

Mapping Fine Scale Vegetation and Land Use in California State Parks

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Central California Foothills and Coastal Mountains Ecoregion

**A Report to the California
Department of Parks and
Recreation**

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Abstract

The purpose of this project was to contribute to state-wide vegetation classification and to create a comprehensive digital map of vegetation communities within the California State Parks using vegetation survey data. Creation of this map has multiple purposes, including but not limited to the following: assisting land managers in decision-making, fire and fuel management, protecting endangered species and habitats, protecting cultural and natural resources, outlining habitat connectivity, guiding habitat restoration, guiding conservation prioritization, and informing development. The map produced for this project is part of a greater collaborative effort to create a comprehensive vegetation map for all of California. This project involved the collection of 403 Rapid Assessment and Relevé vegetation surveys. The completed map covers a surface area of 88,003.92 acres and has a total of 11,027 polygons with 94 vegetation mapping units.

Acknowledgments

We would like to thank the following organizations for their contributions to this project:

- California Department of Parks and Recreation (CDPR)
- California Department of Fish and Wildlife (CDFW)
- California Native Plant Society (CNPS)
- Geographical Information Center (GIC) field staff and photo-interpreters
- Tuckman Geospatial

A special thank you to the Department of Fish and Wildlife's Vegetation Classification and Mapping Program (VegCAMP) team, who assisted in surveying and classification. We would also like to thank the California Department of Parks and Recreation, who also assisted in surveying as well as permitted the Geographical Information Center to access their landholdings.

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Introduction

The Geographical Information Center (GIC) was contracted by the California Department of Parks and Recreation (CDPR) to collect vegetation surveys to contribute to regional and state-wide classification and to create a fine-scale vegetation map following the Survey of California Vegetation (SCV) standards. The study area consists of 15 State Parks (SP), 8 State Beaches (SB), 2 State Nature Reserves (SNR), 1 State Historical Monument (SHM), 1 State Vehicular Recreation Area (SVRA), and 1 State Historic Park (SHP) encompassing over 149,326 total acres.

These parks are further split into Department of Recreation (DPR) districts. This project covers 6 districts, including the Monterey, San Luis Obispo, Diablo Range, Central Valley, Santa Cruz, and Oceano Dunes districts. The parks included in this study are listed in *Table 1* in the Methods section. The total acreage for this project was 88,003.92 acres and a map of the study area is included in *Figures 1 and 2* below.

The vegetation classification used for mapping followed the guidelines outlined by the National Vegetation Classification System (USNVC 2019) and A Manual of California Vegetation (Sawyer, Keeler-Wolf, and Evens 2009). This methodology is in alignment with the California Department of Fish and Wildlife's (CDFW) VegCAMP program in developing a classification system and mapping methodology for the entire state of California.

This study summarizes the vegetation communities in California State Parks. These maps help guide conservation, restoration, climate change monitoring, and habitat connectivity goals. The maps may be used by land managers to help preserve the fragile dune ecosystems where the snowy plover (a bird species of special concern) nests and rears its young. The areas included in this project can be remapped to show the changes in vegetation over time, including the spread of invasive species. Overall, the maps quantify natural vegetation and help the Department of Parks and Recreation educate the public on how to care for public resources.

The scope of this project includes a comprehensive field sampling effort to characterize the vegetation communities within the study area, the creation of a digital vegetation map using ESRI software following the SCV standards, and a final summary report.

Map of Study Area

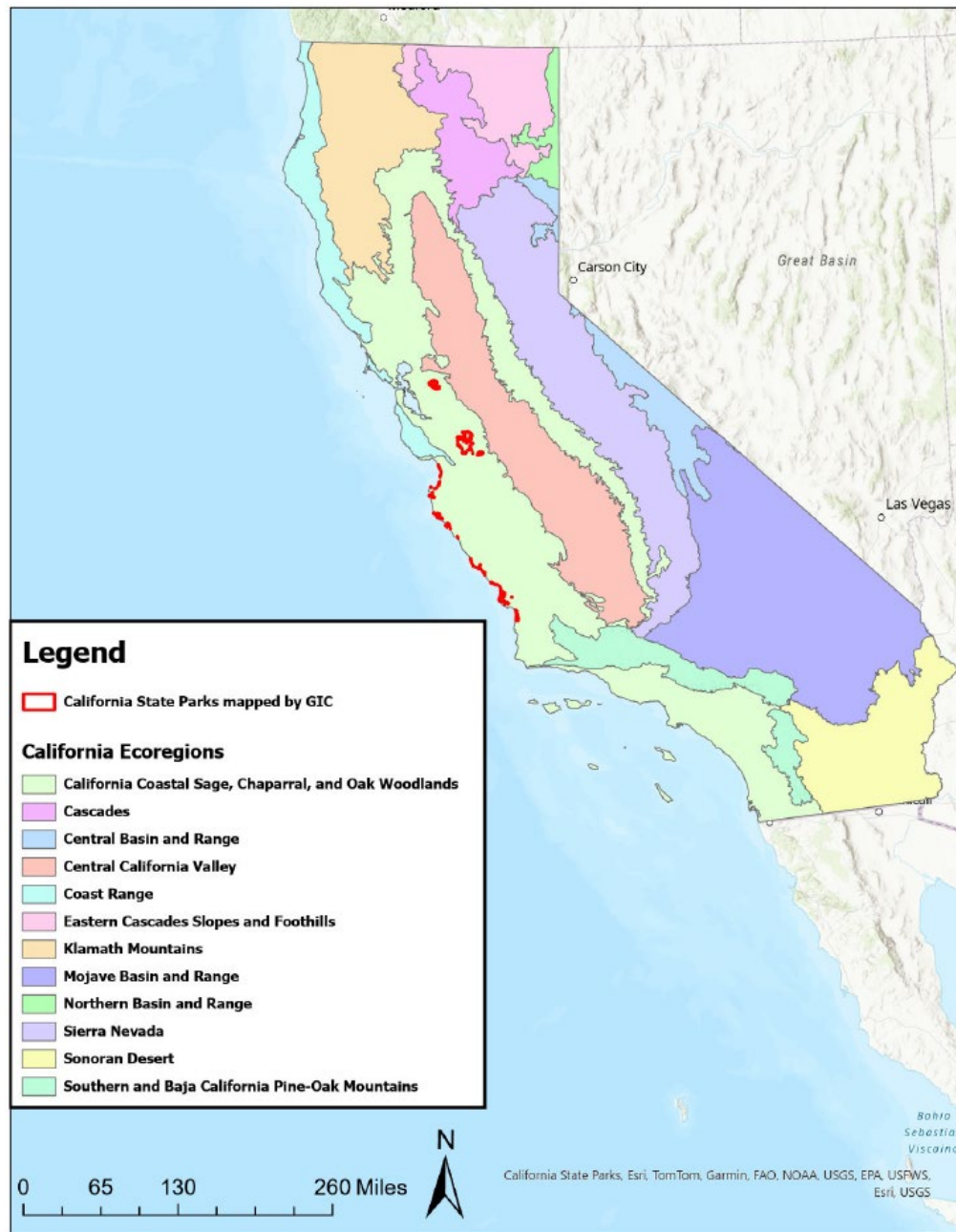


Figure 1: California State Parks sampled and mapped by the GIC in the Central California Foothills and Coastal Mountains Ecoregion.

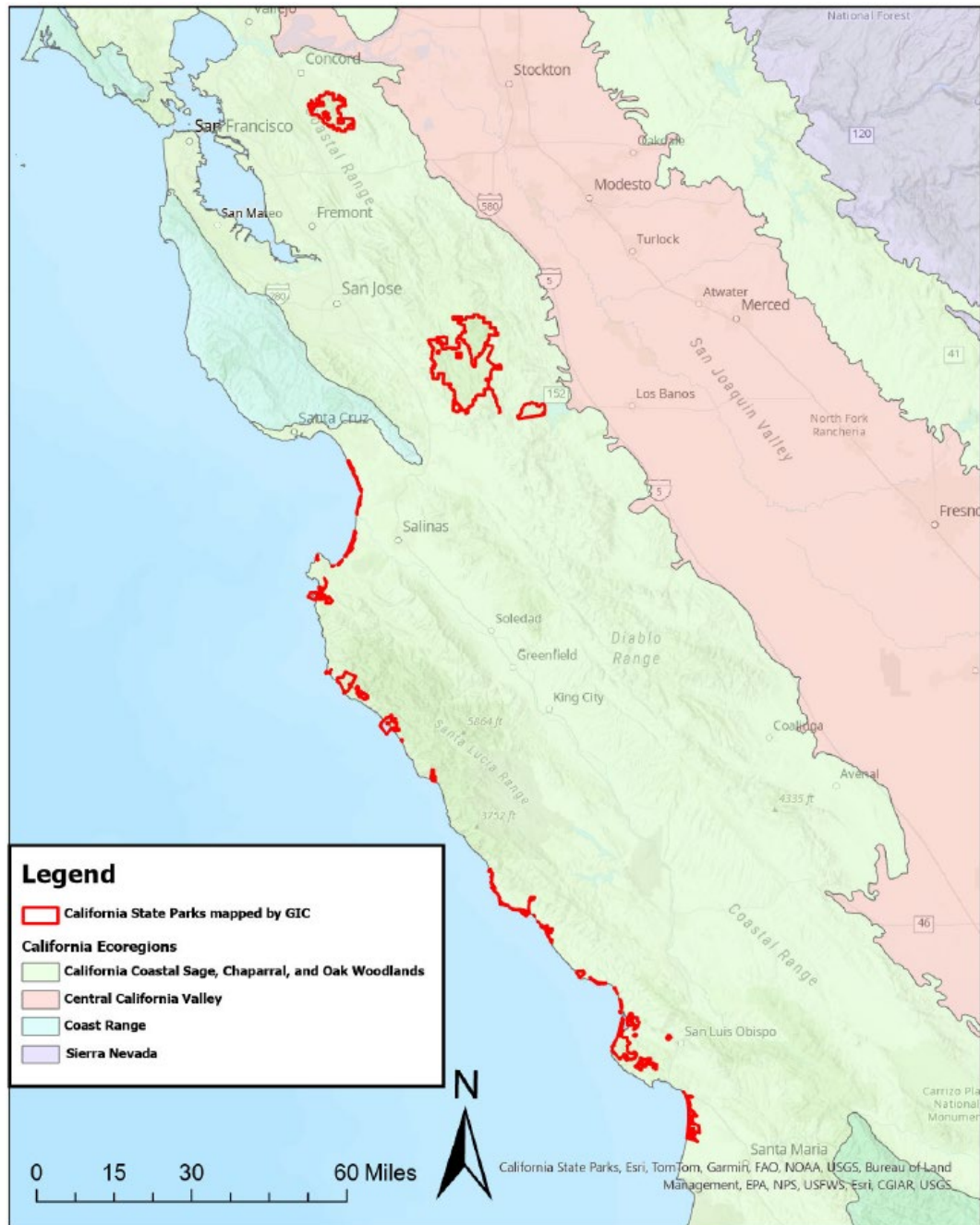


Figure 2: California State Parks sampled and mapped by the GIC in the Central California Foothills and Coastal Mountains Ecoregion shown at finer scale.

Methods

Field Sampling

Sample Allocation Methods

Beaches were primarily sampled by selecting opportunistic stands. Field crews select opportunistic stands by evaluating the repeated vegetation patterns observed throughout a given survey area. There were 124 sample allocations that were created by CDPR for the field crews to sample. Many of these were not visited due to time constraints and/or accessibility issues. The allocation points are not only used to select specific plant communities, but also to spread the sampling effort across the mapping area. Sampling does not always take place at the exact allocation point due to these reasons. In 2021, 39 of the 264 surveys done by the GIC were adjacent to sample allocations, the other 225 were opportunistic samples. In 2022, 40 of the 86 surveys done by the GIC were near sample allocations, and the other 46 were opportunistic surveys.

Sampling data from other organizations were also utilized to produce the vegetation maps. CDFW joined the sampling efforts in Mount Diablo SP in 2021 and contributed 33 surveys, of which 29 were opportunistic surveys. Additionally, photo-interpreters referenced CNPS and Tuckman Geospatial sampling data from 2020 (23 surveys, 20 of which were opportunistic surveys) and 2021 (146 surveys, all of which were opportunistic surveys).

Maps showing survey locations in the study area are included in *Figures 3 through 25*.

Field sampling methods (Reconnaissance, Rapid Assessment (RA)/Relevé)

GIC field crews collected vegetation surveys using the CNPS-CDFW Combined Vegetation Rapid Assessment and Relevé protocol. The field form and protocol can be found in *Appendices A and B*. For each survey, collected data included: sample location, date, names of surveyors, coordinates in UTM, stand size, aspect, gradient, topography, geology, soil texture, surface substrate covers, bioturbation presence, fire evidence, disturbance codes (including evidence of grazing or off-road vehicles), tree diameter at breast height, shrub height, herb height, field alliance, and a list of species present. The site history, stand age, and any other pertinent information about the stand and its surroundings were also recorded in the comments section. Photos were taken for each survey in the four cardinal directions in the following order: North, East, South, and West. Additional photos were taken if the original four photos did not adequately capture the stand's vegetation. All photos were sorted by survey ID and archived with CDFW.

In 2021, 329 surveys were completed by the GIC in Mount Diablo SP, Henry W. Coe SP, Sunset SB, Zmudowski SB, Moss Landing SB, Salinas River SB, Hatton Canyon (now a part of Ishxenta SP), Marina SB, Fort Ord Dunes SP, Monterey SB, Carmel River SB, Asilomar SB, Point Lobos SNR, Andrew Molera SP, Pfeiffer Big Sur SP, Julia Pfeiffer Burns SP, John Little SNR, and Limekiln SP.

In 2022, GIC completed 74 surveys in Morro Bay SP, Morro Strand SB, Los Osos Oaks SNR, Montaña de Oro SP, Pismo SB, Oceano Dunes SVRA, Hearst San Simeon SHM, Hearst San Simeon SP, Harmony Headlands SP, and Estero Bluffs SP for a total of 452 surveys. Biologists from the California Natural Plant Society (CNPS) and the California Department of Fish and Wildlife (CDFW) helped take surveys in both 2021 and 2022.

Survey count listed in *Table 1* below.

Once finalized, the field forms were scanned and bookmarked in PDF format in Adobe Acrobat Pro. Field data were entered into a geospatially referenced Microsoft Access database that was provided by CDFW. The database was checked for quality assurance by both the GIC and CDFW. The data was utilized by VegCAMP to create the classification and key to guide the mapping process. The field photos were also checked for quality assurance by both GIC and CDFW.

