent relative cover in the herb stratum.
- *Jaumea carnosa* must account for at least 5 percent relative cover in the herb stratum.
- *Batis maritima* must be present (otherwise see *Sarcocornia pacifica*-*Jaumea carnosa* Association).
- If present, *Salicornia bigelovii* must account for less than 5 percent relative cover in the herb stratum (otherwise see *Salicornia bigelovii* Association).

- If present, *Monanthochloe littoralis* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Sarcocornia pacifica*-*Monanthochloe littoralis* Special Stands).
- If present, *Bolboschoenus maritimus* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Bolboschoenus maritimus* Association).
- If *Juncus acutus* ssp. *leopoldii* present, combined cover of *J. acutus* ssp. *leopoldii* and *Jaumea carnosa* must account for less than 50 percent relative cover in the herb stratum (otherwise see *Juncus acutus* Provisional Alliance)

5.28 *Sarcocornia pacifica*-*Monanthochloe littoralis* Special Stands

Sarcocornia pacifica and *Monanthochloe littoralis* occur together as codominant to dominant with continuous cover in the herbaceous canopy of the upper salt marsh. Associated shrubs and herbs include *Arthrocnemum subterminale*, *Cressa truxillensis*, *Juncus acutus* ssp. *leopoldii*, *Parapholis incurva*, and *Frankenia salina*.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Monanthochloe littoralis* must account for at least 50 percent relative cover in the herb stratum
- *Sarcocornia pacifica* is diagnostically present (i.e., is not required to be present but is expected to occur with a probability of 80 percent or greater).

5.29 *Schoenoplectus acutus* Alliance

The alliance is a widespread, freshwater to slightly brackish marsh type, typical of marshes throughout much of North America. It is less tolerant of brackish conditions than is *Schoenoplectus californicus*, and the alliance is not found regularly on edges of large stretches of open water.

General characteristics of the alliance in California include the following: *S. acutus* is dominant or codominant in the herbaceous layer with *Azolla filiculoides*, *Calystegia sepium*, *Eichhornia crassipes*, *Hibiscus lasiocarpus*, *Hydrocotyle ranunculoides*, *Leersia oryzoides*, *Ludwigia peploides*, *Lycopus americanus*, *Phragmites australis*, *S. californicus*, *Sparganium eurycarpum*, *Triglochin* spp., *Typha angustifolia*, *T. latifolia*, and *Urtica dioica*. Emergent *Alnus rhombifolia*, *Populus fremontii*, and *Salix gooddingii* trees or *Cephalanthus occidentalis*, *Hoita macrostachya*, *Rubus armeniacus*, *S. exigua*, and *S. lasiolepis* shrubs may be present. Herbs are generally < 4 m and the cover is intermittent to continuous.

5.29.1 *Schoenoplectus acutus* Association

Schoenoplectus acutus is dominant with a closed canopy in the herbaceous canopy. Perennial bulrushes are rhizomatous and usually grow in dense colonies forming uniform stands that are not proximally associated with other plants except generally as wetland affiliates. Many other wetland plant species may be present in the riparian vegetation type but are not associated as fully aquatic emergent wetland plant species. Associated riparian species include *Ambrosia psilostachya*, *Baccharis salicifolia*, *Distichlis spicata*, *Salix* spp., *Populus* spp., *Platanus* spp., and *Isocoma menziesii*. Other emergent wetland plants may occur including other *Schoenoplectus* spp., *Scirpus* spp., *Bolboschoenus maritimus*, *Typha* spp., *Azolla* spp., *Lemna* spp., *Eichhornia crassipes*, and *Ludwigia* spp.

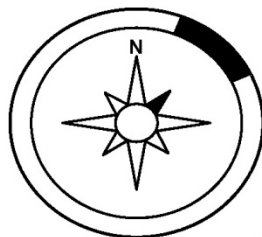
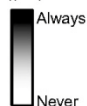
Ecoregions

Central Valley (CV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Schoenoplectus acutus Association

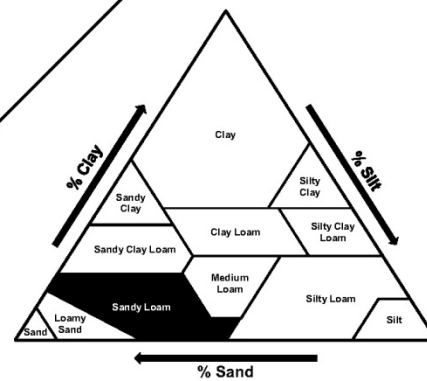
$n = 1$



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Schoenoplectus* spp. must account for at least 50 percent relative cover in the herb stratum.
- *Schoenoplectus acutus* must be the dominant *Schoenoplectus* sp.

5.30 *Schoenoplectus americanus* Alliance

The *Schoenoplectus americanus* Alliance occurs in many wetlands throughout the western United States and the southern Great Plains. Compared to the *S. acutus* Alliance, this alliance tends to tolerate higher alkalinity or salinity. Most stands in California are associated with inland wetlands adjacent to alkali playas and seeps, but they also occur in coastal brackish marshes.

The general characteristics of the alliance in California include the following: *Schoenoplectus americanus* is dominant or codominant plant in the herbaceous layer with *Anemopsis californica*, *Argentina egedii*, *Distichlis spicata*, *Juncus arcticus*, *J. cooperi*, *Phragmites australis*, *Schoenoplectus acutus*, *S. californicus*, *S. pungens*, and *Typha* spp. Herbs are < 4 m and the cover is intermittent to continuous.

5.30.1 *Schoenoplectus americanus* Association

Schoenoplectus americanus is dominant with a closed canopy in the herbaceous canopy. Perennial bulrushes are rhizomatous and usually grow in dense colonies forming uniform stands that are not proximally associated with other plants except generally as wetland affiliates. Many other wetland plant species may be present in the riparian vegetation type but are not associated as fully aquatic emergent wetland plant species. Associated riparian species include *Ambrosia psilostachya*, *Baccharis salicifolia*, *Distichlis spicata*, *Salix* spp., *Populus* spp., *Platanus* spp., and *Isocoma menziesii*. Other emergent wetland plants may occur including other *Schoenoplectus* spp., *Scirpus* spp., *Bolboschoenus maritimus*, *Typha* spp., *Azolla* spp., *Lemna* spp., *Eichhornia crassipes*, and *Ludwigia* spp.

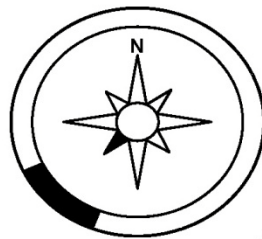
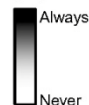
Ecoregions

Southern Foothills (SF)

Observed Slope Aspect, Topographic Position, and Soil Texture

Schoenoplectus americanus Association

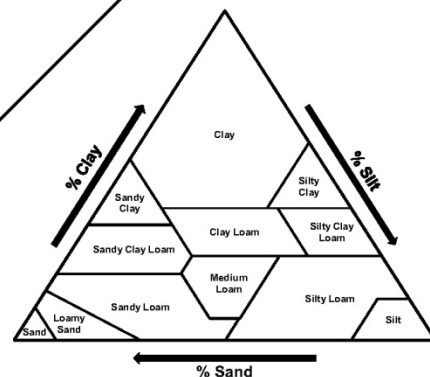
$n = 1$



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Schoenoplectus* spp. must account for at least 50 percent relative cover in the herb stratum.
- *Schoenoplectus americanus* must be the dominant *Schoenoplectus* sp.

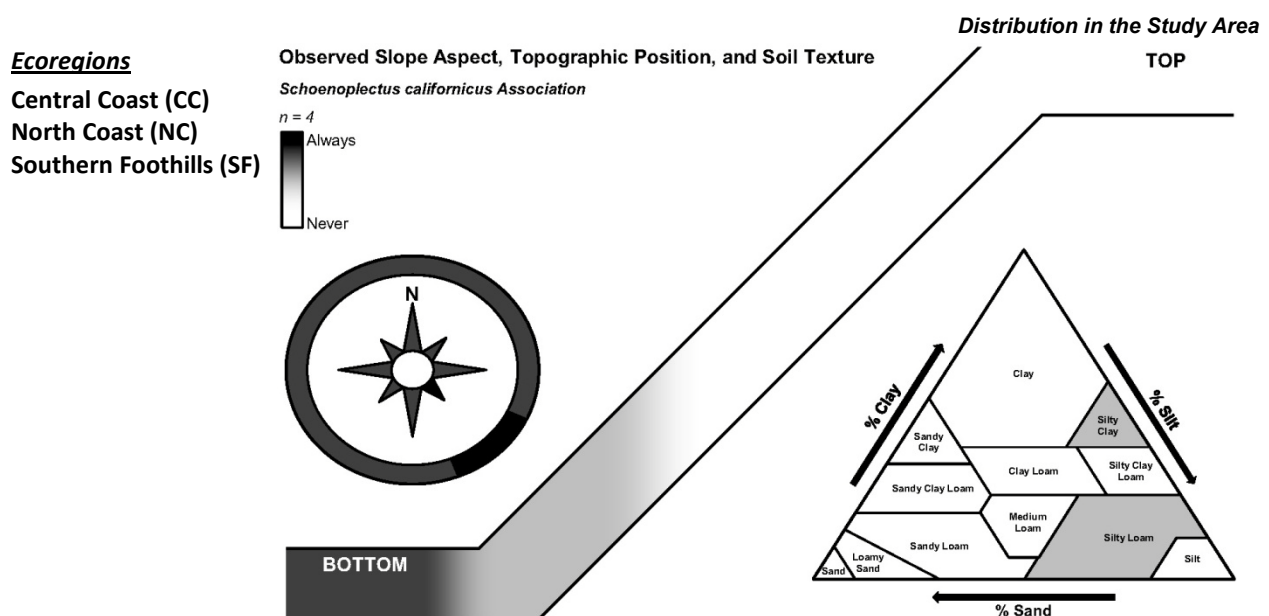
5.31 *Schoenoplectus californicus* Alliance

This alliance is a widespread emergent marsh type. Although *Schoenoplectus acutus* and *S. californicus* commonly occur in the same area, *S. californicus* tends to dominate on the outer, more exposed edges of marshes adjacent to open water, and *S. californicus* appears to be more tolerant of brackish water than *S. acutus*.