*Table 2: List of the State Parks (SP), State Beaches (SB), State Historical Monuments (SHM), State Historic Park (SHP), State Natural Reserves (SNR), and State Vehicular Recreation Areas (SVRA) included in this study with corresponding acreage, county, and Department of Parks and Recreation (DPR) district. *Hatton Canyon is now part of Ishxenta SP.*

Park Unit	Acres	Number of Surveys	County	DPR District
Andrew Molera SP	4,698	17	Monterey	Monterey
Asilomar SB	106	13	Monterey	Monterey
Carmel River SB	299	7	Monterey	Monterey
Estero Bluffs SP	385	4	San Luis Obispo	San Luis Obispo Coast
Fort Ord Dunes SP	925	20	Monterey	Monterey
Harmony Headlands SP	738	4	San Luis Obispo	San Luis Obispo Coast
Hatton Canyon*	126	9	Monterey	Monterey
Hearst San Simeon SHM	200	3	San Luis Obispo	San Luis Obispo Coast
Hearst San Simeon SP	2,298	11	San Luis Obispo	San Luis Obispo Coast
Henry W. Coe SP	87,252	80	Stanislaus	Diablo Range
Ishxenta SP (now includes Hatton Canyon)	1,563	0	Monterey	Monterey
John Little SNR	23	0	Monterey	Monterey
Julia Pfeiffer Burns SP	2,253	16	Monterey	Monterey
Limekiln SP	728	5	Monterey	Monterey
Los Osos Oaks SNR	85	2	San Luis Obispo	San Luis Obispo Coast
Marina SB	176	9	Monterey	Monterey
Montaña de Oro SP	10,275	16	San Luis Obispo	San Luis Obispo Coast
Monterey SB	121	9	Monterey	Monterey
Morro Bay SP	2,398	10	San Luis Obispo	San Luis Obispo Coast
Morro Strand SB	195	4	San Luis Obispo	San Luis Obispo Coast
Moss Landing SB	65	7	Monterey	Monterey
Mount Diablo SP	19,749	62	Contra Costa	Diablo Range
Oceano Dunes SVRA	3,459	9	San Luis Obispo	Oceano Dunes District
Pacheco SP	6,986	12	Santa Clara/Merced	Central Valley
Pismo SB	1,511	11	San Luis Obispo	Oceano Dunes District
Pfeiffer Big Sur SP	1,341	14	Monterey	Monterey
Point Lobos SNR	424	16	Monterey	Monterey
Point Sur SHP	92	3	Monterey	Monterey
Salinas River SB	280	11	Monterey	Monterey
Sunset SB	379	13	Santa Cruz	Santa Cruz
Zmudowski SB	196	6	Santa Cruz/Monterey	Monterey

Sampling equipment

Two crews of two completed the sampling done by GIC in 2021 and 2022. Each crew utilized Dell Toughbooks (rugged laptops) with built-in GPS to collect field data and survey point locations. Rapid Assessment and Relevé data were more thoroughly recorded on “Rite in the Rain” paper and later scanned to digital format in the office. Bushnell rangefinders were used to estimate and record tree heights. Garmin compasses were used to record aspect and gradient. Small shovels were used for collecting soil samples. Photos were taken on either a Sony Cybershot camera or an iPhone. Some crews used the Theodolite application which allowed for labeling pictures in the field and contains other labeled attributes such as coordinates, bearing, and elevation (precision was variable depending on cell service range). Shovels, fire extinguishers, water jugs, first aid kits, air compressors, and Delorme InReach GPS trackers were carried for safety purposes. Plant presses were used to preserve sample specimens. The Jepson Manual (Hickman, J. C., & Jepson, W. L. 2012) was used to identify and confirm the species of plant samples collected.

Map of surveyed data points

Figures 3-25 below show the distribution of surveys and reconnaissance in California State Parks completed in both 2021 and 2022. John Little SNR was not sampled so there is no figure below.

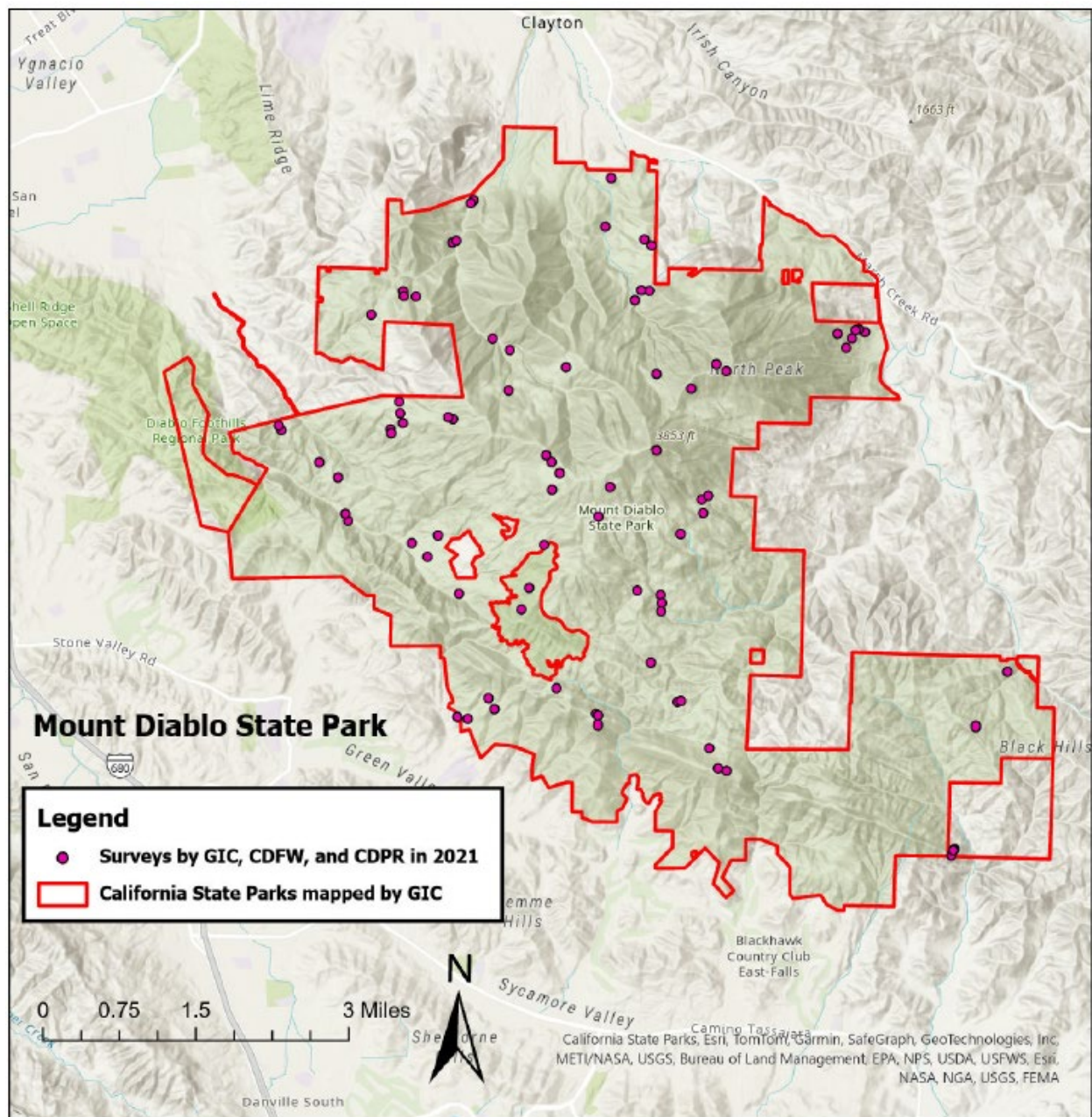


Figure 3: 62 surveys and 15 reconnaissance contributed by GIC, CDFW, and CDPR in Mount Diablo SP in 2021.

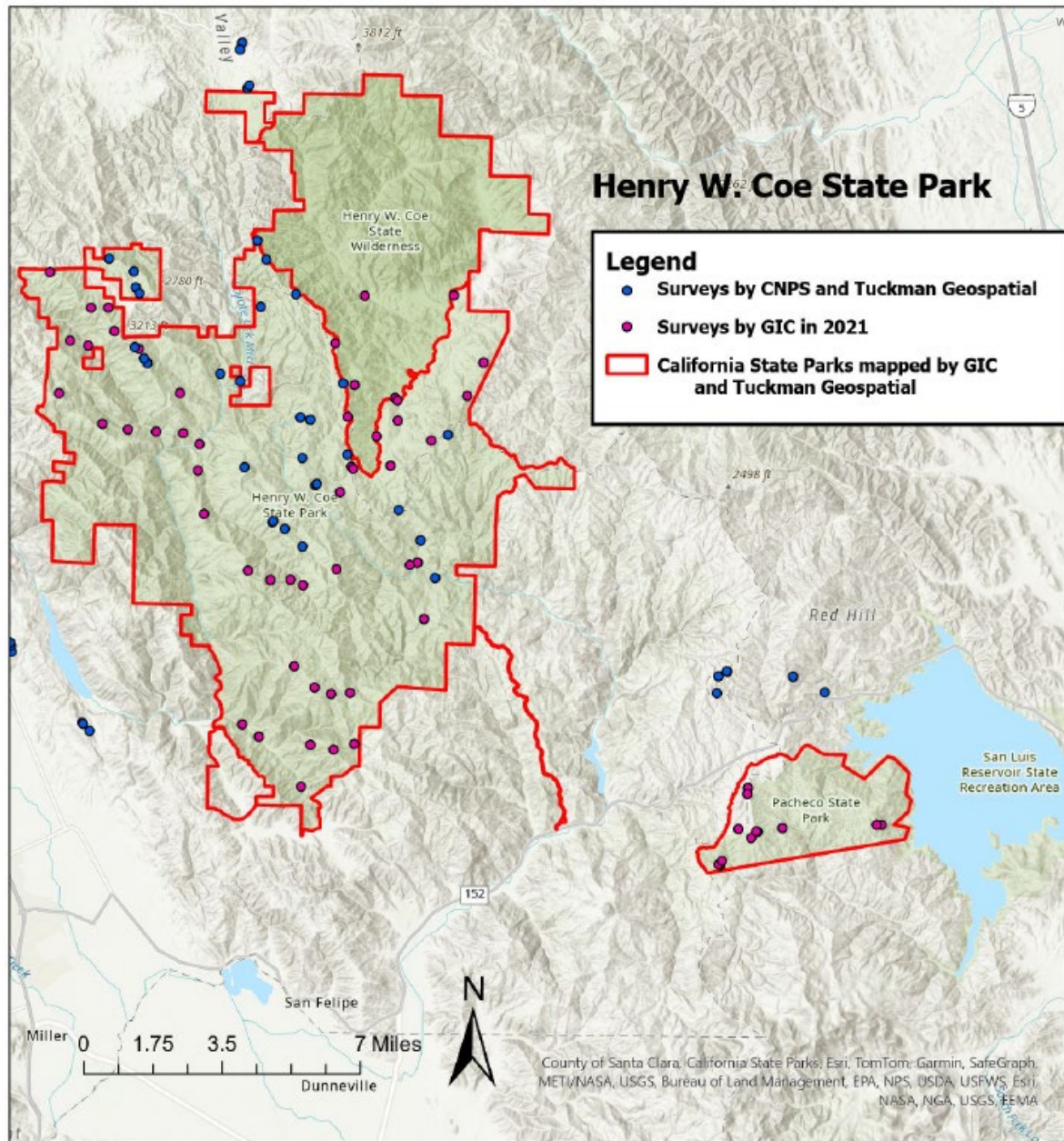


Figure 4: 80 surveys contributed by GIC, CNPS, and Tuckman Geospatial in Henry W. Coe SP in 2021. 12 surveys contributed by GIC in Pacheco SP in 2021.

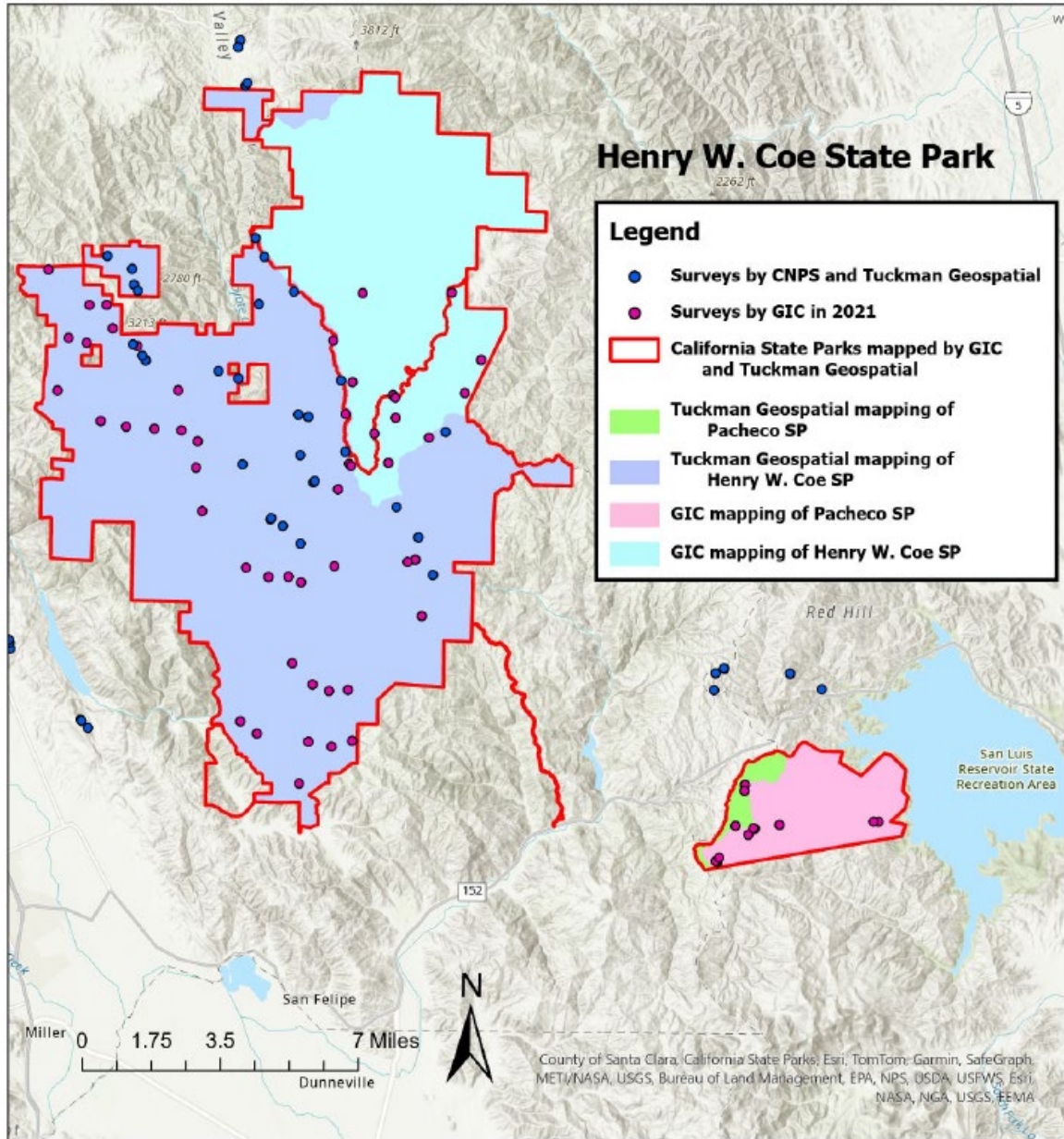


Figure 5: 80 surveys contributed by GIC, CNPS, and Tuckman Geospatial in Henry W. Coe SP in 2021. 12 surveys contributed by GIC in Pacheco SP in 2021. Santa Clara County was mapped by Tuckman Geospatial. The remaining acreage in both parks was mapped by GIC.

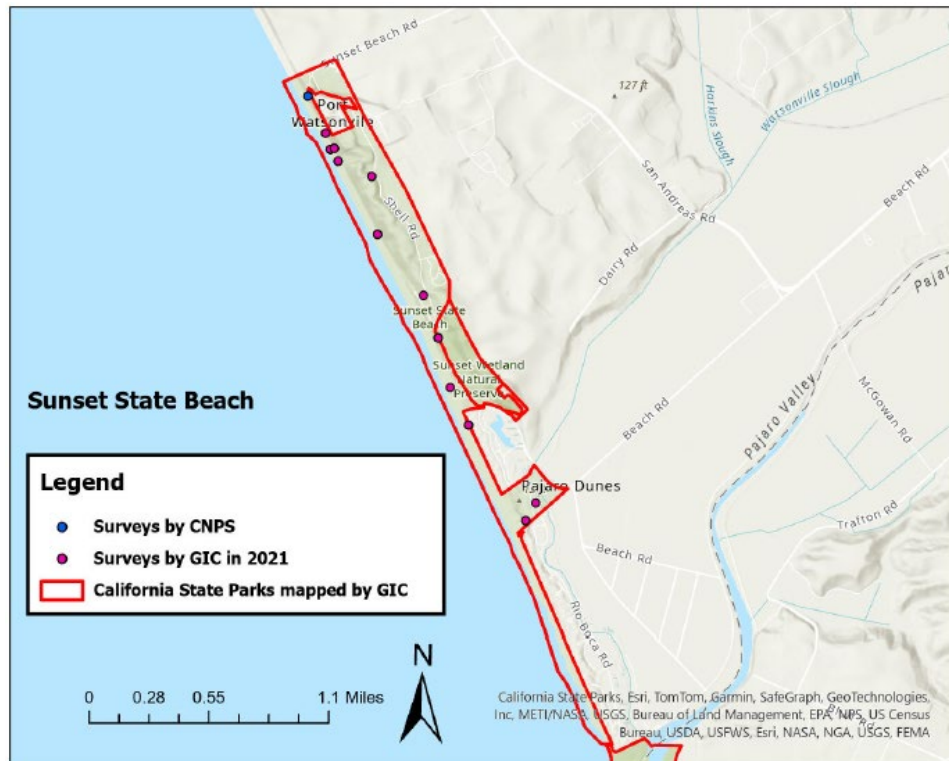


Figure 6: 13 surveys contributed by GIC, and CNPS in Sunset SB in 2021.

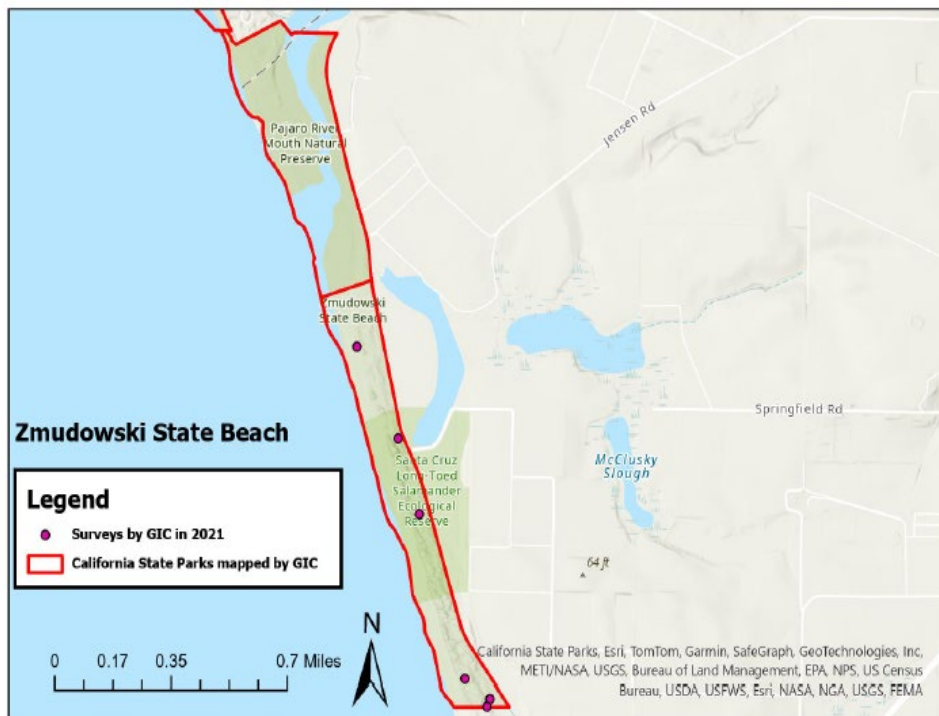


Figure 7: 6 surveys contributed by GIC in Zmudowski SB in 2021.

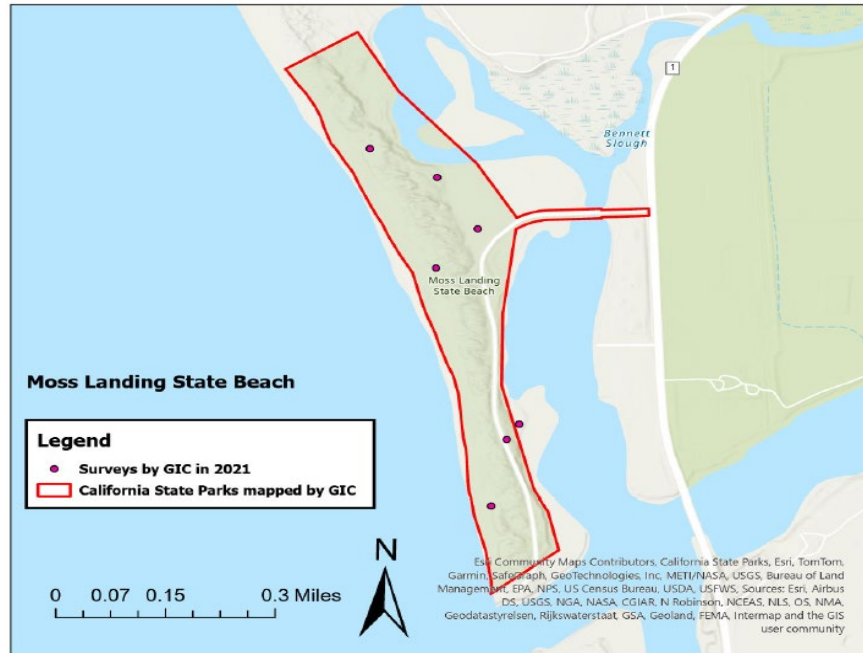


Figure 8: 7 surveys contributed by GIC in Moss Landing SB in 2021.

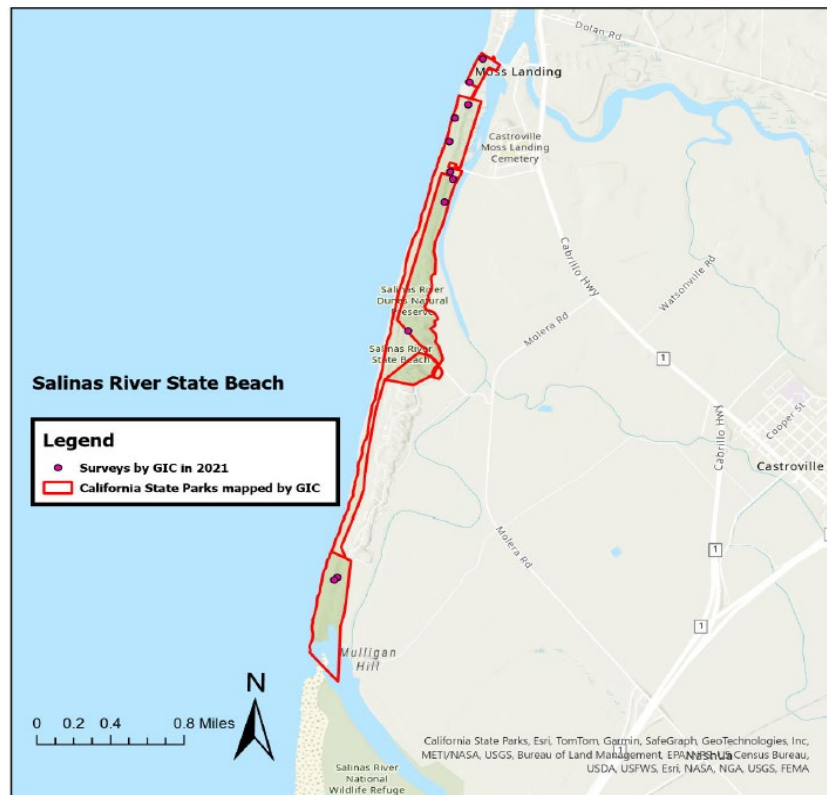


Figure 9: 11 surveys contributed by GIC in Salinas River SB in 2021.



Figure 10: 9 surveys contributed by GIC in Marina SB in 2021. 20 surveys contributed by GIC in Fort Ord Dunes SP in 2021.

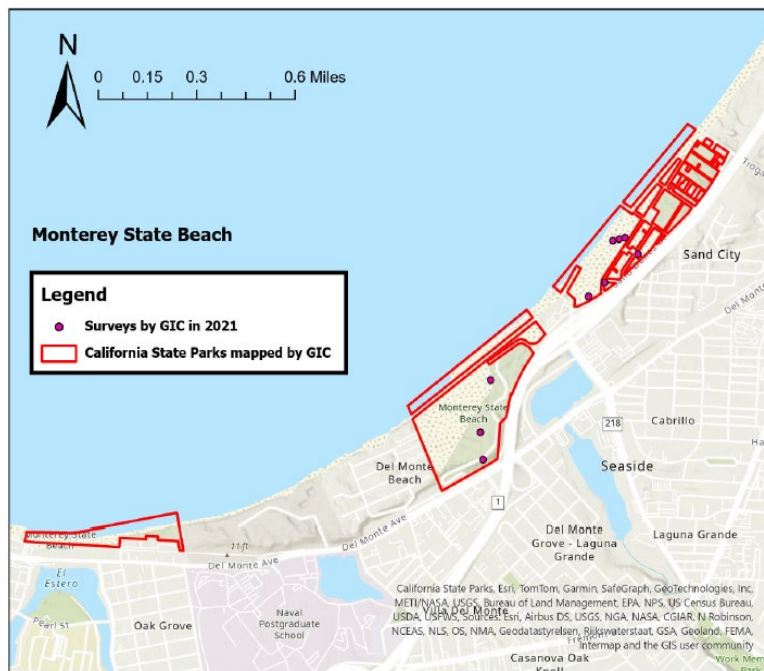


Figure 11: 9 surveys contributed by GIC in Monterey SB in 2021.



Figure 12: 13 surveys contributed by GIC in Asilomar SB in 2021.

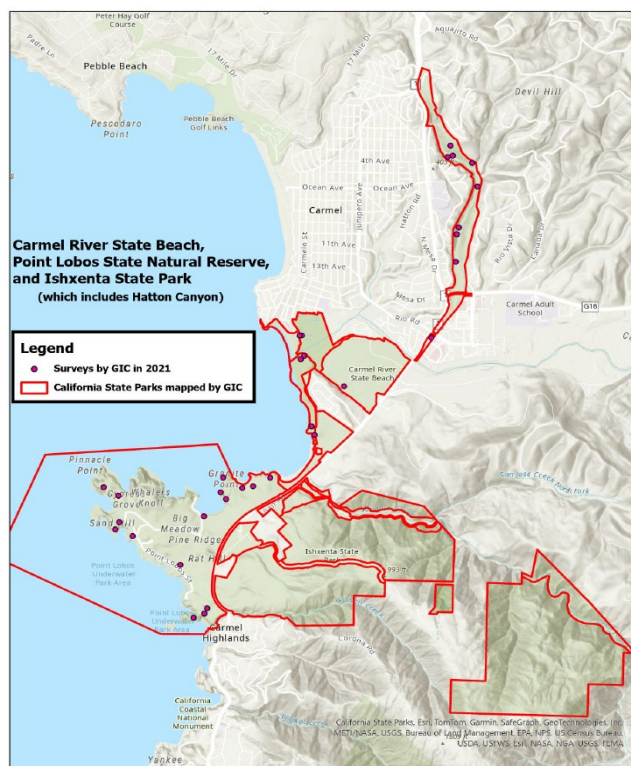


Figure 13: 9 surveys contributed by GIC in Hatton Canyon in 2021. 7 surveys contributed by GIC in Carmel River SB in 2021. 16 surveys contributed by GIC in Point Lobos SNR in 2021.

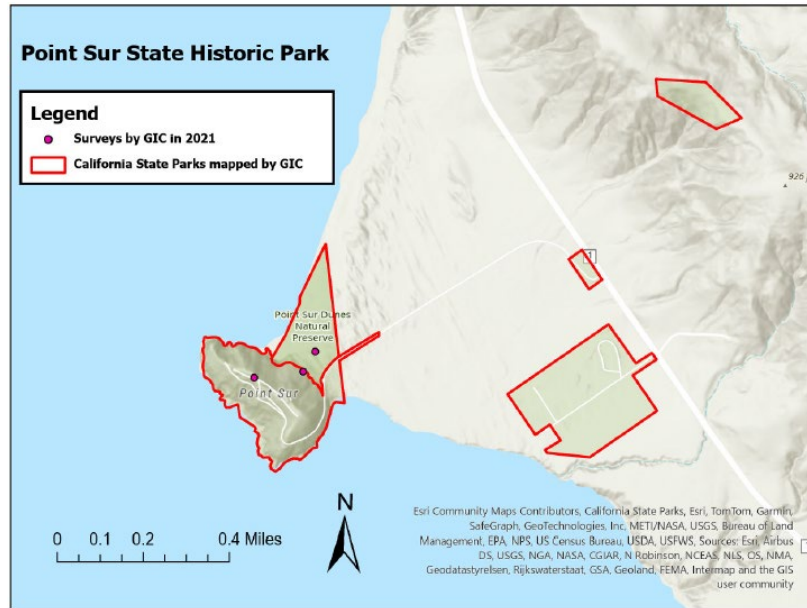


Figure 14: 3 surveys contributed by GIC in Point Sur SHP in 2021.