General characteristics of the alliance in California include the following: *S. californicus* is dominant or codominant in the herbaceous layer with *Apocynum cannabinum*, *Bolboschoenus maritimus*, *Eichhornia crassipes*, *Euthamia occidentalis*, *Ludwigia peploides*, *Persicaria punctata*, *Phragmites australis*, *S. acutus*, *Typha angustifolia*, *T. domingensis*, and *T. latifolia*. Emergent *Cephalanthus occidentalis*, *Rosa californica*, or *Salix lasiolepis* shrubs may be present at low cover. Herbs are generally < 4 m and the cover is intermittent to continuous.

5.31.1 *Schoenoplectus californicus* Association

Schoenoplectus americanus is dominant with a closed canopy in the herbaceous canopy. Perennial bulrushes are rhizomatous and usually grow in dense colonies forming uniform stands that are not proximally associated with other plants except generally as wetland affiliates. Many other wetland plant species may be present in the riparian vegetation type but are not associated as fully aquatic emergent wetland plant species. Associated riparian species include *Ambrosia psilostachya*, *Baccharis salicifolia*, *Distichlis spicata*, *Salix* spp., *Populus* spp., *Platanus* spp., and *Isocoma menziesii*. Other emergent wetland plants may occur, including other *Schoenoplectus* spp., *Scirpus* spp., *Bolboschoenus maritimus*, *Typha* spp., *Azolla* spp., *Lemna* spp., *Eichhornia crassipes*, and *Ludwigia* spp.



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Schoenoplectus* spp. must account for at least 50 percent relative cover in the herb stratum.
- *Schoenoplectus californicus* must be the dominant *Schoenoplectus* sp.

5.32 *Selaginella bigelovii* Alliance

The alliance is characteristic of outcrops in much of cismontane California. It typically occurs on gently to moderately sloping slabs of rock and, over time, may form thick mats of intertwined roots and rhizomes. These mats catch soil and dust and build up enough soil to supply substrate for other herbaceous species. These stands are visible on outcrops at a distance and often show up as dark mats with emergent drying grass stems and scattered shrubs.

Stands of this alliance as described for the state have the following characteristics: *Selaginella bigelovii* is dominant or conspicuous as rhizomatous mats in the herbaceous layer with *Aira caryophyllea*, *Avena barbata*, *Bromus rubens*, *B. diandrus*, *Filago californica*, *Lessingia filaginifolia*, *Melica imperfecta*, *Mirabilis californica*, *Plantago erecta*, and *Vulpia microstachys*. Emergent shrubs of *Adenostoma fasciculatum*, *Artemisia californica*, *Ceanothus crassifolius*, *Diplacus aurantiacus*, *Eriogonum fasciculatum*, *E. wrightii*, and *Hesperoyucca whipplei* may occur at low cover. Herbs are <50 cm and the canopy is intermittent to continuous. Moss and lichens are usually present and may equal or exceed vascular plant cover.

Selaginella bigelovii is dominant in dense continuous mats in the herbaceous canopy. This spike-moss occurs most often in small colonies that occupy small areas of thin soils or the crevices of rocks on mesic sites. There are also large colonies of *S. bigelovii* that occur on rocky faces of massive boulders and rock outcrops such as the porous granitic faces of Mount Woodson granodiorite although this applies to a variety of other geologies. Such sites often support a very specialized flora that can uniquely optimize the short winter moisture and effectively compete where trees, shrubs, and other herbs cannot survive. Associated plants include *Lotus argophyllus*, *Lasthenia gracilis*, *Crassula connata*, *S. cinerascens*, *Dudleya attenuata*, *D. pulverulenta*, *D. variegata*, *D. viscida*, and many species of ferns. Some nonnative plants that can also encroach this vegetation type are *Pennisetum setaceum*, *Melinis repens*, *Lamarckia aurea*, *Erodium* spp., and *Bromus* spp.

Within the study area, this type is known to the alliance only.

Distribution in the Study Area

Ecoregions

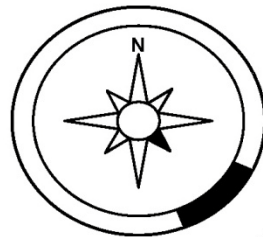
Central Foothills (CF)
Southern Foothills (SF)

Observed Slope Aspect, Topographic Position, and Soil Texture

Selaginella bigelovii Alliance

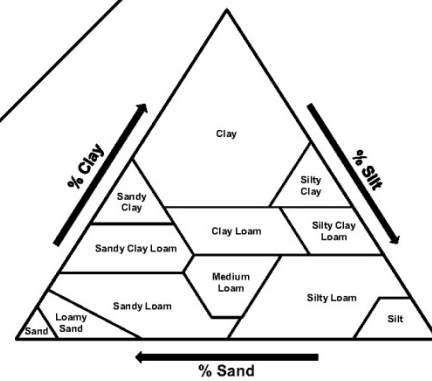
$n = 1$

Always
 Never



BOTTOM

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Selaginella bigelovii* must account for at least 50 percent relative cover in the herb stratum.

5.33 *Spartina foliosa* Alliance

This alliance often dominates lower-marsh settings of coastal salt marshes in Central and Southern California. In Southern California stands occur in low marshes, along creeks, and up to the marsh plain from Santa Barbara County to San Diego County. The largest stands occur in the marshes at Anaheim Bay, Bolsa Chica, Mission Bay, Mugu Lagoon, San Diego Bay, Tijuana Estuary, and Upper Newport Bay.

Stands throughout California are relatively simple, including *Spartina foliosa* as the dominant in the herbaceous layer, and may include *Batis maritima*, *Sarcocornia pacifica*, *Schoenoplectus californicus*, and algae. Herbs are generally < 1.5 m and the canopy is intermittent to continuous.

5.33.1 *Spartina foliosa* Association

Spartina foliosa occurs in dense colonies in the lower tidal portion of estuaries. Plants of the lower salt marsh that are associated include *Sarcocornia pacifica* and *Batis maritima*. The highly invasive nonnative *Spartina densiflora* occurs elsewhere in California although this species has not been conclusively identified in San Diego County.

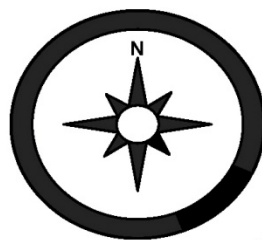
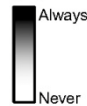
Ecoregions

Central Coast (CC)
North Coast (NC)
Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Spartina foliosa Association

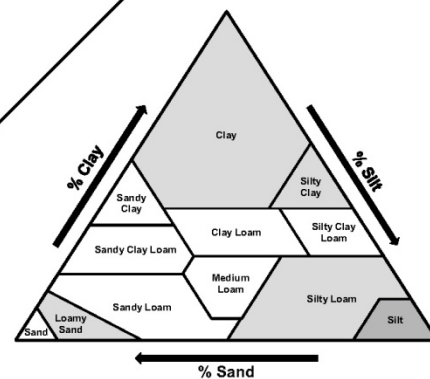
$n = 7$



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Spartina foliosa* must account for at least 50 percent relative cover in the herb stratum, or must be present with at least 10 percent absolute cover.

5.34 *Suaeda esteroa* Special Stands

Suaeda esteroa is a rare associate of coastal salt marshes in the San Diego area. A single stand dominated by *S. esteroa* was sampled in the Mission Bay area. It is otherwise closely related to *Sarcocornia pacifica* Alliance stands in the vicinity. It is uncertain if other stands of this species exist; however, several stands of *S. pacifica* Alliance sampled in this study did have individuals of *S. esteroa* present.

Description

Suaeda esteroa is codominant to dominant usually having continuous cover in the herbaceous canopy. Associated shrubs and herbs include many plants of the upper salt marsh including, *Sarcocornia pacifica*, *Arthrocnemum subterminale*, *Isocoma menziesii*, and *Atriplex* spp. Two other perennial species of *Suaeda* (*S. nigra* and *S. taxifolia*) also occur within the study area and occur in several salt marsh associations, most commonly within associations of the *S. pacifica* Alliance.

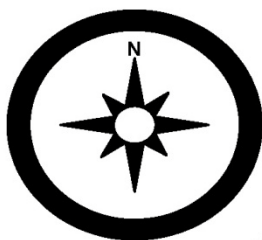
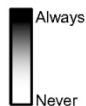
Ecoregions

Southern Coast (SC)

Observed Slope Aspect, Topographic Position, and Soil Texture

Suaeda esteroa Special Stands

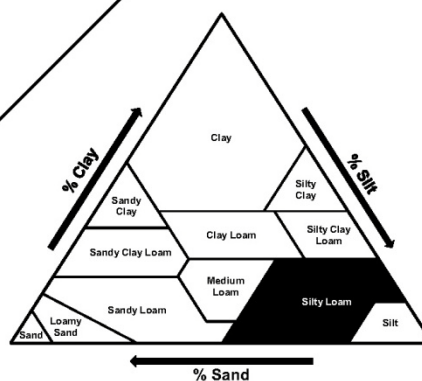
$n = 1$



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Suaeda esteroa* must account for at least 50 percent relative cover in the shrub canopy, or *S. esteroa* must account for at least 30 percent relative cover and combine with other *Suaeda* spp. to form at least 50 percent relative cover in the shrub canopy.
 - If *S. esteroa* is absent and other *Suaeda* spp. account for at least 50 percent relative cover, see *Sarcocornia pacifica* Alliance.

5.35 *Typha* (*angustifolia*, *domingensis*, *latifolia*) Alliance

Cattails are synonymous with marshes throughout much of the world. In the National Vegetation Classification, as shown on the NatureServe website, each *Typha* species is given its own alliance. However, Sawyer et al. (2009) treat all three within the same single alliance (as named above). All three species have similar ecologies. *Typha* species commonly hybridize when they grow in mixed stands. Most studies report mixed stands, so the alliance's name as treated in California includes both mixed stands and those with a single dominant.