Figure 15: 17 surveys contributed by GIC in Andrew Molera SP in 2021.



Figure 16: 14 surveys contributed by GIC in Pfeiffer Big Sur SP in 2021.

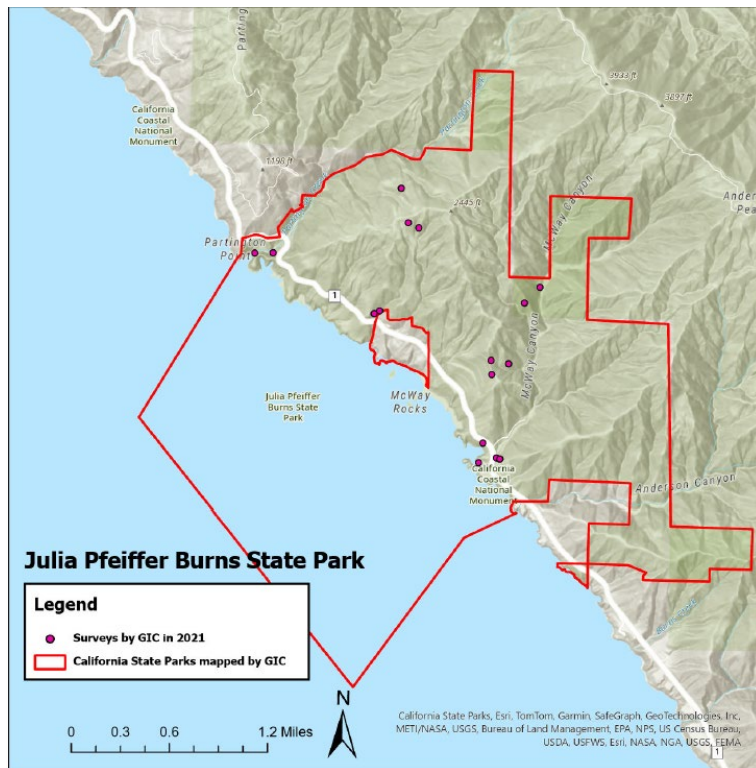


Figure 17: 16 surveys contributed by GIC in Julia Pfeiffer Burns SP in 2021.



Figure 18: 5 surveys contributed by GIC in Limekiln in 2021.



Figure 19: 3 surveys contributed by GIC in Hearst San Simeon SHM in 2022. 11 surveys contributed by GIC in Hearst San Simeon SP in 2022.



Figure 20: 4 surveys contributed by GIC in Harmony Headlands SP in 2022. 4 surveys contributed by GIC in Estero Bluffs SP in 2022.



Figure 21: 4 surveys contributed by GIC in Morro Strand SB in 2022.

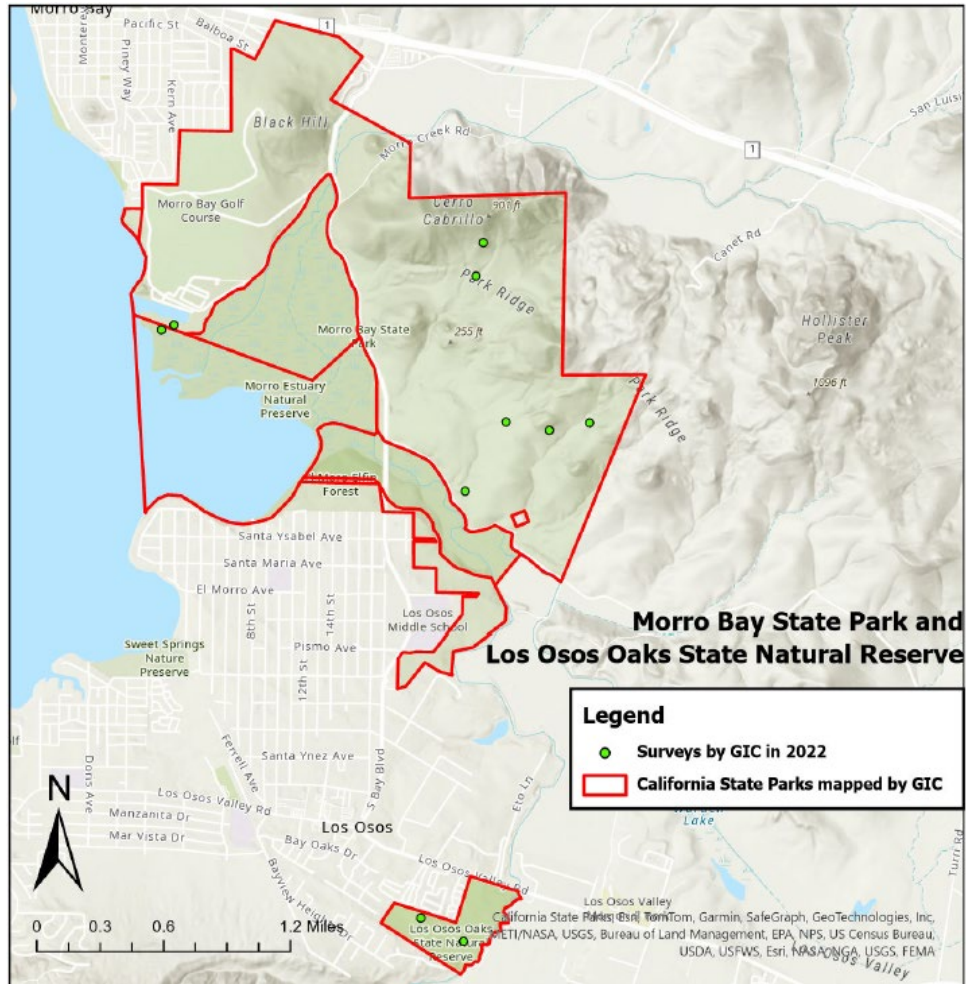


Figure 22: 8 of 10 surveys contributed by GIC in Morro Bay SP in 2022. 2 surveys contributed by GIC in Los Osos Oaks SNR in 2022.

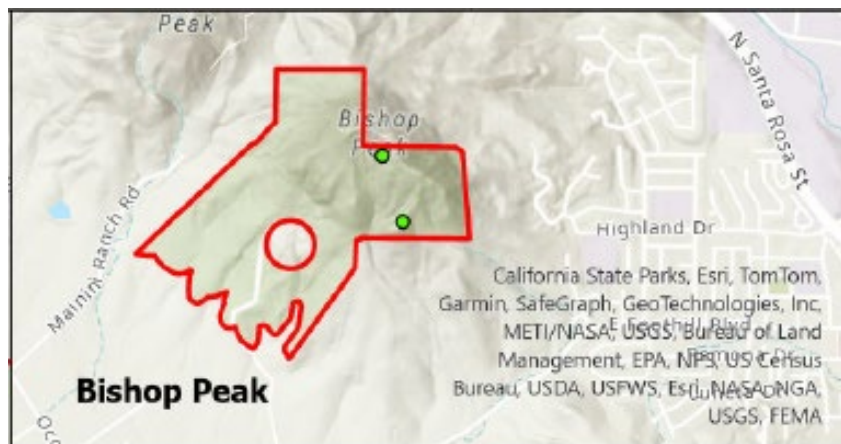


Figure 23: 2 of 10 surveys contributed by GIC in Morro Bay SP at Bishop Peak in 2022.

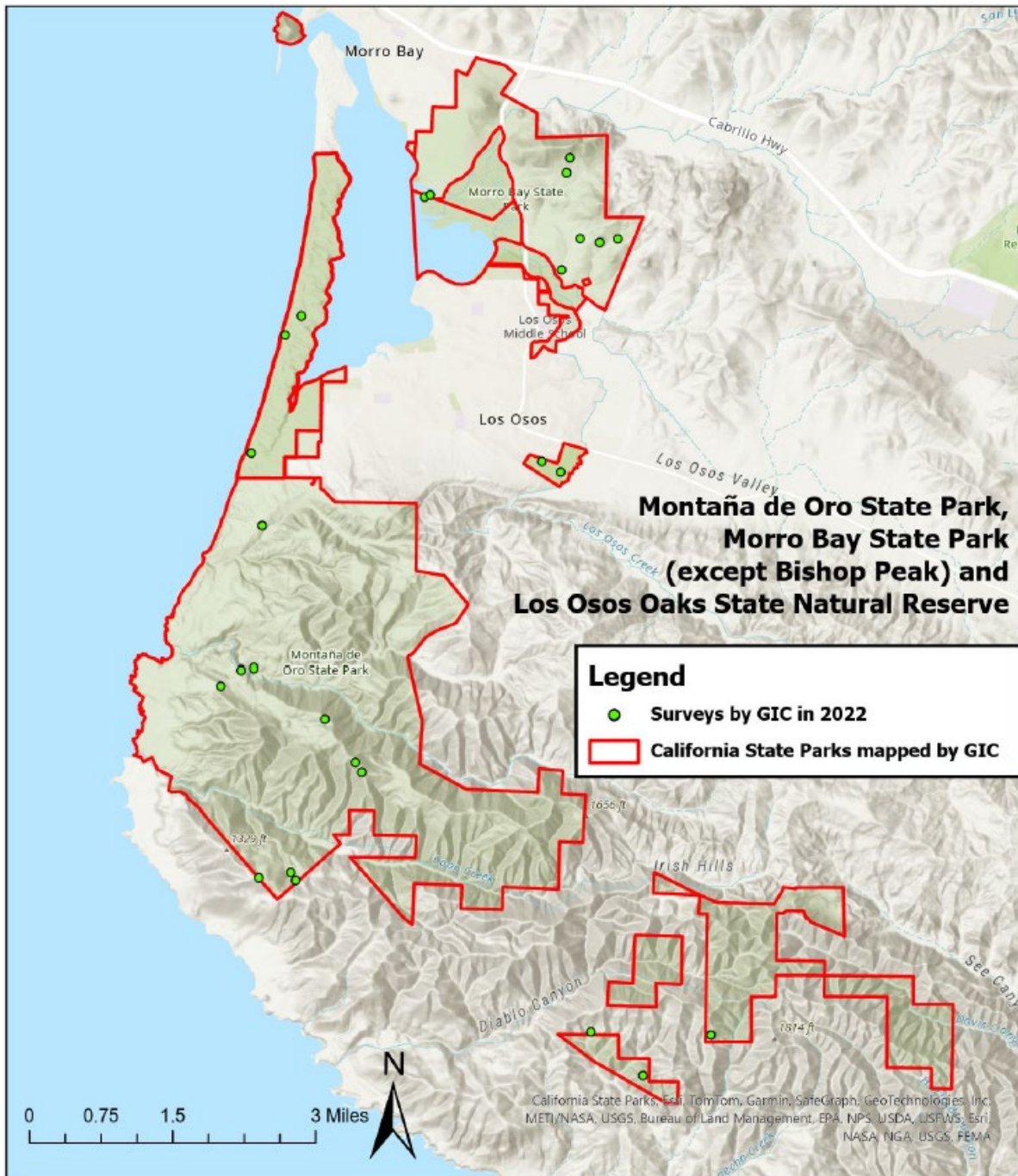


Figure 24: 16 surveys contributed by GIC in Montaña de Oro SP in 2022. 8 of 10 surveys contributed by GIC in Morro Bay SP in 2022. 2 surveys contributed by GIC in Los Osos SNR.

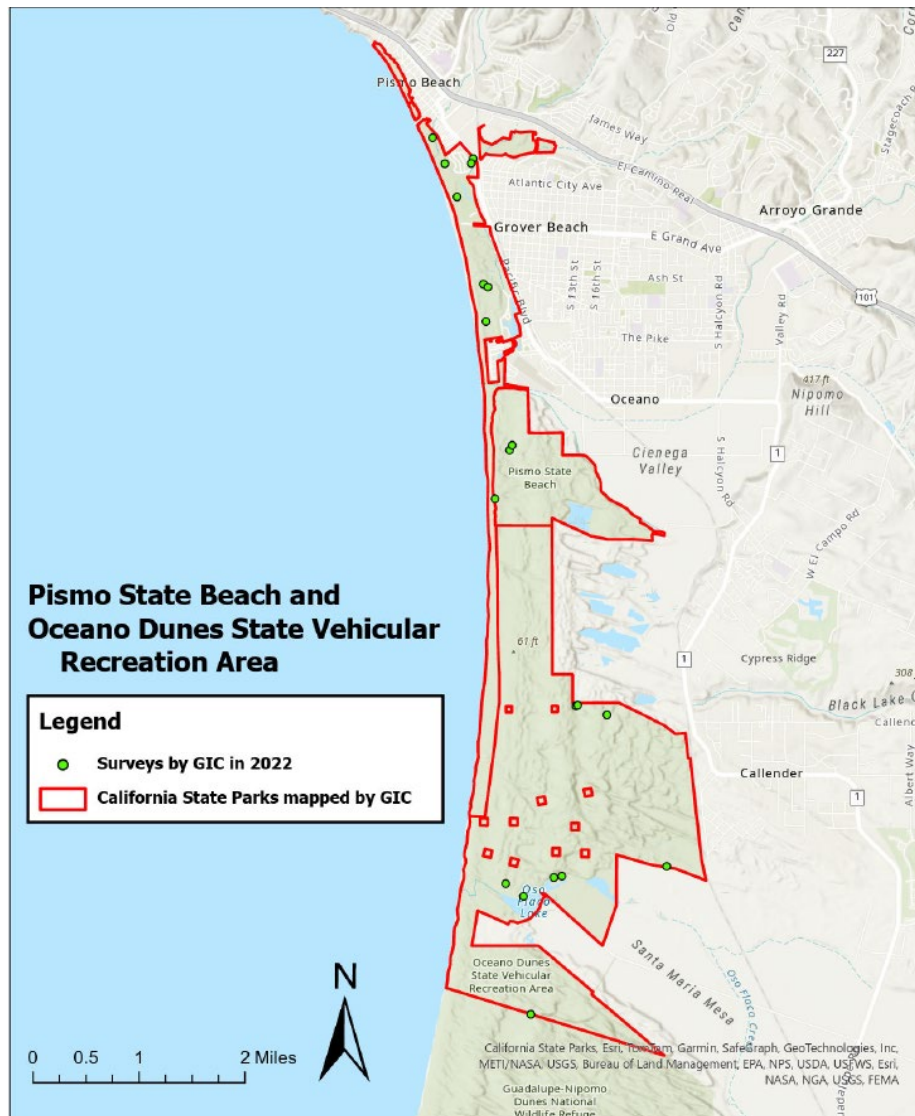


Figure 25: 11 surveys contributed by GIC and CDPR in Pismo SB. 9 surveys contributed by GIC and CDPR in Oceano Dunes SVRA in 2022.