In general, the characteristics of the alliance in California include *Typha angustifolia*, *T. domingensis*, or *T. latifolia* as dominant or codominant in the herbaceous layer with *Agrostis stolonifera*, *Argentina egedii*, *Cyperus* spp., *Distichlis spicata*, *Echinochloa crus-galli*, *Eleocharis macrostachya*, *Equisetum telmateia*, *Juncus* spp., *Lemna* spp., *Lepidium latifolium*, *Oenanthe sarmentosa*, *Persicaria lapathifolia*, *P. punctata*, *Phragmites australis*, *Schoenoplectus americanus*, *S. californicus*, *Typha xglauca*, and/or *Xanthium strumarium*. Emergent trees such as *Salix* spp. may be present and herbs are generally < 2 m with the canopy intermittent to continuous. Southern coastal California stands tend to have *T. domingensis* as the most common dominant species.

5.35.1 *Typha domingensis* Association

Typha domingensis is dominant with a closed herbaceous canopy. Two other *Typha* species also occur in San Diego County—*T. latifolia* and *T. angustifolia*. *Typha* species are rhizomatous and grow in dense colonies forming uniform stands that are not proximally associated with other plants except generally as wetland affiliates. Many other wetland plant species may be present in the riparian vegetation type but are not associated as fully aquatic emergent wetland plant species. Associated riparian species include *Ambrosia psilostachya*, *Baccharis salicifolia*, *Distichlis spicata*, *Salix* spp., *Populus* spp., *Platanus* spp., and *Isocoma menziesii*. Other emergent wetland plants may occur, including other *Schoenoplectus* spp., *Scirpus* spp., *Bolboschoenus maritimus*, *Typha* spp., *Azolla* spp., *Lemna* spp., *Eichhornia crassipes*, and *Ludwigia* spp.

Ecoregions

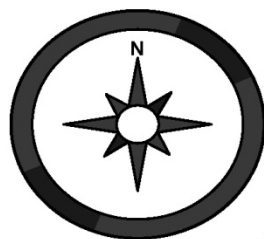
Central Coast (CC) North
Coast (NC)
Southern Valley (SV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Typha domingensis Association

$n = 9$

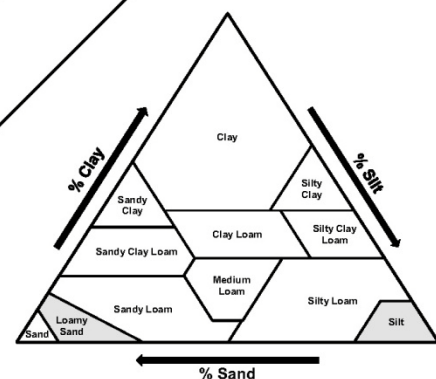
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Typha* spp. must account for at least 50 percent relative cover in the herb stratum.
- *Typha domingensis* must be the dominant *Typha* sp.

5.35.2 *Typha latifolia* Association

Typha latifolia is dominant with a closed herbaceous canopy. Two other *Typha* species also occur in San Diego county—*T. domingensis* and *T. angustifolia*. *Typha* species are rhizomatous and grow in dense colonies forming uniform stands that are not proximally associated with other plants except generally as wetland affiliates. Many other wetland plant species may be present in the riparian vegetation type but are not associated as fully aquatic emergent wetland plant species. Associated riparian species include *Ambrosia psilostachya*, *Baccharis salicifolia*, *Distichlis spicata*, *Salix* spp., *Populus* spp., *Platanus* spp. and, *Isocoma menziesii*. Other emergent wetland plants may occur, including other *Schoenoplectus* spp., *Scirpus* spp., *Bolboschoenus maritimus*, *Typha* spp., *Azolla* spp., *Lemna* spp., *Eichhornia crassipes*, and *Ludwigia* spp.

Ecoregions

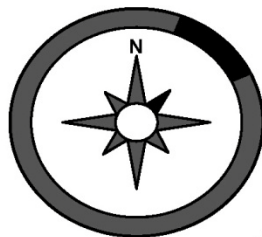
Central Foothills (CF)
Central Valley (CV)

Observed Slope Aspect, Topographic Position, and Soil Texture

Typha latifolia Association

$n = 3$

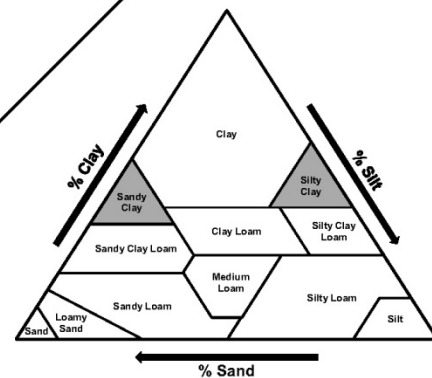
Always
Never



BOTTOM

Distribution in the Study Area

TOP



Membership Rules

- The tree and shrub canopies must each be absent or less than 5 percent absolute cover.
- *Typha* spp. must account for at least 50 percent relative cover in the herb stratum.
- *Typha latifolia* must be the dominant *Typha* sp.

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APPENDIX A
LITERATURE CITED

LITERATURE CITED

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APPENDIX B
VEGETATION ALLIANCES AND ASSOCIATIONS
OF WESTERN SAN DIEGO COUNTY

Table B.1 Vegetation Dominated by Tree Species

Table B.2 Vegetation Dominated by Shrub Species

Table B.3 Vegetation Dominated by Herbaceous Species

Table B.1 Vegetation Dominated by Tree Species
<i>Callitropsis forbesii</i> Alliance
<i>Callitropsis forbesii</i> Provisional Association
<i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands
<i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands
<i>Pinus torreyana</i> Special Stands
<i>Pinus torreyana</i> Special Stands
<i>Platanus racemosa</i> Alliance
<i>Platanus racemosa/Baccharis salicifolia</i> Association
<i>Platanus racemosa-Populus fremontii/Salix lasiolepis</i> Association
<i>Platanus racemosa-Quercus agrifolia</i> Association
<i>Populus fremontii</i> Alliance
<i>Populus fremontii</i> Alliance
<i>Populus fremontii/Baccharis salicifolia</i> Association
<i>Populus fremontii-Salix gooddingii/Baccharis salicifolia</i> Association
<i>Quercus agrifolia</i> Alliance
<i>Quercus agrifolia/Artemisia californica</i> Association
<i>Quercus agrifolia/Quercus (berberidifolia, xacutidens)</i> Association
<i>Quercus agrifolia/Salix lasiolepis</i> Association
<i>Quercus agrifolia/Toxicodendron diversilobum/Grass</i> Association
<i>Quercus engelmannii</i> Alliance
<i>Quercus engelmannii/Salvia apiana</i> Association
<i>Quercus engelmannii-Quercus agrifolia/Toxicodendron diversilobum/Grass</i> Association
<i>Salix gooddingii</i> Alliance
<i>Salix gooddingii</i> Association
<i>Salix laevigata</i> Alliance
<i>Salix laevigata</i> Association
<i>Salix lasiolepis</i> Alliance
<i>Salix lasiolepis</i> Association
<i>Salix lucida</i> Alliance
<i>Salix lucida</i> ssp. <i>lasiandra</i> Association
<i>Tamarix</i> Semi-Natural Stands
<i>Tamarix</i> Semi-Natural Stands

Table B.2 Vegetation Dominated by Shrub Species
<i>Adenostoma fasciculatum</i> Alliance
<i>Adenostoma fasciculatum</i> Association
<i>Adenostoma fasciculatum</i> Southern Maritime Association
<i>Adenostoma fasciculatum</i> -(<i>Eriogonum fasciculatum</i> , <i>Artemisia californica</i> , <i>Salvia mellifera</i>) Association
<i>Adenostoma fasciculatum</i> - <i>Ceanothus crassifolius</i> Association
<i>Adenostoma fasciculatum</i> - <i>Ceanothus tomentosus</i> Association
<i>Adenostoma fasciculatum</i> - <i>Lotus scoparius</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Alliance
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus crassifolius</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus tomentosus</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus verrucosus</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Pickeringia montana</i> Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Quercus (berberidifolia, xacutidens)</i> Association
<i>Ambrosia monogyra</i> Provisional Alliance
<i>Ambrosia monogyra</i> Provisional Association
<i>Arctostaphylos glandulosa</i> Alliance
<i>Arctostaphylos glandulosa</i> Association
<i>Arctostaphylos glandulosa</i> - <i>Adenostoma fasciculatum</i> Association
<i>Arctostaphylos glandulosa</i> - <i>Adenostoma fasciculatum</i> - <i>Chamaebatia australis</i> Association
<i>Arctostaphylos glauca</i> Alliance
<i>Arctostaphylos glauca</i> - <i>Adenostoma fasciculatum</i> Association
<i>Artemisia californica</i> Alliance
<i>Artemisia californica</i> Association
<i>Artemisia californica</i> - <i>Mimulus aurantiacus</i> Association
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Alliance
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> - <i>Malosma laurina</i> Association
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> - <i>Opuntia littoralis</i> / <i>Dudleya (edulis)</i> Association
<i>Artemisia californica</i> - <i>Salvia mellifera</i> Alliance
<i>Artemisia californica</i> - <i>Salvia mellifera</i> Association
<i>Artemisia dracunculus</i> Alliance
<i>Artemisia dracunculus</i> Association
<i>Baccharis pilularis</i> Alliance
<i>Baccharis pilularis</i> /Herbaceous Association
<i>Baccharis salicifolia</i> Alliance
<i>Baccharis salicifolia</i> Association

Table B.2 Vegetation Dominated by Shrub Species (continued)
<i>Baccharis sarothroides</i> Provisional Alliance
<i>Baccharis sarothroides</i> Provisional Association
<i>Ceanothus crassifolius</i> Alliance
<i>Ceanothus crassifolius</i> Association
<i>Ceanothus cyaneus</i> Special Stands
<i>Ceanothus cyaneus</i> Special Stands
<i>Ceanothus leucodermis</i> Alliance
<i>Ceanothus leucodermis</i> Association
<i>Ceanothus spinosus</i> Alliance
<i>Ceanothus spinosus</i> Association
<i>Ceanothus tomentosus</i> Alliance
<i>Ceanothus tomentosus</i> Association
<i>Ceanothus verrucosus</i> Alliance
<i>Ceanothus verrucosus</i> Association
<i>Cercocarpus minutiflorus</i> Alliance
<i>Cercocarpus minutiflorus</i> Provisional Association
<i>Dendromecon rigida</i> Alliance
<i>Dendromecon rigida</i> Association
<i>Encelia californica</i> Alliance
<i>Encelia californica</i> - <i>Artemisia californica</i> Association
<i>Eriogonum fasciculatum</i> Alliance
<i>Eriogonum fasciculatum</i> Alliance
<i>Eriogonum fasciculatum</i> Association
<i>Eriogonum fasciculatum</i> / <i>Salvia columbariae</i> - <i>Mirabilis laevis</i> Provisional Association
<i>Eriogonum fasciculatum</i> - <i>Bebbia juncea</i> Association
<i>Eriogonum fasciculatum</i> - <i>Salvia apiana</i> Alliance
<i>Eriogonum fasciculatum</i> - <i>Salvia apiana</i> Association
<i>Frankenia palmeri</i> Special Stands
<i>Frankenia palmeri</i> Special Stands
<i>Frankenia salina</i> Alliance
<i>Frankenia salina</i> - <i>Distichlis spicata</i> Association
<i>Fremontodendron mexicanum</i> Special Stands
<i>Isocoma menziesii</i> Alliance
<i>Isocoma menziesii</i> Provisional Association
<i>Isocoma menziesii</i> / <i>Distichlis spicata</i> Association
<i>Iva hayesiana</i> Special Stands
<i>Keckiella antirrhinoides</i> Alliance
<i>Keckiella antirrhinoides</i> - <i>Artemisia californica</i> Association

Table B.2 Vegetation Dominated by Shrub Species (continued)
<i>Lotus scoparius</i> Alliance
<i>Lotus scoparius</i> Association
<i>Lycium californicum</i> Provisional Alliance
<i>Lycium californicum</i> Provisional Association
<i>Malacothamnus fasciculatus</i> Alliance
<i>Malacothamnus fasciculatus</i> Association
<i>Malosma laurina</i> Alliance
<i>Malosma laurina</i> - <i>Lotus scoparius</i> Association
<i>Pluchea sericea</i> Alliance
<i>Pluchea sericea</i> Association
<i>Quercus berberidifolia</i> Alliance
<i>Quercus (berberidifolia, ×acutidens)</i> Association
<i>Quercus (berberidifolia, ×acutidens)</i> - <i>Cercocarpus minutiflorus</i> Provisional Association
<i>Quercus (berberidifolia, ×acutidens)</i> - <i>Ceanothus leucodermis</i> Association
<i>Quercus berberidifolia</i> Alliance
<i>Quercus berberidifolia</i> - <i>Adenostoma fasciculatum</i> Alliance
<i>Quercus (berberidifolia, ×acutidens)</i> - <i>Adenostoma fasciculatum</i> Association
<i>Quercus cedrosensis</i> Special Stands
<i>Quercus dumosa</i> Alliance
<i>Quercus dumosa</i> Alliance
<i>Quercus dumosa</i> Association
<i>Rhamnus crocea</i> Provisional Alliance
<i>Rhamnus crocea</i> Provisional Association
<i>Rhus integrifolia</i> Alliance
<i>Rhus integrifolia</i> Association
<i>Salix exigua</i> Alliance
<i>Salix exigua</i> Alliance
<i>Salvia apiana</i> Alliance
<i>Salvia apiana</i> Provisional Association
<i>Salvia apiana</i> - <i>Artemisia californica</i> Association
<i>Salvia mellifera</i> Alliance
<i>Salvia mellifera</i> Alliance
<i>Salvia mellifera</i> - <i>Eriogonum fasciculatum</i> Association
<i>Salvia mellifera</i> - <i>Malosma laurina</i> Association
<i>Simmondsia chinensis</i> Alliance
<i>Simmondsia chinensis</i> - <i>Bahiopsis laciniata</i> Association
<i>Toxicodendron diversilobum</i> Alliance
<i>Toxicodendron diversilobum</i> - <i>Artemisia californica</i> / <i>Leymus condensatus</i> Association
<i>Bahiopsis laciniata</i> Alliance
<i>Bahiopsis laciniata</i> - <i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Association

Table B.3 Vegetation Dominated by Herbaceous Species
<i>Ambrosia chamissonis</i> - <i>Abronia maritima</i> Alliance
<i>Ambrosia chamissonis</i> - <i>Abronia maritima</i> - <i>Cakile maritima</i> Association
<i>Anemopsis californica</i> Alliance
<i>Anemopsis californica</i> - <i>Juncus arcticus</i> Association
<i>Arthrocnemum subterminale</i> Alliance
<i>Arthrocnemum subterminale</i> Association
<i>Arthrocnemum subterminale</i> - <i>Sarcocornia pacifica</i> Association
<i>Arundo donax</i> Semi-Natural Stands
<i>Avena (barbata, fatua)</i> Semi-Natural Stands
<i>Bolboschoenus maritimus</i> Alliance
<i>Bolboschoenus maritimus</i> - <i>Sarcocornia pacifica</i> Association
<i>Brassica (nigra)</i> and Other Mustards Semi-Natural Stands
<i>Brassica nigra</i> Semi-Natural Stand Type
<i>Bromus (diandrus, hordeaceus)</i> - <i>Brachypodium distachyon</i> Semi-Natural Stands
<i>Brachypodium distachyon</i> Semi-Natural Stand Type
<i>Bromus (diandrus, hordeaceus)</i> - <i>Brachypodium distachyon</i> Semi-Natural Stands
<i>Bromus diandrus</i> Semi-Natural Stand Type
<i>Bromus rubens</i> - <i>Schismus (arabicus, barbatus)</i> Semi-Natural Stands
<i>Bromus rubens</i> Semi-Natural Stand Type
<i>Conium maculatum</i> - <i>Foeniculum vulgare</i> Semi-Natural Stands
<i>Conium maculatum</i> Semi-Natural Stand Type
<i>Corethrogyne filaginifolia</i> Provisional Alliance
<i>Corethrogyne filaginifolia</i> Provisional Association
<i>Cressa truxillensis</i> - <i>Distichlis spicata</i> Alliance
<i>Cressa truxillensis</i> Provisional Association
<i>Deinandra fasciculata</i> Alliance
<i>Deinandra fasciculata</i> Association
<i>Distichlis spicata</i> Alliance
<i>Distichlis spicata</i> -Annual Grasses Association
<i>Glebionis coronaria</i> Semi-Natural Stands
<i>Gutierrezia (californica, sarothrae)</i> Provisional Alliance
<i>Juncus acutus</i> Provisional Alliance
<i>Juncus acutus</i> Provisional Association
<i>Juncus acutus</i> - <i>Jaumea carnosa</i> Provisional Association
<i>Lepidium latifolium</i> Semi-Natural Stands
<i>Leymus condensatus</i> Alliance
<i>Leymus condensatus</i> Association

Table B.3 Vegetation Dominated by Herbaceous Species (continued)
<i>Leymus triticoides</i> Alliance
<i>Leymus triticoides</i> Association
<i>Lolium perenne</i> Semi-Natural Stands
<i>Lolium perenne</i> Semi-Natural Stand Type
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
<i>Muhlenbergia rigens</i> Alliance
<i>Muhlenbergia rigens</i> Association
<i>Nassella lepida</i> Provisional Alliance
<i>Nassella lepida</i> Provisional Association
<i>Nassella pulchra</i> Alliance
<i>Nassella pulchra</i> Association
<i>Pennisetum setaceum</i> Semi-Natural Stands
<i>Pennisetum setaceum</i> Semi-Natural Stands
<i>Sarcocornia pacifica</i> (<i>Salicornia depressa</i>) Alliance
<i>Salicornia bigelovii</i> Provisional Association
<i>Sarcocornia pacifica</i> (<i>Salicornia depressa</i>) Alliance
<i>Sarcocornia pacifica</i> Association
<i>Sarcocornia pacifica</i> - <i>Frankenia salina</i> Association
<i>Sarcocornia pacifica</i> - <i>Jaumea carnosa</i> Association
<i>Sarcocornia pacifica</i> - <i>Jaumea carnosa</i> - <i>Batis maritima</i> Association
<i>Sarcocornia pacifica</i> - <i>Monanthochloe littoralis</i> Special Stands
<i>Schoenoplectus acutus</i> Alliance
<i>Schoenoplectus acutus</i> Association
<i>Schoenoplectus americanus</i> Alliance
<i>Schoenoplectus americanus</i> Association
<i>Schoenoplectus californicus</i> Alliance
<i>Schoenoplectus californicus</i> Association
<i>Selaginella bigelovii</i> Alliance
<i>Selaginella bigelovii</i> Alliance
<i>Spartina foliosa</i> Alliance
<i>Spartina foliosa</i> Association
<i>Suaeda esteroa</i> Special Stands
<i>Suaeda esteroa</i> Special Stands
<i>Typha</i> (<i>angustifolia</i> , <i>domingensis</i> , <i>latifolia</i>) Alliance
<i>Typha domingensis</i> Association
<i>Typha latifolia</i> Association