Mapping

Map classification creation

Along with pre-existing data for the project area, vegetation survey data were utilized by CDFW VegCAMP as well as CNPS to create a vegetation classification for the project area, including corresponding descriptions and a field key to the alliance and associations (Sikes, Buck-Diaz, & Evens, 2023). The classification is based on the hierarchical National Vegetation Classification System (USNVC 2019). The hierarchical structure can be seen in *Table 2*, which ranges from Formation Class at the most general level to Association, which is the most detailed level of the hierarchy. Refer to *Appendix F* for the floristic vegetation key. The classification report does not provide descriptions at the association level.

Table 3: USNVC Hierarchy Structure

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

GIC photo-interpreters determined which types and which levels of the floristic classification could be mapped to develop a mapping classification of potential mapping units. Mapping units are primarily alliance level. Mapping units are also used for group and macrogroup level. When possible, photo-interpreters attempt to identify the more specific association level. Tree and shrub types are typically easier to identify with imagery and can be correctly interpreted at the alliance and association levels. However, some vegetation types are more difficult to photo-interpret to association or alliance level and are therefore mapped to the group level. Herbaceous types often are mapped at group or macrogroup level due to the challenge of differentiating and interpreting them correctly from imagery. Macrogroup level was utilized for rock outcroppings as well as for herbaceous types. If confident, the photo-interpreter included the alliance and association level for herbaceous types. The mapping classification also contains non-vegetated mapping units that are not in the floristic classification. The mapping classification can be found in *Appendix E*.

Use of field data assisting photo-interpretation or modeling

Trained GIC biologists/vegetation ecologists/photo-interpreters used manual photo interpretation (heads-up digitizing) of National Agricultural Inventory Program (NAIP) imagery to determine the delineation and attribution of vegetation stands to create a wall-to-wall vegetation map of the study area, although some maps do not reach the park boundary. This is because the ocean was not mapped, and the ocean typically appears in the imagery for the California State Parks along the coastline. Photo-interpreters also mapped outside the boundary, using their discretion, to keep vegetation communities intact. Digitizing was done at an average scale of 1:2000. Both 2020 NAIP natural color and infrared imagery from the entire state were utilized for photo interpretation. Google Earth imagery was also heavily used as ancillary information to inform the photo interpretation process. Example imagery (photo signatures) for each mapping unit used in the map can be found in *Appendix E*. Field survey-point data were also utilized by the photo-interpreters for baseline known signatures to guide linework and attribution. Slope, aspect, and hydrology all influence vegetation distribution and were considered while mapping. Survey data and field photos also assisted the photo-interpreters in their decision-making process. Mapping was completed in ESRI's ArcGIS Pro 3.1.2 using a file geodatabase for data storage.

GIC also utilized informal field markers to assist in the mapping process. These points were taken by field crews in 2021 and 2022 to mark vegetation for photo-interpreters to use as plant signature references.

Mapping criteria

Minimum polygon size or minimum mapping unit (MMU) is important to consider when creating a map. Determining the MMU for a project can be influenced by time and budget constraints, the purpose of the map, and the clarity of the imagery. Also, the vegetation type itself can influence the MMU for a given type. For example, stands of special significance may have a smaller MMU.

- 1 acre for woody and herbaceous upland stands
- 0.25 acres for wetland and riparian
- No MMU for polygons on the border of the mapping boundary as the vegetation stands often continue out of the park boundaries
- 1 acre for agriculture and urban
- 0.25 acre for water
- Minimum width of linear polygons was 10 meters but photo-interpreters used discernment to preserve riparian stands

Vegetation cover was estimated using a birds-eye view perspective, looking straight down on the vegetation, considering porosity (light passing through the canopy). Cover of trees and shrubs was estimated as whole integers while herbaceous vegetation cover was estimated using the cover class categories described in *Appendix E*. When the

overstory layer(s) were 40% absolute cover or greater, estimates of the understory were unreliable and therefore not given.

Vegetation porosity varies from species to species and community to community depending on multiple environmental factors. A combination of field data, imagery, and calibration between photo-interpreters were all utilized to guide photo-interpreters in determining absolute cover values.

Adjacent polygons of the same vegetation type (typically alliance level) were separated if the overstory had a break in cover class and each polygon was at least 3 acres, or if the understory had a break in cover class and each polygon was at least 5 acres. The Braun-Blanquet cover classes (1932) used are described in *Appendix E*.

Adjacent polygons of the same alliance were also broken at 3 acres each when there was a change in the modal height of the overstory layer. Height classes are described in *Appendix E*.

Map Attributes and Associated Rules

This portion of the report covers definitions of macrogroup, group, alliance, and association level. This section also defines trees, shrubs and herbs and the associated values necessary to determine each type.

Macrogroup: The fifth level in the natural vegetation hierarchy, in which each vegetation unit is defined by a group of plant communities with a common set of growth forms and many diagnostic plant taxa (including many character taxa of the dominant growth forms) preferentially sharing a broadly similar geographic region, regional climate, and disturbance factors. (cf Pignatti et al. 1995, and Braun-Blanquet concept of “Class”).

Group: The sixth level in the natural vegetation hierarchy, in which each vegetation unit is defined by a group of plant communities with a common set of growth forms and diagnostic species or taxa (including several characteristic species of the dominant growth forms), preferentially sharing a similar set of regional edaphic, topographic, and disturbance factors. (Jennings et al. 2009, FGDC 2008) This is the level in which most herbaceous types were mapped.

Alliance: A classification unit of vegetation containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover. Alliances reflect the general form or appearance of the landscape as well as regional to sub-regional climates, substrates, hydrology, and disturbance regimes (Jennings et al. 2006, FGDC 2008). An alliance was assigned to each polygon and was the target classification level for this map. Group level (one level up in the hierarchy) was utilized when alliance level was not achievable.

Association: A classification unit of vegetation containing diagnostic species, usually from multiple growth forms or layers, which have similar composition that reflects topographic climate, substrates, hydrology, and disturbance regimes (Jennings et al. 2009,

FGDC 2008). Association level was attempted, but not required, when photo-interpreters were confident to map to this level.

Tree: A woody plant that generally has a single main stem and a more or less definite crown. Tree stands must have at least 5% absolute cover of tree species to be determined a tree stand. Percent of estimated absolute **tree cover** was entered as a real number for conifer and hardwoods. Percent tree was entered as 333 for the non-vegetation mapping units: built-up and urban disturbance and agriculture which are already delineated and categorized to finer levels in other land use layers.

Shrub: A woody plant that generally has two to several stems from its base, giving it a broad crown, and is usually below 5 m in height. Includes dwarf shrubs and low or short woody vines. Shrub stands must have less than 5% tree cover and shrub cover must be >2% and evenly distributed. Riparian stands required 10% shrub cover to be determined a shrub stand.

Shrub cover was recorded when tree cover was <40% and was entered as a real number for estimated absolute cover. Percent shrub was entered as 333 for the non-vegetation mapping units: built-up and urban disturbance and agriculture which are already delineated and categorized to finer levels in other land use layers.

Herbaceous cover was estimated when total tree and shrub cover was <40% and recorded as shown in the protocol in *Appendix B*.

Clearing Disturbance was recorded based on the percentage of the polygon affected by noticeable clearing, scraping, or other obvious anthropogenic disturbance (other than buildings) and was recorded as shown in the protocol in *Appendix B*.

Roadedness was recorded based on the percentage of the polygon affected by roads fragmenting the polygon, as shown in the protocol in *Appendix B*.

Development was recorded as a percentage of the polygon affected when it was obvious to the photo-interpreter that anthropogenic development was present and was recorded as shown in the protocol in *Appendix B*.

Invasive species were recorded when it was obvious to the photo-interpreter that invasive species were present. Relative cover was used to determine the percentage of invasive species present. Relative cover always totals 100%, even when absolute cover is low, and is a measure of the cover of a species in relation to that of other species within a set area or sample of vegetation. Invasive species were calculated across all strata layers and were recorded as shown in the protocol in *Appendix B*.

Comments are notes from the photo-interpreter pertinent to an individual polygon.

Further information describing the attributes used can be found in the metadata of the map and in *Appendix B* and *Appendix E*.

For more details, see [Survey of California Vegetation Classification and Mapping Standards](#).

Parks mapped by the GIC and their inholdings

*Table 3: List of the State Parks (SP), State Beaches (SB), State Historical Monuments (SHM), State Historic Park (SHP), State Natural Reserves (SNR), Natural Preserves (NP), Cultural Preserves (CP), State Wilderness (SW), and State Vehicular Recreation Areas (SVRA) and their inholdings within the park boundaries. Photo-interpreters mapped inholdings to maintain cohesive vegetation stands. *Hatton Canyon is now part of Ishxenta SP.*

Parks mapped by GIC	Properties included in park boundaries
Asilomar SB	Asilomar Dunes NP
Carmel River SB	Carmel River Lagoon and Wetland NP
Carmel River SB	Ohlone Coastal CP
Hearst San Simeon SP	Pa-nu CP
Hearst San Simeon SP	San Simeon NP
Hearst San Simeon SP	Santa Rosa Creek NP
Henry W. Coe SP	Henry W. Coe SW
Henry W. Coe SP	Henry W. Coe Sillaci Conservation Easement
Ishxenta SP	Hatton Canyon
Ishxenta SP	Tatlun CP
Ishxenta SP	San Jose Creek NP
Ishxenta SP	Point Lobos Ridge NP
Limekiln SP	Limekiln SW
Marina SB	Marina Dunes NP
Montaña de Oro SP	Morro Dunes NP
Morro Bay SP	Morro Estuary NP
Morro Bay SP	Heron Rookery NP
Morro Bay SP	Morro Rock NP
Mount Diablo SP	Civilian Conservation Corps CP
Mount Diablo SP	Mount Diablo SP Diablo Foothills Regional Park
Mount Diablo SP	Mount Diablo SP Morgan Territory Regional Preserve
Pismo SB	Pismo Dunes NP
Point Sur SHP	Point Sur Dunes NP
Salinas River SB	Salinas River Mouth NP
Salinas River SB	Salinas River Dunes NP

Parks mapped by GIC	Properties included in park boundaries
Sunset SB	Sunset Wetlands NP
Zmudowski SB	Pajaro River Mouth NP

Results

Sampling

Table 4 below shows a list of alliances surveyed during the 2021 and 2022 field seasons. 418 vegetation communities were sampled (including the 15 reconnaissance done on Mount Diablo SP). Sampling by the GIC, CDFW, and CDPR during 2021 took place from May through July. Sampling by the GIC and CDPR during 2022 took place during May. Sampling is done during the summer months

Table 4: Vegetation Communities sampled by the GIC, CDFW, CNPS, Tuckman Geospatial, and CDPR in 2021 and 2022 and the number of surveys per vegetation type.

Vegetation Communities Sampled in 2021 and 2022	# of surveys
Abronia latifolia - Ambrosia chamissonis	11
Abronia maritima	2
Acacia cyclops	1
Acacia spp. - Grevillea spp. - Leptospermum laevigatum	1
Acer macrophyllum	2
Acer macrophyllum - Alnus rubra	1
Adenostoma fasciculatum	19
Adenostoma fasciculatum - Salvia mellifera	1
Adenostoma fasciculatum – Salvia spp.	2
Aesculus californica	5
Allium spp. – Streptanthus spp. – Hesperolinon spp. Serpentine Alliance	1
Alnus rhombifolia	5
Ambrosia chamissonis	4
Ammophila arenaria	3
Arctostaphylos (canescens, manzanita, stanfordiana)	1
Arctostaphylos auriculata	1
Arctostaphylos crustacea	3
Arctostaphylos glandulosa	1
Arctostaphylos glauca	2
Arctostaphylos morroensis	1
Armeria maritima - Plantago maritima	2
Artemisia californica	10
Artemisia californica - Salvia melifera	1
Artemisia pycnocephala	9
Astragalus nuttallii - Erigeron glaucus	1

Vegetation Communities Sampled in 2021 and 2022	# of surveys
Avena spp. - Bromus spp	4
Baccharis pilularis	15
Baccharis salicifolia	2
Brassica nigra - Centaurea (solstitialis, melitensis)	1
Brassica nigra - Raphanus spp	1
Cakile maritima	4
California xeric chaparral	1
Calystegia soldanella	2
Carex nudata	1
Carpobrotus (edulis, chilensis)	3
Carpobrotus chilensis	1
Ceanothus cuneatus	1
Ceanothus oliganthus	1
Ceanothus thyrsiflorus	7
Cercocarpus betuloides	2
CFG (Native Grasses)	4
Coreopsis gigantea	1
Corethrogyne filaginifolia – Eriogonum (elongatum, nudum)	1
Cornus sericea	1
Diplacus aurianticus	1
Distichlis spicata	3
Dudleya farinosa	1
Eleocharis (acicularis, macrostachya)	1
Elymus glaucus	1
Elymus mollis	1
Elymus triticoides	1
Emmenanthe penduliflora	3
Ericameria ericoides	11
Ericameria linearifolia	1
Eriodictyon californicum	1
Eriogonum latifolium	3
Eriogonum parvifolium	8
Eriogonum wrightii	3
Eriophyllum staechadifolium	8
Eriophyllum staechadifolium - Erigeron glaucus - Eriogonum latifolium	2
Eschscholzia	1
Eschscholzia californica	1
Eucalyptus (camaldulensis, globula)	1