APPENDIX C
CLASSIFICATION CROSSWALKS FOR VEGETATION ALLIANCES
AND ASSOCIATIONS OF WESTERN SAN DIEGO COUNTY

Table C.1 Vegetation Dominated by Tree Species

Table C.2 Vegetation Dominated by Shrub Species

Table C.3 Vegetation Dominated by Herbaceous Species

Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code

Table C.1 Vegetation Dominated by Tree Species	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Callitropsis forbesii</i> Alliance	
<i>Callitropsis forbesii</i> Provisional Association	83230 Southern Interior Cypress Forest
<i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands	
<i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands	79100 Eucalyptus Woodland
<i>Pinus torreyana</i> Special Stands	
<i>Pinus torreyana</i> Special Stands	83140 Torrey Pine Forest
<i>Platanus racemosa</i> Alliance	
<i>Platanus racemosa/Baccharis salicifolia</i> Association	62500 Southern Riparian Woodland
<i>Platanus racemosa-Populus fremontii/Salix lasiolepis</i> Association	62500 Southern Riparian Woodland
<i>Platanus racemosa-Quercus agrifolia</i> Association	61300 Southern Riparian Forest
<i>Populus fremontii</i> Alliance	
<i>Populus fremontii/Baccharis salicifolia</i> Association	61330 Southern Cottonwood-Willow Riparian Forest
<i>Populus fremontii-Salix gooddingii/Baccharis salicifolia</i> Association	61330 Southern Cottonwood-Willow Riparian Forest
<i>Quercus agrifolia</i> Alliance	
<i>Quercus agrifolia/Artemisia californica</i> Association	71160 Coast Live Oak Woodland 71161 Open Coast Live Oak Woodland
<i>Quercus agrifolia/Quercus (berberidifolia, xacutidens)</i> Association	71160 Coast Live Oak Woodland 71161 Open Coast Live Oak Woodland
<i>Quercus agrifolia/Salix lasiolepis</i> Association	61310 Southern Coast Live Oak Riparian Forest
<i>Quercus agrifolia/Toxicodendron diversilobum/Grass</i> Association	61310 Southern Coast Live Oak Riparian Forest 71161 Open Coast Live Oak Woodland
<i>Quercus engelmannii</i> Alliance	
<i>Quercus engelmannii/Salvia apiana</i> Association	71180 Engelmann Oak Woodland 71181 Open Engelmann Oak Woodland
<i>Quercus engelmannii-Quercus agrifolia/Toxicodendron diversilobum/Grass</i> Association	71180 Engelmann Oak Woodland 71182 Dense Engelmann Oak Woodland
<i>Salix gooddingii</i> Alliance	
<i>Salix gooddingii</i> Association	62500 Southern Riparian Woodland
<i>Salix laevigata</i> Alliance	
<i>Salix laevigata</i> Association	62500 Southern Riparian Woodland 63320 Southern Willow Scrub
<i>Salix lasiolepis</i> Alliance	
<i>Salix lasiolepis</i> Association	61320 Southern Arroyo Willow Riparian Forest 63320 Southern Willow Scrub
<i>Salix lucida</i> Alliance	
<i>Salix lucida</i> ssp. <i>lasiandra</i> Association	62500 Southern Riparian Woodland
<i>Tamarix</i> Semi-Natural Stands	
<i>Tamarix</i> Semi-Natural Stands	65000 Non-Native Riparian

Table C.2 Vegetation Dominated by Shrub Species	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Adenostoma fasciculatum</i> Alliance	
<i>Adenostoma fasciculatum</i> Southern Maritime Association	37C30 Southern Maritime Chaparral
<i>Adenostoma fasciculatum</i> -(<i>Eriogonum fasciculatum</i> <i>Artemisia californica</i> , <i>Salvia mellifera</i>) Association	37G00 Coastal Sage-Chaparral Transition
<i>Adenostoma fasciculatum</i> - <i>Ceanothus crassifolius</i> Association	37820 <i>Ceanothus crassifolius</i> Chaparral
<i>Adenostoma fasciculatum</i> - <i>Lotus scoparius</i> Association	37200 Chamise Chaparral
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Alliance	
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Association	37120 Southern Mixed Chaparral
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus crassifolius</i> Association	37120 Southern Mixed Chaparral
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus tomentosus</i> Association	37120 Southern Mixed Chaparral
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus verrucosus</i> Association	37C30 Southern Maritime Chaparral
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Pickeringia montana</i> Association	37122 Mafic Southern Mixed Chaparral 37132 Mafic Northern Mixed Chaparral
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Quercus (berberidifolia, xacutidens)</i> Association	37C30 Southern Maritime Chaparral
<i>Ambrosia monogyra</i> Provisional Alliance	
<i>Ambrosia monogyra</i> Provisional Association	63000 Riparian Scrubs
<i>Arctostaphylos glandulosa</i> Alliance	
<i>Arctostaphylos glandulosa</i> - <i>Adenostoma fasciculatum</i> Association	37120 Southern Mixed Chaparral 37130 Northern Mixed Chaparral
<i>Arctostaphylos glandulosa</i> - <i>Adenostoma fasciculatum</i> - <i>Chamaebatia australis</i> Association	37122 Mafic Southern Mixed Chaparral 37132 Mafic Northern Mixed Chaparral
<i>Arctostaphylos glauca</i> Alliance	
<i>Arctostaphylos glauca</i> - <i>Adenostoma fasciculatum</i> Association	37130 Northern Mixed Chaparral
<i>Artemisia californica</i> Alliance	
<i>Artemisia californica</i> Association	32510 Diegan Coastal Sage Scrub: Coastal form
<i>Artemisia californica</i> - <i>Mimulus aurantiacus</i> Association	32500 Diegan Coastal Sage Scrub
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Alliance	
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> - <i>Malosma laurina</i> Association	32500 Diegan Coastal Sage Scrub
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> - <i>Opuntia littoralis</i> / <i>Dudleya (edulis)</i> Association	32400 Maritime Succulent Scrub
<i>Artemisia californica</i> - <i>Salvia mellifera</i> Alliance	
<i>Artemisia californica</i> - <i>Salvia mellifera</i> Association	32500 Diegan Coastal Sage Scrub

Table C.2 Vegetation Dominated by Shrub Species (continued)	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Artemisia dracunculus</i> Alliance	
<i>Artemisia dracunculus</i> Association	63000 Riparian Scrubs
<i>Baccharis pilularis</i> Alliance	
<i>Baccharis pilularis</i> /Herbaceous Association	32530 Diegan Coastal Sage Scrub: <i>Baccharis</i> -dominated
<i>Baccharis salicifolia</i> Alliance	
<i>Baccharis salicifolia</i> Association	63310 Mule Fat Scrub
<i>Baccharis sarothroides</i> Provisional Alliance	
<i>Baccharis sarothroides</i> Provisional Association	32530 Diegan Coastal Sage Scrub: <i>Baccharis</i> -dominated
<i>Bahiopsis laciniata</i> Alliance	
<i>Bahiopsis laciniata</i> - <i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Association	32500 Diegan Coastal Sage Scrub
<i>Ceanothus crassifolius</i> Alliance	
<i>Ceanothus crassifolius</i> Association	37820 <i>Ceanothus crassifolius</i> Chaparral
<i>Ceanothus cyaneus</i> Special Stands	
<i>Ceanothus cyaneus</i> Special Stands	37120 Southern Mixed Chaparral
<i>Ceanothus leucodermis</i> Alliance	
<i>Ceanothus leucodermis</i> Association	37120 Southern Mixed Chaparral
<i>Ceanothus spinosus</i> Alliance	
<i>Ceanothus spinosus</i> Association	37120 Southern Mixed Chaparral
<i>Ceanothus tomentosus</i> Alliance	
<i>Ceanothus tomentosus</i> Association	37120 Southern Mixed Chaparral
<i>Ceanothus verrucosus</i> Alliance	
<i>Ceanothus verrucosus</i> Association	37C30 Southern Maritime Chaparral
<i>Cercocarpus minutiflorus</i> Alliance	
<i>Cercocarpus minutiflorus</i> Provisional Association	37120 Southern Mixed Chaparral
<i>Dendromecon rigida</i> Alliance	
<i>Dendromecon rigida</i> Association	37000 Chaparral
<i>Encelia californica</i> Alliance	
<i>Encelia californica</i> - <i>Artemisia californica</i> Association	32500 Diegan Coastal Sage Scrub 32400 Maritime Succulent Scrub
<i>Eriogonum fasciculatum</i> Alliance	
<i>Eriogonum fasciculatum</i> Association	32500 Diegan Coastal Sage Scrub
<i>Eriogonum fasciculatum</i> / <i>Salvia columbariae</i> - <i>Mirabilis laevis</i> Provisional Association	32500 Diegan Coastal Sage Scrub
<i>Eriogonum fasciculatum</i> - <i>Bebbia juncea</i> Association	32500 Diegan Coastal Sage Scrub 32520 Diegan Coastal Sage Scrub: Inland form
<i>Eriogonum fasciculatum</i> - <i>Salvia apiana</i> Alliance	
<i>Eriogonum fasciculatum</i> - <i>Salvia apiana</i> Association	32500 Diegan Coastal Sage Scrub 32520 Diegan Coastal Sage Scrub: Inland form
<i>Frankenia palmeri</i> Special Stands	
<i>Frankenia palmeri</i> Special Stands	52120 Southern Coastal Salt Marsh 52310 Cismontane Alkali Marsh

Table C.2 Vegetation Dominated by Shrub Species (continued)	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Frankenia salina</i> Alliance	
<i>Frankenia salina</i> - <i>Distichlis spicata</i> Association	52120 Southern Coastal Salt Marsh 52310 Cismontane Alkali Marsh
<i>Fremontodendron mexicanum</i> Special Stands	
<i>Fremontodendron mexicanum</i> Special Stands	83230 Southern Interior Cypress Forest 37000 Chaparral
<i>Isocoma menziesii</i> Alliance	
<i>Isocoma menziesii</i> Provisional Association	32000 Coastal Scrub
<i>Isocoma menziesii</i> / <i>Distichlis spicata</i> Association	32000 Coastal Scrub
<i>Iva hayesiana</i> Special Stands	
<i>Iva hayesiana</i> Special Stands	45320 Alkali Seep
<i>Keckiella antirrhinoides</i> Alliance	
<i>Keckiella antirrhinoides</i> - <i>Artemisia californica</i> Association	32500 Diegan Coastal Sage Scrub
<i>Lotus scoparius</i> Alliance	
<i>Lotus scoparius</i> Association	32000 Coastal Scrub 37000 Chaparral
<i>Lycium californicum</i> Provisional Alliance	
<i>Lycium californicum</i> Provisional Association	32400 Maritime Succulent Scrub
<i>Malacothamnus fasciculatus</i> Alliance	
<i>Malacothamnus fasciculatus</i> Association	32000 Coastal Scrub 37000 Chaparral
<i>Malosma laurina</i> Alliance	
<i>Malosma laurina</i> - <i>Lotus scoparius</i> Association	32000 Coastal Scrub
<i>Pluchea sericea</i> Alliance	
<i>Pluchea sericea</i> Association	63320 Southern Willow Scrub
<i>Quercus berberidifolia</i> Alliance	
<i>Quercus (berberidifolia, xacutidens)</i> Association	37900 Scrub Oak Chaparral
<i>Quercus (berberidifolia, xacutidens)</i> - <i>Cercocarpus minutiflorus</i> Provisional Association	37900 Scrub Oak Chaparral
<i>Quercus (berberidifolia, xacutidens)</i> - <i>Ceanothus leucodermis</i> Association	37900 Scrub Oak Chaparral
<i>Quercus berberidifolia</i> - <i>Adenostoma fasciculatum</i> Alliance	
<i>Quercus (berberidifolia, xacutidens)</i> - <i>Adenostoma fasciculatum</i> Association	37900 Scrub Oak Chaparral
<i>Quercus cedrosensis</i> Special Stands	37900 Scrub Oak Chaparral
<i>Quercus dumosa</i> Alliance	
<i>Quercus dumosa</i> Association	37900 Scrub Oak Chaparral
<i>Rhamnus crocea</i> Provisional Alliance	
<i>Rhamnus crocea</i> Provisional Association	32000 Coastal Scrub
<i>Rhus integrifolia</i> Alliance	
<i>Rhus integrifolia</i> Association	32500 Diegan Coastal Sage Scrub

Table C.2 Vegetation Dominated by Shrub Species (continued)	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Salix exigua</i> Alliance	
<i>Salix exigua</i> Alliance	63320 Southern Willow Scrub
<i>Salvia apiana</i> Alliance	
<i>Salvia apiana</i> Provisional Association	32500 Diegan Coastal Sage Scrub 32520 Diegan Coastal Sage Scrub: Inland form
<i>Salvia apiana</i> - <i>Artemisia californica</i> Association	32500 Diegan Coastal Sage Scrub 32520 Diegan Coastal Sage Scrub: Inland form
<i>Salvia mellifera</i> Alliance	
<i>Salvia mellifera</i> - <i>Eriogonum fasciculatum</i> Association	32500 Diegan Coastal Sage Scrub 32700 Riversidian Sage Scrub
<i>Salvia mellifera</i> - <i>Malosma laurina</i> Association	32500 Diegan Coastal Sage Scrub 32700 Riversidian Sage Scrub
<i>Simmondsia chinensis</i> Alliance	
<i>Simmondsia chinensis</i> - <i>Bahiopsis laciniata</i> Association	32400 Maritime Succulent Scrub
<i>Toxicodendron diversilobum</i> Alliance	
<i>Toxicodendron diversilobum</i> - <i>Artemisia californica</i> / <i>Leymus condensatus</i> Association	32000 Coastal Scrub

Table C.3 Vegetation Dominated by Herbaceous Species	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Ambrosia chamissonis</i> - <i>Abronia maritima</i> Alliance	
<i>Ambrosia chamissonis</i> - <i>Abronia maritima</i> - <i>Cakile maritima</i> Association	21230 Southern Foredunes
<i>Anemopsis californica</i> Alliance	
<i>Anemopsis californica</i> - <i>Juncus arcticus</i> Association	52310 Cismontane Alkali Marsh
<i>Arthrocnemum subterminale</i> Alliance	
<i>Arthrocnemum subterminale</i> Association	52120 Southern Coastal Salt Marsh
<i>Arthrocnemum subterminale</i> - <i>Sarcocornia pacifica</i> Association	52120 Southern Coastal Salt Marsh
<i>Arundo donax</i> Semi-Natural Stands	65000 Non-Native Riparian
<i>Arundo donax</i> Semi-Natural Stands	65000 Non-Native Riparian
<i>Avena (barbata, fatua)</i> Semi-Natural Stands	42200 Non-Native Grassland
<i>Bolboschoenus maritimus</i> Alliance	
<i>Bolboschoenus maritimus</i> - <i>Sarcocornia pacifica</i> Association	52120 Southern Coastal Salt Marsh
<i>Brassica (nigra)</i> and Other Mustards Semi-Natural Stands	
<i>Brassica nigra</i> Semi-Natural Stand Type	42210 Non-Native Grassland: Broadleaf-Dominated
<i>Bromus (diandrus, hordeaceus)</i> - <i>Brachypodium distachyon</i> Semi-Natural Stands	
<i>Brachypodium distachyon</i> Semi-Natural Stand Type	42200 Non-Native Grassland
<i>Bromus (diandrus, hordeaceus)</i> - <i>Brachypodium distachyon</i> Semi-Natural Stands	42200 Non-Native Grassland
<i>Bromus diandrus</i> Semi-Natural Stand Type	42200 Non-Native Grassland
<i>Conium maculatum</i> - <i>Foeniculum vulgare</i> Semi-Natural Stands	
<i>Conium maculatum</i> Semi-Natural Stand Type	65000 Non-Native Riparian 11300 Disturbed Habitat
<i>Corethrogyne filaginifolia</i> Provisional Alliance	
<i>Corethrogyne filaginifolia</i> Provisional Association	42300 Wildflower Field
<i>Cressa truxillensis</i> - <i>Distichlis spicata</i> Alliance	
<i>Cressa truxillensis</i> Provisional Association	52120 Southern Coastal Salt Marsh 52310 Cismontane Alkali Marsh
<i>Deinandra fasciculata</i> Alliance	
<i>Deinandra fasciculata</i> Association	42300 Wildflower Field
<i>Distichlis spicata</i> Alliance	
<i>Distichlis spicata</i> -Annual Grasses Association	42120 Valley Sacaton Grassland
<i>Glebionis coronaria</i> Semi-Natural Stands	
<i>Glebionis coronaria</i> Semi-Natural Stands	11300 Disturbed Habitat
<i>Gutierrezia (californica, sarothrae)</i> Provisional Alliance	32500 Diegan Coastal Sage Scrub
<i>Juncus acutus</i> Provisional Alliance	
<i>Juncus acutus</i> Provisional Association	45320 Alkali Seep
<i>Juncus acutus</i> - <i>Jaumea carnosa</i> Provisional Association	52120 Southern Coastal Salt Marsh

Table C.3 Vegetation Dominated by Herbaceous Species (continued)	
Alliances and Associations of Western San Diego County	Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008)
<i>Lepidium latifolium</i> Semi-Natural Stands	11200 Disturbed Wetland
<i>Leymus condensatus</i> Alliance	
<i>Leymus condensatus</i> Association	42100 Native Grassland
<i>Leymus triticoides</i> Alliance	
<i>Leymus triticoides</i> Association	42100 Native Grassland 42400 Foothill/Mountain Perennial Grassland
<i>Lolium perenne</i> Semi-Natural Stands	
<i>Lolium perenne</i> Semi-Natural Stand Type	42200 Non-Native Grassland
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	42200 Non-Native Grassland
<i>Muhlenbergia rigens</i> Alliance	
<i>Muhlenbergia rigens</i> Association	42100 Native Grassland 42400 Foothill/Mountain Perennial Grassland
<i>Nassella lepida</i> Provisional Alliance	
<i>Nassella lepida</i> Provisional Association	42300 Wildflower Field
<i>Nassella pulchra</i> Alliance	
<i>Nassella pulchra</i> Association	42100 Native Grassland
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	65000 Non-Native Riparian
<i>Pennisetum setaceum</i> Semi-Natural Stands	42200 Non-Native Grassland
<i>Sarcocornia pacifica</i> (<i>Salicornia depressa</i>) Alliance	
<i>Salicornia bigelovii</i> Provisional Association	52120 Southern Coastal Salt Marsh
<i>Sarcocornia pacifica</i> Association	52120 Southern Coastal Salt Marsh
<i>Sarcocornia pacifica</i> - <i>Frankenia salina</i> Association	52120 Southern Coastal Salt Marsh
<i>Sarcocornia pacifica</i> - <i>Jaumea carnosa</i> Association	52120 Southern Coastal Salt Marsh
<i>Sarcocornia pacifica</i> - <i>Jaumea carnosa</i> - <i>Batis maritima</i> Association	52120 Southern Coastal Salt Marsh
<i>Sarcocornia pacifica</i> - <i>Monanthochloe littoralis</i> Special Stands	52120 Southern Coastal Salt Marsh
<i>Schoenoplectus acutus</i> Alliance	
<i>Schoenoplectus acutus</i> Association	52410 Coastal and Valley Freshwater Marsh
<i>Schoenoplectus americanus</i> Alliance	
<i>Schoenoplectus americanus</i> Association	52410 Coastal and Valley Freshwater Marsh
<i>Spartina foliosa</i> Alliance	
<i>Spartina foliosa</i> Association	52120 Southern Coastal Salt Marsh
<i>Suaeda esteroa</i> Special Stands	52120 Southern Coastal Salt Marsh
<i>Typha</i> (<i>angustifolia</i> , <i>domingensis</i> , <i>latifolia</i>) Alliance	
<i>Typha domingensis</i> Association	52410 Coastal and Valley Freshwater Marsh
<i>Typha latifolia</i> Association	52410 Coastal and Valley Freshwater Marsh

Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code	
Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008) (Shaded)	
Alliances of Western San Diego County (Unshaded)	Associations of Western San Diego County
11200 Disturbed Wetland	
<i>Lepidium latifolium</i> Semi-Natural Stands	
11300 Disturbed Habitat	
<i>Glebionis coronaria</i> Semi-Natural Stands	
21230 Southern Foredunes	
<i>Ambrosia chamissonis</i> - <i>Abronia maritima</i> Alliance	<i>Ambrosia chamissonis</i> - <i>Abronia maritima</i> - <i>Cakile maritima</i> Association
32000 Coastal Scrub	
<i>Isocoma menziesii</i> Alliance	<i>Isocoma menziesii</i> Provisional Association
	<i>Isocoma menziesii</i> / <i>Distichlis spicata</i> Association
<i>Malosma laurina</i> Alliance	<i>Malosma laurina</i> - <i>Lotus scoparius</i> Association
<i>Rhamnus crocea</i> Provisional Alliance	<i>Rhamnus crocea</i> Provisional Association
<i>Toxicodendron diversilobum</i> Alliance	<i>Toxicodendron diversilobum</i> - <i>Artemisia californica</i> / <i>Leymus condensatus</i> Association
32000 Coastal Scrub 37000 Chaparral	
<i>Lotus scoparius</i> Alliance	<i>Lotus scoparius</i> Association
<i>Malacothamnus fasciculatus</i> Alliance	<i>Malacothamnus fasciculatus</i> Association
32400 Maritime Succulent Scrub	
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Alliance	<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> - <i>Opuntia littoralis</i> / <i>Dudleya (edulis)</i> Association
<i>Lycium californicum</i> Provisional Alliance	<i>Lycium californicum</i> Provisional Association
<i>Simmondsia chinensis</i> Alliance	<i>Simmondsia chinensis</i> - <i>Bahiopsis laciniata</i> Association
32500 Diegan Coastal Sage Scrub	
<i>Artemisia californica</i> Alliance	<i>Artemisia californica</i> - <i>Mimulus aurantiacus</i> Association
<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Alliance	<i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> - <i>Malosma laurina</i> Association
<i>Artemisia californica</i> - <i>Salvia mellifera</i> Alliance	<i>Artemisia californica</i> - <i>Salvia mellifera</i> Association
<i>Bahiopsis laciniata</i> Alliance	<i>Bahiopsis laciniata</i> - <i>Artemisia californica</i> - <i>Eriogonum fasciculatum</i> Association
	<i>Eriogonum fasciculatum</i> Association
<i>Eriogonum fasciculatum</i> Alliance	<i>Eriogonum fasciculatum</i> / <i>Salvia columbariae</i> - <i>Mirabilis laevis</i> Provisional Association
<i>Gutierrezia (californica, sarothrae)</i> Provisional Alliance	<i>Gutierrezia (californica, sarothrae)</i> Provisional Alliance
<i>Keckiella antirrhinoides</i> Alliance	<i>Keckiella antirrhinoides</i> - <i>Artemisia californica</i> Association
<i>Rhus integrifolia</i> Alliance	<i>Rhus integrifolia</i> Association
32500 Diegan Coastal Sage Scrub	
32400 Maritime Succulent Scrub	
<i>Encelia californica</i> Alliance	<i>Encelia californica</i> - <i>Artemisia californica</i> Association

Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code (continued)	
Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008) (Shaded)	
Alliances of Western San Diego County (Unshaded)	Associations of Western San Diego County
32500 Diegan Coastal Sage Scrub	
32520 Diegan Coastal Sage Scrub: Inland form	
<i>Eriogonum fasciculatum</i> Alliance	<i>Eriogonum fasciculatum</i> - <i>Bebbia juncea</i> Association
<i>Eriogonum fasciculatum</i> - <i>Salvia apiana</i> Alliance	<i>Eriogonum fasciculatum</i> - <i>Salvia apiana</i> Association
<i>Salvia apiana</i> Alliance	<i>Salvia apiana</i> Provisional Association
	<i>Salvia apiana</i> - <i>Artemisia californica</i> Association
32500 Diegan Coastal Sage Scrub	
32700 Riversidian Sage Scrub	
<i>Salvia mellifera</i> Alliance	<i>Salvia mellifera</i> - <i>Eriogonum fasciculatum</i> Association
	<i>Salvia mellifera</i> - <i>Malosma laurina</i> Association
32510 Diegan Coastal Sage Scrub: Coastal form	
<i>Artemisia californica</i> Alliance	<i>Artemisia californica</i> Association
32530 Diegan Coastal Sage Scrub: <i>Baccharis</i>-dominated	
<i>Baccharis pilularis</i> Alliance	<i>Baccharis pilularis</i> /Herbaceous Association
<i>Baccharis sarothroides</i> Provisional Alliance	<i>Baccharis sarothroides</i> Provisional Association
37000 Chaparral	
<i>Dendromecon rigida</i> Alliance	<i>Dendromecon rigida</i> Association
37120 Southern Mixed Chaparral	
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Alliance	<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Association
	<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus crassifolius</i> Association
	<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus tomentosus</i> Association
<i>Ceanothus cyaneus</i> Special Stands	<i>Ceanothus cyaneus</i> Special Stands
<i>Ceanothus leucodermis</i> Alliance	<i>Ceanothus leucodermis</i> Association
<i>Ceanothus spinosus</i> Alliance	<i>Ceanothus spinosus</i> Association
<i>Ceanothus tomentosus</i> Alliance	<i>Ceanothus tomentosus</i> Association
<i>Cercocarpus minutiflorus</i> Alliance	<i>Cercocarpus minutiflorus</i> Provisional Association
37120 Southern Mixed Chaparral	
37130 Northern Mixed Chaparral	
<i>Arctostaphylos glandulosa</i> Alliance	<i>Arctostaphylos glandulosa</i> - <i>Adenostoma fasciculatum</i> Association
37122 Mafic Southern Mixed Chaparral	
37132 Mafic Northern Mixed Chaparral	
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Alliance	<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Pickeringia montana</i> Association
<i>Arctostaphylos glandulosa</i> Alliance	<i>Arctostaphylos glandulosa</i> - <i>Adenostoma fasciculatum</i> - <i>Chamaebatia australis</i> Association

Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code (continued)	
Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008) (Shaded)	
Alliances of Western San Diego County (Unshaded)	Associations of Western San Diego County
37130 Northern Mixed Chaparral	
<i>Arctostaphylos glauca</i> Alliance	<i>Arctostaphylos glauca</i> - <i>Adenostoma fasciculatum</i> Association
37200 Chamise Chaparral	
<i>Adenostoma fasciculatum</i> Alliance	<i>Adenostoma fasciculatum</i> - <i>Lotus scoparius</i> Association
37820 Ceanothus crassifolius Chaparral	
<i>Adenostoma fasciculatum</i> Alliance	<i>Adenostoma fasciculatum</i> - <i>Ceanothus crassifolius</i> Association
<i>Ceanothus crassifolius</i> Alliance	<i>Ceanothus crassifolius</i> Association
37900 Scrub Oak Chaparral	
<i>Quercus berberidifolia</i> Alliance	<i>Quercus (berberidifolia, ×acutidens)</i> Association
	<i>Quercus (berberidifolia, ×acutidens)</i> - <i>Cercocarpus minutiflorus</i> Provisional Association
	<i>Quercus (berberidifolia, ×acutidens)</i> - <i>Ceanothus leucodermis</i> Association
<i>Quercus berberidifolia</i> - <i>Adenostoma fasciculatum</i> Alliance	<i>Quercus (berberidifolia, ×acutidens)</i> - <i>Adenostoma fasciculatum</i> Association
<i>Quercus cedrosensis</i> Special Stands	<i>Quercus cedrosensis</i> Special Stands
<i>Quercus dumosa</i> Alliance	<i>Quercus dumosa</i> Association
37C30 Southern Maritime Chaparral	
<i>Adenostoma fasciculatum</i> Alliance	<i>Adenostoma fasciculatum</i> Southern Maritime Association
<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> Alliance	<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Ceanothus verrucosus</i> Association
	<i>Adenostoma fasciculatum</i> - <i>Xylococcus bicolor</i> - <i>Quercus (berberidifolia, ×acutidens)</i> Association
<i>Ceanothus verrucosus</i> Alliance	<i>Ceanothus verrucosus</i> Association
37G00 Coastal Sage-Chaparral Transition	
<i>Adenostoma fasciculatum</i> Alliance	<i>Adenostoma fasciculatum</i> -(<i>Eriogonum fasciculatum</i> , <i>Artemisia californica</i> , <i>Salvia mellifera</i>) Association
42100 Native Grassland	
<i>Leymus condensatus</i> Alliance	<i>Leymus condensatus</i> Association
<i>Nassella pulchra</i> Alliance	<i>Nassella pulchra</i> Association
42100 Native Grassland	
42400 Foothill/Mountain Perennial Grassland	
<i>Leymus triticoides</i> Alliance	<i>Leymus triticoides</i> Association
<i>Muhlenbergia rigens</i> Alliance	<i>Muhlenbergia rigens</i> Association
42120 Valley Sacaton Grassland	
<i>Distichlis spicata</i> Alliance	<i>Distichlis spicata</i> -Annual Grasses Association
42200 Non-Native Grassland	
<i>Avena (barbata, fatua)</i> Semi-Natural Stands	<i>Avena barbata</i> - <i>Avena fatua</i> Semi-Natural Stands

Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code (continued)	
Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008) (Shaded)	
Alliances of Western San Diego County (Unshaded)	Associations of Western San Diego County
<i>Bromus (diandrus, hordeaceus)</i> - <i>Brachypodium distachyon</i> Semi-Natural Stands	<i>Brachypodium distachyon</i> Semi-Natural Stand Type
	<i>Bromus (diandrus, hordeaceus)</i> - <i>Brachypodium distachyon</i> Semi-Natural Stands
	<i>Bromus diandrus</i> Semi-Natural Stand Type
<i>Lolium perenne</i> Semi-Natural Stands	<i>Lolium perenne</i> Semi-Natural Stand Type
Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands	Mediterranean California Naturalized Annual and Perennial Grassland Semi-Natural Stands
<i>Pennisetum setaceum</i> Semi-Natural Stands	<i>Pennisetum setaceum</i> Semi-Natural Stands
42210 Non-Native Grassland: Broadleaf-Dominated	
<i>Brassica (nigra)</i> and Other Mustards Semi-Natural Stands	<i>Brassica nigra</i> Semi-Natural Stand Type
42300 Wildflower Field	
<i>Corethrogyne filaginifolia</i> Provisional Alliance	<i>Corethrogyne filaginifolia</i> Provisional Association
<i>Deinandra fasciculata</i> Alliance	<i>Deinandra fasciculata</i> Association
<i>Nassella lepida</i> Provisional Alliance	<i>Nassella lepida</i> Provisional Association
45320 Alkali Seep	
<i>Iva hayesiana</i> Special Stands	<i>Iva hayesiana</i> Special Stands
<i>Juncus acutus</i> Provisional Alliance	<i>Juncus acutus</i> Provisional Association
52120 Southern Coastal Salt Marsh	
<i>Arthrocnemum subterminale</i> Alliance	<i>Arthrocnemum subterminale</i> Association
	<i>Arthrocnemum subterminale</i> - <i>Sarcocornia pacifica</i> Association
<i>Bolboschoenus maritimus</i> Alliance	<i>Bolboschoenus maritimus</i> - <i>Sarcocornia pacifica</i> Association
<i>Juncus acutus</i> Provisional Alliance	<i>Juncus acutus</i> - <i>Jaumea carnosa</i> Provisional Association
<i>Sarcocornia pacifica</i> (<i>Salicornia depressa</i>) Alliance	<i>Salicornia bigelovii</i> Provisional Association
	<i>Sarcocornia pacifica</i> Association
	<i>Sarcocornia pacifica</i> - <i>Frankenia salina</i> Association
	<i>Sarcocornia pacifica</i> - <i>Jaumea carnosa</i> Association
	<i>Sarcocornia pacifica</i> - <i>Jaumea carnosa</i> - <i>Batis maritima</i> Association
	<i>Sarcocornia pacifica</i> - <i>Monanthochloe littoralis</i> Special Stands
<i>Spartina foliosa</i> Alliance	<i>Spartina foliosa</i> Association
<i>Suaeda esteroa</i> Special Stands	<i>Suaeda esteroa</i> Special Stands
52120 Southern Coastal Salt Marsh	
52310 Cismontane Alkali Marsh	
<i>Cressa truxillensis</i> - <i>Distichlis spicata</i> Alliance	<i>Cressa truxillensis</i> Provisional Association
<i>Frankenia palmeri</i> Special Stands	<i>Frankenia palmeri</i> Special Stands

Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code (continued)	
Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008) (Shaded)	Associations of Western San Diego County
Alliances of Western San Diego County (Unshaded)	
<i>Frankenia salina</i> Alliance	<i>Frankenia salina</i> - <i>Distichlis spicata</i> Association
52310 Cismontane Alkali Marsh	
<i>Anemopsis californica</i> Alliance	<i>Anemopsis californica</i> - <i>Juncus arcticus</i> Association
52410 Coastal and Valley Freshwater Marsh	
<i>Schoenoplectus acutus</i> Alliance	<i>Schoenoplectus acutus</i> Association
<i>Schoenoplectus americanus</i> Alliance	<i>Schoenoplectus americanus</i> Association
<i>Typha</i> (<i>angustifolia</i> , <i>domingensis</i> , <i>latifolia</i>) Alliance	<i>Typha domingensis</i> Association
	<i>Typha latifolia</i> Association
61300 Southern Riparian Forest	
<i>Platanus racemosa</i> Alliance	<i>Platanus racemosa</i> - <i>Quercus agrifolia</i> Association
61310 Southern Coast Live Oak Riparian Forest	
<i>Quercus agrifolia</i> Alliance	<i>Quercus agrifolia</i> / <i>Salix lasiolepis</i> Association
61310 Southern Coast Live Oak Riparian Forest 71161 Open Coast Live Oak Woodland	
<i>Quercus agrifolia</i> Alliance	<i>Quercus agrifolia</i> / <i>Toxicodendron diversilobum</i> /Grass Association
61320 Southern Arroyo Willow Riparian Forest 63320 Southern Willow Scrub	
<i>Salix lasiolepis</i> Alliance	<i>Salix lasiolepis</i> Association
61330 Southern Cottonwood-Willow Riparian Forest	
<i>Populus fremontii</i> Alliance	<i>Populus fremontii</i> / <i>Baccharis salicifolia</i> Association
	<i>Populus fremontii</i> - <i>Salix gooddingii</i> / <i>Baccharis salicifolia</i> Association
62500 Southern Riparian Woodland	
<i>Platanus racemosa</i> Alliance	<i>Platanus racemosa</i> / <i>Baccharis salicifolia</i> Association
	<i>Platanus racemosa</i> - <i>Populus fremontii</i> / <i>Salix lasiolepis</i> Association
<i>Salix gooddingii</i> Alliance	<i>Salix gooddingii</i> Association
<i>Salix lucida</i> Alliance	<i>Salix lucida</i> ssp. <i>lasiandra</i> Association
62500 Southern Riparian Woodland 63320 Southern Willow Scrub	
<i>Salix laevigata</i> Alliance	<i>Salix laevigata</i> Association
63000 Riparian Scrubs	
<i>Ambrosia monogyra</i> Provisional Alliance	<i>Ambrosia monogyra</i> Provisional Association
<i>Artemisia dracunculus</i> Alliance	<i>Artemisia dracunculus</i> Association
63310 Mule Fat Scrub	
<i>Baccharis salicifolia</i> Alliance	<i>Baccharis salicifolia</i> Association

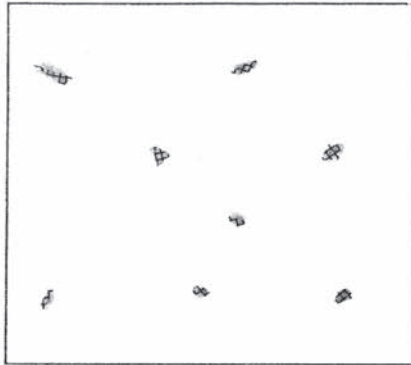
Table C.4 Alliances and Associations Arranged by Holland (Oberbauer) Code (continued)	
Draft Vegetation Communities of San Diego County (Oberbauer et al. 2008) (Shaded)	
Alliances of Western San Diego County (Unshaded)	Associations of Western San Diego County
63320 Southern Willow Scrub	
<i>Pluchea sericea</i> Alliance	<i>Pluchea sericea</i> Association
<i>Salix exigua</i> Alliance	(Alliance level only)
65000 Non-Native Riparian	
<i>Arundo donax</i> Semi-Natural Stands	<i>Arundo donax</i> Semi-Natural Stands
Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands	Naturalized Warm-Temperate Riparian and Wetland Semi-Natural Stands
<i>Tamarix</i> Semi-Natural Stands	<i>Tamarix</i> Semi-Natural Stands
65000 Non-Native Riparian	
11300 Disturbed Habitat	
<i>Conium maculatum</i> - <i>Foeniculum vulgare</i> Semi-Natural Stands	<i>Conium maculatum</i> - <i>Foeniculum vulgare</i> Semi-Natural Stands
71160 Coast Live Oak Woodland	
71161 Open Coast Live Oak Woodland	
<i>Quercus agrifolia</i> Alliance	<i>Quercus agrifolia</i> / <i>Artemisia californica</i> Association
	<i>Quercus agrifolia</i> / <i>Quercus (berberidifolia, xacutidens)</i> Association
71180 Engelmann Oak Woodland	
71181 Open Engelmann Oak Woodland	
<i>Quercus engelmannii</i> Alliance	<i>Quercus engelmannii</i> / <i>Salvia apiana</i> Association
71180 Engelmann Oak Woodland	
71182 Dense Engelmann Oak Woodland	
<i>Quercus engelmannii</i> Alliance	<i>Quercus engelmannii</i> - <i>Quercus agrifolia</i> / <i>Toxicodendron diversilobum</i> /Grass Association
79100 Eucalyptus Woodland	
<i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands	<i>Eucalyptus (globulus, camaldulensis)</i> Semi-Natural Stands
83140 Torrey Pine Forest	
<i>Pinus torreyana</i> Special Stands	<i>Pinus torreyana</i> Special Stands
83230 Southern Interior Cypress Forest	
<i>Callitropsis forbesii</i> Alliance	<i>Callitropsis forbesii</i> Provisional Association
83230 Southern Interior Cypress Forest	
37000 Chaparral	
<i>Fremontodendron mexicanum</i> Special Stands	<i>Fremontodendron mexicanum</i> Special Stands

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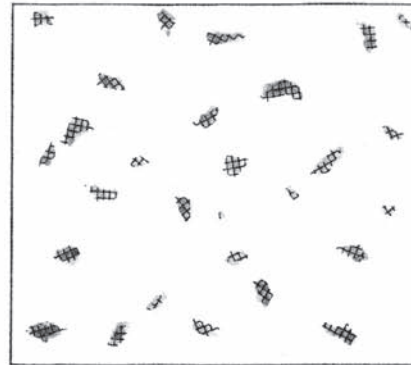


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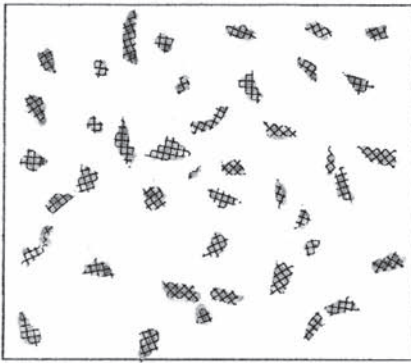
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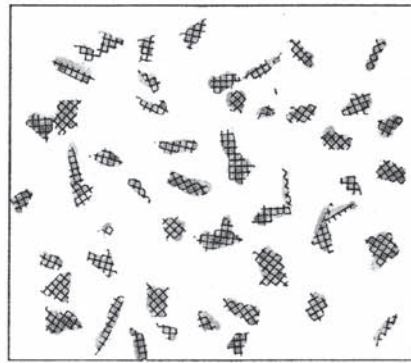
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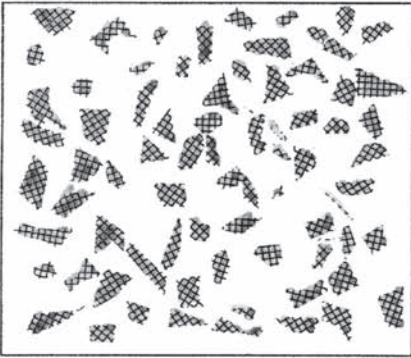
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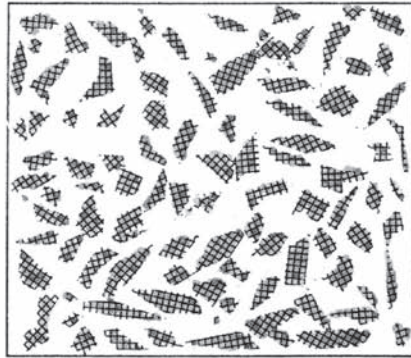
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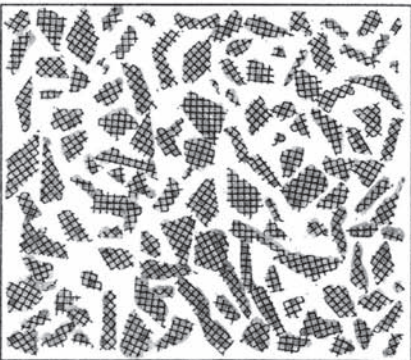
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