Vegetation Communities Sampled in 2021 and 2022	# of surveys
<i>Festuca arundinacea</i>	1
<i>Frangula californica</i>	8
<i>Frankenia salina</i>	2
<i>Fraxinus dipetala</i>	1
<i>Grindelia stricta</i>	2
<i>Hesperocyparis macrocarpa</i>	4
<i>Hesperocyparis macrocarpa</i> - <i>Pinus radiata</i>	2
<i>Heteromeles arbutifolia</i>	2
<i>Heterotheca oregona</i>	2
<i>Hirshfeldia incana</i>	1
<i>Juncus</i> (<i>effusus</i> , <i>patens</i>) – <i>Carex</i> (<i>pansa</i> , <i>praegracilis</i>) Alliance	1
<i>Juncus</i> (<i>oxymeris</i> , <i>xiphioides</i>)	1
<i>Juncus balticus</i>	1
<i>Juncus lescurii</i>	1
<i>Juniperus californicus</i>	2
<i>Keckiella corymbosa</i>	2
<i>Koeleria macrantha</i>	1
<i>Lasthenia californica</i> - <i>Plantago erecta</i> - <i>Vulpia microstachys</i>	1
<i>Lathyrus littoralis</i>	2
<i>Leptichinia fragrans</i>	1
<i>Leymus cinereus</i> – <i>Leymus triticoides</i>	2
<i>Leymus mollis</i>	2
<i>Lotus scoparius</i> - <i>Lupinus albifrons</i> - <i>Eriodictyon</i> spp.	1
<i>Lupinus albifrons</i>	1
<i>Lupinus arboreus</i>	4
<i>Lupinus chamissonis</i>	2
<i>Lupinus chamissonis</i> – <i>Ericameria ericoides</i>	1
<i>Morella californica</i>	1
<i>Nassella</i> spp. – <i>Melica</i> spp.	1
<i>Notholithocarpus densiflorus</i>	1
<i>Phalaris aquatica</i> – <i>Phalaris arundinacea</i>	1
<i>Pinus attenuata</i>	1
<i>Pinus muricata</i> - <i>Pinus radiata</i>	5
<i>Pinus ponderosa</i>	5
<i>Pinus radiata</i>	3
<i>Pinus sabiniana</i>	7
<i>Plantago coronopus</i>	1
<i>Plantago maritima</i>	2

Vegetation Communities Sampled in 2021 and 2022	# of surveys
Plantago subnuta-Potentilla anserina	1
Platanus racemosa	1
Populus trichocarpa	4
Potentilla anserina	1
Prunus ilicifolia	2
Ptelea crenulata	1
Pteridium aquilinum	1
Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni)	2
Quercus agrifolia	24
Quercus douglasii	18
Quercus durata	1
Quercus kelloggii	5
Quercus lobata	4
Quercus lobata - Quercus agrifolia	1
Quercus lobata Riparian	1
Quercus wislizeni	2
Quercus wislizeni – Quercus parvula (tree)	1
Quercus wislizeni (shrub)	1
Raphanus sativus	1
Rubus parviflorus	1
Salicornia pacifica	5
Salix gooddingii - Salix laevigata	2
Salix laevigata	1
Salix lasiolepis	12
Salix sitchensis	1
Salvia mellifera	6
Sambucus nigra	2
Sarcocornia pacifica (Salicornia depressa)	1
Schoenoplectus (acutus, californicus)	2
Schoenoplectus acutus	3
Schoenoplectus americanus	1
Schoenoplectus californicus	1
Schoenoplectus pugnans	1
Sequoia sempervirens	7
Sparganium eurycarpum	1
Stipa coronata	1
Stipa coronata var. intermedia	1
Stipa pulchra	6

Vegetation Communities Sampled in 2021 and 2022	# of surveys
Toxicodendron diversilobum	2
Umbellularia californica	10
unknown	4
VPB (Vernal Pool Basin)	1
Total Vegetation Communities	418

Classification

Table 5 shows the vegetation classification system used to map vegetation communities throughout the Central California Foothills and Coastal Mountains ecoregion in the California State Parks. The floristic key was created using this vegetation classification can be found in *Appendix F*. The classification is created and refined by analyzing the survey data taken in the study area.

Table 5: “Vegetation classification at the Alliance level, organized within the current USNVC hierarchy, for Santa Clara and Santa Cruz Counties. Two status columns for the National Vegetation Classification (NVC) and for the Manual of California Vegetation (MCV) indicate whether the alliance is newly added based upon this project (new) with modifiers for whether the alliance was merged (-m) or split (-s) from existing Alliance concepts, or whether the alliances were expanded (expand) or otherwise revised (revise) from their existing concepts. An asterisk () denotes alliances that are likely present or are present but have not been sampled in the region. (Sikes, Buck-Diaz, & Evens, 2023).”*

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
1. Forest & Woodland						
1.B. Temperate & Boreal Forest & Woodland						
1.B.1 Warm Temperate Forest & Woodland						
	1.B.1.Nc. Californian Forest & Woodland					
		Californian Broadleaf Forest & Woodland				
			Californian Broadleaf Forest & Woodland			
				<i>Aesculus californica</i>		
				<i>Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni)</i>		
				<i>Quercus agrifolia</i>		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Quercus chrysolepis</i> (tree)		
				<i>Quercus douglasii</i>		
				<i>Quercus kelloggii</i>		
				<i>Quercus lobata</i>		
				<i>Quercus wislizeni</i> – <i>Quercus parvula</i>	Expand	Expand
				<i>Umbellularia californica</i>	New-S	
			Californian Conifer Forest & Woodland			
				<i>Hesperocyparis</i> (<i>pigmaea</i> , <i>abramsiana</i> , <i>macrocarpa</i> , <i>goveniana</i>)		
				<i>Pinus attenuata</i>		
				<i>Pinus coulteri</i>		
				<i>Pinus muricata</i> – <i>Pinus radiata</i>		
				<i>Pinus ponderosa</i>		Revise
				<i>Pinus sabiniana</i>		
		Californian Ruderal Forest				
			Californian Ruderal Forest			

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Eucalyptus</i> spp. – <i>Ailanthus altissima</i> – <i>Robinia pseudoacacia</i>	Expand	
				<i>Hesperocyparis macrocarpa</i> – <i>Pinus radiata</i> *	New	
				<i>Schinus (molle, terebinthifolius)</i> – <i>Myoporum laetum</i> *		
1.B.2 Cool Temperate Forest & Woodland						
	1.B.2.Nd. Vancouverian Forest & Woodland					
		Vancouverian Coastal Rainforest				
			Californian Coastal Redwood Forest			
				<i>Sequoia sempervirens</i>		
		Southern Vancouverian Dry Foothill Forest & Woodland				
			Californian Moist Coastal Mixed Evergreen Forest			
				<i>Pseudotsuga menziesii</i> – (<i>Notholithocarpus densiflorus</i> – <i>Arbutus menziesii</i>)		
				<i>Notholithocarpus densiflorus</i>	New-S	
				<i>Arbutus menziesii</i>	New-S	

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
1.B.3 Temperate Flooded and Swamp Forest						
	1.B.3.Nd. Western North American interior Flooded Forest					
		Interior Warm & Cool Desert Riparian Forest				
			Western Interior Riparian Forest & Woodland			
				<i>Acer negundo</i>		
				<i>Juglans hindsii</i> and Hybrids		
				<i>Platanus racemosa</i> – <i>Quercus agrifolia</i>		
				<i>Populus fremontii</i> – <i>Fraxinus velutina</i> – <i>Salix gooddingii</i>		
				<i>Quercus lobata</i> Riparian		
				<i>Salix gooddingii</i> – <i>Salix laevigata</i>		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
		Interior West Ruderal Flooded & Swamp Forest & Woodland				
			Interior West Ruderal Riparian Forest & Scrub			
				Rubus armeniacus - Sesbania punicea - Ficus carica		
	1.B.3.Ng. Vancouveri an Flooded & Swamp Forest					
		Vancouverian Flooded & Swamp Forest				
			North-Central Pacific Lowland Riparian Forest			
				<i>Acer macrophyllum</i> – <i>Alnus rubra</i>		
				<i>Alnus rhombifolia</i>		
				<i>Fraxinus latifolia</i> *		
				<i>Populus trichocarpa</i>		
				<i>Salix lucida</i> ssp. <i>lasiandra</i>		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
2. Shrub and Herb Vegetation						
2.B. Temperate & Boreal Grassland & Shrubland						
2.B.1 Mediterranean Scrub & Grassland						
	2.B.1.Na. Californian Scrub & Grassland					
		Californian Chaparral				
			Californian Xeric Chaparral			
				<i>Adenostoma fasciculatum</i>		
				<i>Adenostoma fasciculatum</i> – <i>Salvia</i> spp.		
				<i>Arctostaphylos</i> (<i>canescens</i> , <i>manzanita</i> , <i>stanfordiana</i>)		
				<i>Arctostaphylos glauca</i>		
				<i>Ceanothus cuneatus</i>		
			Californian Maritime Chaparral			
				<i>Arctostaphylos</i> (<i>crustacea</i> , <i>tomentosa</i>)	Expand	Expand
				<i>Arctostaphylos</i> (<i>nummularia</i> , <i>sensitiva</i>) – <i>Chrysolepis chrysophylla</i>	Expand	Expand
			Californian Mesic & Pre-			

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
			montane Chaparral			
				<i>Arctostaphylos glandulosa</i>		
				<i>Ceanothus (oliganthus, tomentosus)</i>		
				<i>Ceanothus papillosus</i>		
				<i>Cercocarpus montanus</i>		
				<i>Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus</i>	Expand	Expand
				<i>Quercus berberidifolia</i>		
				<i>Quercus durata</i>		
				<i>Quercus wislizeni – Quercus chrysolepis (shrub)</i>	New-S	
		Californian Coastal Scrub				
			Central & Southern Californian Coastal Sage Scrub			
				<i>Artemisia californica – (Salvia leucophylla)</i>		
				<i>Eriogonum fasciculatum</i>		
				<i>Salvia mellifera – (Artemisia californica)</i>		New-M
			Californian North Coastal & Mesic Scrub			

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Baccharis pilularis</i>		
				<i>Ceanothus thyrsiflorus</i>		
				<i>Corylus cornuta</i> var. <i>californica</i>		
				<i>Toxicodendron diversilobum</i>		
			Californian Coastal-Foothill Seral Scrub			
				<i>Diplacus aurantiacus</i>	Revise	
				<i>Lotus scoparius</i> – <i>Lupinus albifrons</i> – <i>Eriodictyon</i> spp.	Revise	Expand
				<i>Malacothamnus fasciculatus</i> – <i>Malacothamnus</i> spp.		
		Californian Annual & Perennial Grassland				
			Californian Perennial Grassland			
				<i>Corethrogyne filaginifolia</i> – <i>Eriogonum (elongatum, nudum)</i>	Expand	Expand
				<i>Nassella</i> spp. – <i>Melica</i> spp.	New-M	
			Californian Annual Grassland & Forb Meadow			
				<i>Amsinckia (menziesii, tessellata)</i> – <i>Phacelia</i> spp.		
				<i>Eschscholzia (californica)</i> – <i>Lupinus (nanus)</i>		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Holocarpha</i> (<i>heermannii</i> , <i>virgata</i>)		
				<i>Lasthenia californica</i> – <i>Plantago erecta</i> – <i>Vulpia microstachys</i>		
				<i>Monolopia</i> (<i>lanceolata</i>) – <i>Coreopsis</i> (<i>calliopsidea</i>)*		
				<i>Plagiobothrys</i> <i>nothofulvus</i>		
		Californian Ruderal Grassland, Meadow & Scrub				
			Californian Ruderal Grassland, Meadow & Scrub			
				<i>Acacia</i> spp. – <i>Grevillea</i> spp. – <i>Leptospermum</i> <i>laevigatum</i>	New	
				<i>Avena</i> spp. – <i>Bromus</i> spp.		
				<i>Brassica nigra</i> – <i>Centaurea</i> (<i>solstitialis</i> , <i>melitensis</i>)	Revise	
				<i>Lolium perenne</i>		
2.B.2 Temperate Grassland & Shrubland						
	2.B.2.Nf. Western North American Grassland & Shrubland					
		Cool Interior Chaparral				

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
			Western North American Montane Chaparral			
				Ribes quercetorum – Rhus trilobata – Frangula californica	New	Expand
		Western North American Ruderal Grassland & Shrubland				
			G648 Southern Vancouveria n Lowland Ruderal Grassland & Shrubland			
				Conium maculatum – Foeniculum vulgare	Revise	
				Cortaderia (jubata, selloana)*		
				Cynosurus echinatus – Arrhenatherum elatus*	New	
				Cytisus scoparius – Genista monspessulana – Cotoneaster spp.	Expand	
				Holcus lanatus – Anthoxanthum odoratum		
		Southern Vancouverian Lowland Grassland & Shrubland				

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
			Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie			
				<i>Bromus carinatus</i> – <i>Elymus glaucus</i>		
				<i>Calamagrostis nutkaensis</i>		
				<i>Festuca idahoensis</i> – <i>Danthonia californica</i>		
				<i>Gaultheria shallon</i> – <i>Rubus (ursinus)</i>	New	
2.B.4 Temperate to Polar Scrub & Herb Coastal Vegetation						
	2.B.4.Nb. Pacific North American Coastal Scrub & Herb Vegetation					
		Pacific Coastal Beach & Dune				
			North Pacific Maritime Dune & Coastal Beach			
				<i>Leymus mollis</i>		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
			Californian Coastal Beach & Dune			
				<i>Abronia latifolia</i> – <i>Ambrosia chamissonis</i>		
				<i>Eriophyllum staechadifolium</i> – <i>Erigeron glaucus</i> – <i>Eriogonum latifolium</i>	New-S	
				<i>Lupinus arboreus</i>		
				<i>Lupinus chamissonis</i> – <i>Ericameria ericoides</i>	New-S	
		North Pacific Coastal Ruderal Grassland & Shrubland				
			North Pacific Maritime Coastal Ruderal Dune			
				<i>Ammophila arenaria</i>		
				<i>Cakile (edentula, maritima)</i>	New	
				<i>Mesembryanthemum</i> – <i>Carpobrotus</i> spp.		
2.C. Shrub & Herb Wetland						

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
2.C.4 Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland						
	2.C.4.Nb. Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland					
		Vancouverian Lowland Marsh, Wet Meadow & Shrubland				
			Vancouveria n Wet Shrubland			
				Cornus sericea		
				<i>Frangula californica</i> – <i>Rhododendron occidentale</i> – <i>Salix breweri</i>	New	
				<i>Rubus spectabilis</i> – <i>Morella californica</i>	Expand	

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Salix hookeriana</i> – <i>Salix sitchensis</i> – <i>Spiraea douglasii</i>		
		Vancouverian Lowland Marsh, Wet Meadow & Shrubland				
			Vancouverian Freshwater Wet Meadow & Marsh			
				<i>Deschampsia cespitosa</i> – <i>Hordeum brachyantherum</i> – <i>Danthonia californica</i>	Expand	
				<i>Carex barbarae</i>	New	
				<i>Carex nudata</i>	New	

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Carex obnupta</i> – <i>Oenanthe sarmentosa</i> – <i>Scirpus microcarpus</i>	New-M	
				<i>Juncus (effusus, patens)</i> – <i>Carex (pansa, praegracilis)</i>	Expand	
				<i>Juncus arcticus</i> (var. <i>balticus, mexicanus</i>)		
				<i>Mimulus guttatus</i> – <i>Cirsium</i> spp. – <i>Stachys</i> spp.	New-M	New-M
			Temperate Pacific Freshwater Wet Mudflat			
				<i>Bidens cernua</i> – <i>Euthamia occidentalis</i> – <i>Ludwigia palustris</i>	Expand	Expand
				<i>Heterotheca (oregona, sessiliflora)</i>		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Lilaeopsis occidentalis*</i>		
				<i>Polygonum lapathifolium – Xanthium strumarium</i>	New	
		Western North American Vernal Pool				
			Californian Vernal Pool			
				Centromadia (pungens)		
				<i>Cressa truxillensis – Distichlis spicata</i>		
				<i>Eleocharis (acicularis, macrostachya)</i>	Revise	

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Eryngium aristulatum*</i>		
				<i>Lasthenia glaberrima*</i>		
				<i>Trifolium variegatum</i>		
		Western North American Ruderal Marsh, Wet Meadow & Shrubland				
			Western North American Ruderal Marsh, Wet Meadow & Shrubland			
				<i>Atriplex prostrata – Cotula coronopifolia</i>	New	

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Cynodon dactylon</i> – <i>Crypsis</i> spp. – <i>Paspalum</i> spp.	Expand	
				<i>Lepidium latifolium</i> – <i>Lactuca serriola</i>		Revise
				<i>Phalaris aquatica</i> – <i>Phalaris arundinacea</i>	Expand	
				<i>Poa pratensis</i> – <i>Agrostis gigantea</i> – <i>Agrostis stolonifera</i>		
		Arid West Interior Freshwater Marsh				
			Arid West Interior Freshwater Marsh			
				<i>Schoenoplectus</i> (<i>acutus</i> , <i>californicus</i>)		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Schoenoplectus americanus</i>		
				<i>Typha (angustifolia, domingensis, latifolia)</i>		
		Western North American Montane Marsh, Wet Meadow & Shrubland				
			Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland			
				<i>Rhus trilobata – Crataegus rivularis – Forestiera pubescens</i>		
					Expand	
	2.C.4.Nc. Southwestern North American Warm Desert Freshwater Marsh & Bosque					

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
		Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland				
			North American Warm Desert Riparian Low Bosque & Shrubland			
				<i>Baccharis salicifolia</i>		
				<i>Rosa californica</i>		
				<i>Salix lasiolepis</i>		
				<i>Salix exigua</i>		
2.C.5 Salt Marsh						
	2.C.5.Nc. Temperate and Boreal Pacific Coastal Salt Marsh					
		North American Pacific Coastal Salt Marsh				
			Temperate Pacific Salt Marsh			

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Bolboschoenus maritimus</i>		
				<i>Distichlis spicata</i> – <i>Frankenia salina</i> Coastal		New-M
				<i>Sarcocornia pacifica</i> (<i>Salicornia depressa</i>)		
				<i>Spartina foliosa</i>		
	2.C.5.Nd. North American Western Interior Brackish Marsh, Playa & Shrubland					
		Warm & Cool Desert Alkali- Saline Marsh, Playa & Shrubland				
			North American Desert Alkaline- Saline Marsh & Playa			
				<i>Leymus cinereus</i> – <i>Leymus triticoides</i>		
3. Desert & Semi-Desert						

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
3.B. Cool Semi-Desert Scrub & Grassland						
3.B.1 Cool Semi-Desert Scrub & Grassland						
	3.B.1.Ne. Western North American Cool Semi-Desert Scrub & Grassland					
		Great Basin-Intermountain Dry Shrubland & Grassland				
			Mojave Mid-Elevation Mixed Desert Scrub			
				<i>Eriogonum wrightii</i> – <i>Eriogonum heermannii</i> – <i>Buddleja utahensis</i>		
				<i>Juniperus californica</i> *		
			Intermountain Semi-Desert Steppe & Shrubland			
				<i>Ericameria nauseosa</i> *		
5. Aquatic Vegetation						
5.A. Saltwater						

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
Aquatic Vegetation						
5.A.3 Benthic Vascular Saltwater Vegetation						
	5.A.3.We. Temperate Seagrass Aquatic Vegetation					
		Temperate Pacific Seagrass Intertidal Vegetation				
			Temperate Pacific Seagrass Bed			
				Zostera (marina, pacifica) Pacific Aquatic*	Expand	
	5.A.3.Wf. Temperate Estuarine & Inland Brackish Aquatic Vegetation					
		Ditchgrass Saline Aquatic Vegetation				
			Widgeongrass Bed			
				<i>Ruppia (cirrhosa, maritima)*</i>		
5.B. Freshwater Aquatic Vegetation						

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
5.B.2 Temperate to Polar Freshwater Aquatic Vegetation						
	5.B.2.Na. North American Freshwater Aquatic Vegetation					
		Western North American Freshwater Aquatic Vegetation				
			Western North American Temperate Freshwater Aquatic Vegetation			
				<i>Azolla (filiculoides, microphylla)</i>		
				<i>Ceratophyllum demersum</i> Aquatic		
				<i>Hydrocotyle (ranunculoides, umbellata)</i>		
				<i>Nuphar lutea</i> *		
				<i>Sparganium (angustifolium)</i>		
				<i>Stuckenia (pectinata)</i> – <i>Potamogeton</i> spp.		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
		North American Temperate Ruderal Aquatic Vegetation				
			North American Temperate Ruderal Aquatic Vegetation		New	
				<i>Ludwigia (hexapetala, peplodes) – Eichhornia crassipes</i>	New	Revise
6. Open Rock Vegetation						
6.B. Temperate & Boreal Open Rock Vegetation						
6.B.1 Temperate & Boreal Cliff, Scree & Other Rock Vegetation						
	6.B.1.Nb. Western North American Temperate Cliff, Scree & Rock Vegetation					
		Western North American Cliff, Scree & Rock Vegetation				
			Californian Cliff, Scree & Rock Vegetation			
				<i>Allium</i> spp. – <i>Streptanthus</i> spp. –		

Formation	Division	Macrogroup	Group	Alliance	NVC	MCV
				<i>Hesperolinon</i> spp. Serpentine		
				<i>Dudleya cymosa</i> – <i>Dudleya lanceolata</i> – Lichen/Moss*		
				<i>Sedum</i> <i>spathulifolium</i> *		

Mapping

The GIC mapped a total of 88,003.92 acres with a total of 11,027 polygons. Of the 11,027 total polygons, 3,625 were tree types, 5,075 were shrub types, and 1,739 were herbaceous types. The average polygon size was 7.98 acres. The largest polygon was Californian Annual & Perennial Macrogroup with a total of 2,698.32 acres.

A total of 94 mapping units were utilized by photo-interpreters which included 78 alliances, 49 associations, 7 groups, 4 macrogroups, and 7 non-vegetated mapping units, all of which are listed in *Appendix D*. The number of polygons and acreage mapped for each vegetation type are also listed in *Appendix D*. A detailed description of all map classes and their identification is found in *Appendix C*.

This project included multiple counties in California. On average, the State Beaches and State Parks along the coast included more saline-tolerant species, and the State Parks that were further inland, (Mount Diablo SP, Pacheco SP, and Henry W. Coe SP) included drier, more upland species.

Common and uncommon vegetation types

The most common vegetation types are *Quercus douglasii* alliance (n=1420), *Adenostoma fasciculatum* alliance (n=1378), Californian Annual & Perennial Grassland Macrogroup (n=1201), *Baccharis pilularis* alliance (n=941), and *Quercus agrifolia* alliance (n=744).

There were 38 mapping units with 10 or less polygons in the study area. Some examples of uncommon mapping units are *Pseudotsuga menziesii* – (*Notholithocarpus densiflorus*) - *Arbutus menziesii* alliance (n=9), *Leymus mollis* alliance (n=6), and *Pinus ponderosa* Alliance (n=2).

Invasive Species

Invasive species presence can be tracked using these maps. Some notable species and acreages across all parks are Californian Annual & Perennial Grassland Macrogroup (14,796.81 acres), *Mesembryanthemum* spp. – *Carpobrotus* spp. alliance (503.15 acres), *Eucalyptus (globulus, camaldulensis)* Semi-Natural Association (384.85 acres), *Ammophila arenaria* alliance (66 acres), *Cortaderia (jubata, selloana)* alliance (60.81 acres), and Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (23.37 acres). *Table 6* below shows the distributions of these invasive mapping units across the California State Parks.

California Annual & Perennial Grassland Macrogroup stands generally have high invasive species content. See *Appendix F* for classification description. This macrogroup is an upland vegetation type that is found in every California State Park mapped by GIC except Asilomar SB, Los Osos Oaks SNR, Moss Landing SB, Pismo SB/Oceano Dunes SVRA, Salinas River SB, and Zmudowski SB.

Mesembryanthemum spp. – *Carpobrotus* spp. alliance stands are found on beaches or on beach margins. The common name for the species that dominate this alliance is iceplant. Iceplant creates mats across the dunes in the State Beaches displacing the native species (Sikes, Buck-Diaz, & Evens, 2023). Fort Ord Dunes SP, Marina SB, Montaña de Oro SP, and Zmudowski SB had the highest cover of *Mesembryanthemum* spp. – *Carpobrotus* spp. alliance. Fort Ord Dunes SP had the highest cover of *Mesembryanthemum* spp. – *Carpobrotus* spp. alliance with 281.03 acres.

*Table 6: Invasive species mapping units with the highest cover across the California State Parks in the Central California Foothills and Coastal Mountains Ecoregion by park. *Hatton Canyon is now part of Ishxenta SP.*

Park Unit	Acres of Californian Annual & Perennial Grassland Macrogroup (high invasiveness)	Acres of <i>Mesembryanthemum</i> spp. - <i>Carpobrotus</i> spp. Alliance	Acres of <i>Eucalyptus (globulus camaldulensis)</i> Semi-Natural Association	Acres of <i>Ammophila arenaria</i> Alliance	Acres of <i>Cortaderia (jubata, selloana)</i> Alliance	Acres of Western North American Ruderal Marsh, Wet Meadow & Shrubland Group
Andrew Molera SP	466.01	0	7.35	0	0	0
Asilomar SB	0	0	0	0	0	0
Carmel River SB	45.72	4.76	3.29	0	0	5.68
Estero Bluffs SP	251.15	0	0.21	0	0	0
Fort Ord Dunes SP	79.71	281.03	0	0.76	0	0
Harmony Headlands SP	392.08	0	0	0	0	0
Hatton Canyon*	12.34	0	0	0	0	0
Hearst San Simeon SHM	24.75	0	11.38	0	0	0
Hearst San Simeon SP	896.56	12.53	33.23	0	0	0
Henry W. Coe SP	2471.13	0	0	0	0	0
Ishxenta SP (now includes Hatton Canyon)	34.47	7.61	0	0	0	0
John Little SNR	0.14	0	0.64	0	1.22	0
Julia Pfeiffer Burns SP	84.49	0	3.4	0	31.44	0
Limekiln SP	12.19	0	0	0	28.15	0
Los Osos Oaks SNR	0	0	0	0	0	0

Park Unit	Acres of Californian Annual & Perennial Grassland Macrogroup (high invasiveness)	Acres of <i>Mesembryanthemum</i> spp. - <i>Carpobrotus</i> spp. Alliance	Acres of <i>Eucalyptus (globulus camaldulensis)</i> Semi-Natural Association	Acres of <i>Ammophila arenaria</i> Alliance	Acres of <i>Cortaderia (jubata, selloana)</i> Alliance	Acres of Western North American Ruderal Marsh, Wet Meadow & Shrubland Group
Marina SB	3.66	44.11	0	0	0	0
Montaña de Oro SP	246.41	47.69	206	0	0	0
Monterey SB	2.18	20.04	0.96	0	0	0
Morro Bay SP	450.34	0.35	94.63	0	0	0
Morro Strand SB	3.54	9.19	1	0	0	0
Moss Landing SB	0	1.66	0	0	0	0
Mount Diablo SP	5701.39	0	0	0	0	0
Pacheco SP	3583.35	0	0	0	0	0
Pismo SB and Oceano Dunes SVRA	0	23.05	15.74	59.45	0	0
Pfeiffer Big Sur SP	24.21	0	0	0	0	0
Point Lobos SNR	14.76	0	0	0	0	5.8
Point Sur SHP	25.57	2.18	0	0	0	1.76
Salinas River SB	0	5.28	0	0	0	0
Sunset SB	0.98	1.67	7.02	5.8	0	0
Zmudowski SB	0	38.37	0	0	0	0

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Appendix A: Field Form for Rapid Assessment and Relevé Surveys

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised May 20, 2019, for the State Parks project)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association
I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION			circle: Relevé or RA
Database #:	Date:	Name of recorder:	
		Other surveyors:	
	UID:	Location Name:	
GPS name: _____ For Relevé only: Bearing°, left axis at ID point _____ of Long / Short side			
UTME _____ UTMN _____ Zone: 10 NAD83 GPS error: ft./m./PDOP _____			
Decimal degrees: LAT _____ LONG _____			
GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) _____ bearing ° _____ inclination ° _____			
and record: Base point ID _____ Projected UTM's: UTME _____ UTMN _____			
Camera Name: _____ Cardinal photos at ID point:			
Other photos:			
Stand Size (acres): <1, 1-5, >5 Plot Area (m²): 100 / _____ Plot Dimensions _____ x _____ m RA Radius _____ m			
Exposure, Actual °: _____ NE NW SE SW Flat Variable Steepness, Actual °: _____ 0° 1-5° > 5-25° > 25°			
Topography: Macro: top upper mid lower bottom Micro: convex flat concave undulating			
Geology code: _____ Soil Texture code: _____ Upland or Wetland/Riparian (circle one)			
Restoration code: 1-None obvious 2-Juniper removal 3-Grass/forbs seeding 4-Shrub/tree planting 5-Thinning (pine, juniper) 6-Other			
% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)			
H ₂ O: BA Stems: Litter: Bedrock: Boulder: Stone: Cobble: Gravel: Fines: =100%			
% Current year bioturbation _____ Past bioturbation present? Yes / No % Hoof punch _____			
Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.			
Site history, stand age, comments:			
Disturbance code / Intensity (L,M,H): _____ / _____ / _____ / _____ / _____ "Other" _____ / _____			
II. HABITAT DESCRIPTION			
Tree DBH: <u>T1</u> (<1" dbh), <u>T2</u> (1-6" dbh), <u>T3</u> (6-11" dbh), <u>T4</u> (11-24" dbh), <u>T5</u> (>24" dbh), <u>T6</u> multi-layered (T3 or T4 layer under T5, >60% cover)			
Shrub: <u>S1</u> seedling (<3 yr. old), <u>S2</u> young (<1% dead), <u>S3</u> mature (1-25% dead), <u>S4</u> decadent (>25% dead)			
Herbaceous: <u>H1</u> (<12" plant ht.), <u>H2</u> (>12" ht.)			
III. INTERPRETATION OF STAND			
Field-assessed vegetation Alliance name: _____			
Field-assessed Association name (optional): _____			
Adjacent Alliances/direction: _____ / _____, _____ / _____			
Confidence in Alliance identification: L M H Explain: _____			
Phenology (E,P,L): Herb _____ Shrub _____ Tree _____ Other identification or mapping information: _____			

Appendix B: Protocol for Rapid Assessments and Relevé Survey

CDFW-CNPS Protocol for the Combined Vegetation Rapid Assessment and Relevé Field Form Doyle-Loyalton (May 20, 2019)

Introduction

This protocol describes the methodology for both the Relevé and Rapid Assessment (RA) vegetation sampling techniques as recorded in the Combined Vegetation Rapid Assessment and Relevé Field Form. The same environmental data are collected for both techniques. However, the relevé sample is a plot demarcated with a measuring tape, and each species in the plot is recorded along with its cover. The rapid assessment sample is not based on a taped plot, but is based on a visually estimated, usually circular area within a representative portion of the entire stand, with up to 20 of the dominant or characteristic species and their cover values recorded.

For this project, collect rapid assessments in woody vegetation and relevés in herbaceous vegetation. Some parts of this project area have not been sampled before, so RAs in woody vegetation may list more than 20 species.

Defining a Stand

A stand is the basic physical unit of vegetation in a landscape. It has no set size. Some vegetation stands are very small, such as a portion of a vernal pool, and some may be several square kilometers in size, such as a forest type. All samples should be in stands that meet the minimum mapping unit of 1 acre for upland and 0.5 acre for special stands such as small wetlands, riparian and serpentine barrens.

A stand is defined by two main unifying characteristics:

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

The structural and compositional features of a stand are often combined into a term called homogeneity. For an area of vegetated ground to meet the requirements of a stand, it must be homogeneous (uniform in structure and composition throughout).

Selecting a bounded plot (Relevé) or representative area (Rapid Assessment) to sample within a stand

Stands to be sampled may be selected by evaluation prior to a site visit (e.g., from aerial photos) or they may be selected on site during reconnaissance to determine extent and boundaries, location of other similar stands, etc.

Because many stands are large, it may be difficult to summarize the species composition, cover, and structure of an entire stand. We are usually trying to capture the most information as efficiently as possible. Thus, we are typically forced to select a representative portion to sample.

When sampling a stand of vegetation, the main point is to select a sample that, in as many ways possible, is representative of that stand. This means that you are not randomly selecting a plot; on the contrary, you are actively using your own best judgment to find a representative example of the stand.

Selecting a relevé plot or RA area requires that you see enough of the stand you are sampling to feel comfortable in choosing a representative plot location. Take a brief walk through the stand and look for variations in species composition and in stand structure. In hilly or mountainous terrain, look for a vantage point from which you can get a representative view of the whole stand. Variations in vegetation that are repeated throughout the stand should be included in your plot. Once you assess the variation within the stand, attempt to find an area that captures the stand's common species composition and structural condition to sample.

Tracking sampled vegetation types

For large projects, the number of samples should be tracked daily or weekly by field-assessed Alliance type so that samples are spread as evenly as possible over types and time is not wasted collecting excessive numbers of samples of certain types. When multiple teams are in the field in the same week, daily communication between teams about Alliances sampled can ensure even sampling. *Prior to selecting a stand to sample, determine if what you are going to sample is needed based on this Alliance tracking.*

Selecting plots to avoid spatial autocorrelation

In no case should you sample the same stand more than once. For large projects, select sample locations to limit spatial autocorrelation. When possible, do not sample adjacent stands. Do not take a sample within 1000 meters of a survey of the same vegetation type. Exceptions can be made due to limited access to private lands. For example, samples taken from different formations, subclasses, or classes (e.g., wetlands vs. uplands, lithomorphic vs. mesomorphic) adjacent to one-another have a lower probability of sharing a number of species and may be sampled within 1000 meters of each other. However, avoid sampling adjacent stands that tend to have more species overlap even if they are technically different formations, such as a grassland adjacent to an open woodland.

Plot Size

For this project, the herbaceous relevé plot size is 100 m². In a very few cases, such as vernal pools, the plot size can be less (10 m²).

Plot Shape

A relevé has no fixed shape, though plot shape should reflect the character of the stand and is either a square or a rectangle. Adjust the orientation and dimensions of the plot to incorporate the best approximation of stand homogeneity. If the stand is about the same size as a Relevé, the plot boundaries may be similar to that of the entire stand. If we are sampling streamside riparian or other linear communities, our plot dimensions should not go beyond the community's natural ecological boundaries. Thus, a relatively long, narrow plot capturing the vegetation within the stand, but not outside it, would be appropriate. Species present along the edges of the plot that are clearly part of the adjacent stand should be excluded from the plot.

Location of GPS Points

For Relevés, one point will be considered the plot identifier (ID point) and should be in the SW corner of a rectangular or square plot, if possible, or in the center of a circular plot. If it is taken in another location, this should be noted in the Site History section.

Definitions of fields in the Field Form

I. Locational/Environmental Description

Relevé or RA: Circle the appropriate survey type.

Database #: This is the unique ID number for Relevés and Rapid Assessments, in the form of PPPPxxxx, where PPPP is the 4-character project code and xxxx is a unique 4-digit number (e.g. MOLA0001 for Modoc-Lassen sample #1). If this is a long term plot, a character from A to Z can be added to the unique ID for each re-sampling survey; so, the first re-sample for MOLA0001 would be MOLA0001A.

Base Points: For a projected RA (GPS within stand = No), a Base Point will be taken where the surveyors are standing and a separate point will be projected into the stand. The ID of the basepoint is B_PPPPxxxx, i.e. B_MOLA0001.

Photo Points: Occasionally, stand photos will be taken from a vantage point outside the stand, or in a place other than the survey point. The ID for this point is PPPPxxxx_P#, i.e. the first Photo Point for MOLA0001 will be MOLA0001_P1.

Date: Date of the sampling.

Name of recorder: The full name of the recorder should be provided for the first field form for the day. On successive forms, initials can be recorded.

Other Surveyors: The full names of each person assisting should be provided for the first field form for the day. On successive forms, initials of each person assisting can be recorded.

UID: The ID of a previously assigned point that was created to suggest survey locations. You can find this ID on the field map or the GPS device map.

Location Name: The name of the property or park, or the location within large holdings (like USFS or BLM properties).

GPS name: The name/number assigned to each GPS unit. This can be the serial number if another number is not assigned.

Bearing°, left axis at ID point of Long / Short side: Fill this in for Relevés only. For square or rectangular plots: from the ID Point, looking towards the plot, record the bearing of the axis to your left. If the plot is a rectangle, indicate whether the left side of the plot is the long or short side of the rectangle by circling “long” or “short” side (no need to circle anything for square plots). If there are no stand constraints, set up the plot with boundaries running in the cardinal directions and place the ID Point in the SW corner.

UTM coordinates: Easting (**UTME**) and northing (**UTMN**) location coordinates using the Universal Transverse Mercator (UTM) grid. Record the information from your GPS unit. These coordinates are always the base point of the survey. Soil samples and photos are taken from this point, and exposure, steepness, topography, etc. are measured here. If the GPS is not within the stand (i.e., the point is projected), these are the UTMs of the base point. Important: a projected point or a point digitized in the field must always have a base point associated with it (projected surveys are preferred). A base point can serve as the base for several distance surveys.

For Relevé plots, take the GPS point in the southwest corner of the plot whenever possible or in the center of a circular plot.

Zone: Universal Transverse Mercator zone. Zone 10 is for California west of the 120th longitude; zone 11 is for California east of 120th longitude. The UTM Zone is 10 for this project.

NAD83: This is the default GPS datum. If you use a different one, cross this out and write in the correct datum.

GPS error: ft./ m./ PDOP: Circle the appropriate unit of measure and record the error reading from the GPS unit.

Decimal degrees: *Use this only if your GPS unit will not record UTM coordinates.* Latitude–Longitude reading in decimal degrees. Record the information from your GPS unit. These coordinates are always the base point of the survey. Soil samples and photos are taken from this point, and exposure, steepness, topography, etc. are measured here.

For Relevé plots, take the waypoint in the southwest corner of the plot whenever possible or in the center of a circular plot.

GPS within stand? Yes / No: Circle “Yes” to denote that the GPS waypoint was taken directly within or at the edge of the stand being assessed for a Rapid Assessment, or circle “No” if the waypoint was taken at a distance from the stand (such as with a binocular view of the stand). If the point is taken at the edge of the stand, note the direction to the stand.

If No, cite from GPS to stand: distance (m), bearing°, inclination°: From the base GPS point, measure the distance to the projected point using a range finder. Record the compass bearing from the base point to the projected point; record the inclination if the base and projected points are not at the same elevation.

and record Base point ID: This is the ID of the base GPS point, where the surveyors were standing to record the distance survey. This is required for both projected points and points digitized in the field (gathering projection data is preferred).

and Projected UTM: These are the coordinates of the projected point; the point being surveyed. They are generated in the field if the GPS units have the ability to calculate projected points. If the GPS unit does not have this capability, make a note to that effect and leave these fields blank. Note that a digitized point, e.g., using your finger to plunk the location that you are surveying in Collector, is NOT a projected point.

Camera Name: Write the camera name.

Cardinal photos at ID point: Take four photos in the main cardinal directions (N, E, S, W) clockwise from the north, from the ID Point, and record the jpeg numbers here. Try to include the horizon in at least some of these photos. If this is a distance survey to a projected point, take the four cardinal photos at the base point and at least one photo of the stand. A digital camera with a minimum 10 megapixel resolution must be used.

Other photos: This may include cardinal photos at additional corners or other relevant photos. Notes regarding photo locations or subjects can go here.

Stand Size: Estimate the size of the entire stand in which the sample is taken. As a measure, one acre is about 4,000 square meters (approximately 64 x 64 m), or 208 feet by 208 feet. One acre is similar in size to a football field.

Plot Size: If this is a Relevé, circle “100” for a 100m² plot, or record the plot size.

Plot Dimensions: Record the length and width of the Relevé plot in meters.

RA Radius: Enter the radius in meters of the visually estimated sample area for Rapid Assessments (should be a 20-meter radius at minimum). For a large stand, this limits the area covered by the RA. If you can see and assess the entire stand, the length and width should be recorded. If it is a long, narrow stand, note the width of the stand at your location. If your point is on the edge of the stand, record the radius into the stand, but note your location and the direction to which the RA Radius applies in the Site History section.

Exposure: (Enter Actual ° and circle general category): While facing in the general downhill direction, read degrees of the compass for the aspect or the direction you are standing, using degrees from north, adjusted for declination. Average the reading over

the entire stand, even if you are sampling a Relevé plot, since your plot is representative of the stand. If estimating the exposure, write “N/A” for the actual degrees, and circle the general category chosen. “Variable” may be selected if the same, homogenous stand of vegetation occurs across a varied range of slope exposures.

Steepness: (Enter Actual ° and circle general category): Read degree slope from your compass. If estimating, write “N/A” for the actual degrees, and circle the general category chosen. Make sure to average the reading across the entire stand even if you are sampling in a Relevé plot.

Topography: First assess the broad (**Macro**) topographic feature or general position of the stand relative to the immediately surrounding landscape. This attribute does not refer to the watershed as a whole, but to a cross section of the topography at the location of your stand. For instance, if your stand is located along a small creek in a narrow, v-shaped canyon, your position would be at the “Bottom,” even if the canyon itself slopes downward. Since stands can occupy more than just a single slope position, **circle all the positions that apply.**

Then assess the local (**Micro**) topographic features or the lay of the area (e.g., surface is flat or concave). **Circle only one of the microtopographic descriptors.**

Geology code: Geological parent material of stand. If exact type is unknown, use a more general category (e.g., igneous, metamorphic, sedimentary). *See code list for types.*

Soil Texture code: Record soil texture that is characteristic of the plot (e.g., coarse loamy sand, sandy clay loam). *See soil texture key for types.*

Upland or Wetland/Riparian: Indicate if the stand is in upland or wetland/riparian setting. (Wetland and riparian are one category.) Note that a site need not be officially delineated (as in the Army Corps of Engineer’s wetland delineation protocols) as a wetland to qualify as such in this context (e.g., seasonally wet meadow).

Restoration Code: Circle the appropriate code. If you observe more than one type of restoration, circle all codes that apply. “6-Other” should only be used if the restoration type is not described by codes 2-5. Describe the type of restoration for code 6 in the Site History.

% Surface cover: The abiotic substrates of the plot. The total should sum to 100%. It is helpful to imagine “mowing off” all of the live vegetation at the base of the plants and removing it – you will be estimating what is left covering the surface. Note that non-vascular cover (lichens, mosses, cryptobiotic crusts) is not estimated in this section.

- | | |
|------------------------|--|
| H₂O: | Percent surface cover of running or standing water, ignoring the substrate below the water. |
| BA Stems: | Percent surface cover of the basal area of stems at the ground surface. For most vegetation types, BA is 1-3% cover. |
| Litter: | Percent surface cover of litter, duff, or wood on the ground. |
| Bedrock: | Percent surface cover of bedrock, including outcrops. |
| Boulder: | Percent surface cover of rocks >60 cm in the longest dimension. |

- Stone:** Percent surface cover of rocks >25–60 cm in the longest dimension.
- Cobble:** Percent surface cover of rocks >7.5–25 cm in the longest dimension.
- Gravel:** Percent surface cover of rocks 2 mm–7.5 cm in the longest dimension.
- Fines:** Percent surface cover of bare ground and fine sediment <2 mm in the longest dimension (e.g., dirt, sand).

% Current year bioturbation: Estimate the percent of the plot exhibiting soil disturbance by any organism that lives underground. Do not include disturbance by ungulates. Note that this is a separate estimation from surface cover.

Past bioturbation present? Circle Yes if there is evidence of bioturbation from previous years in the plot.

% Hoof punch: Note the percent of the plot surface that has been punched down by hooves (cattle or native grazers) in wet soil. Depressions must be >2 cm deep.

Fire Evidence: Circle Yes if there is visible evidence of fire within the stand and note the type of evidence in the “Site history, stand age, comments section,” for example, “charred dead stems of *Quercus berberidifolia* extending 2 feet above resprouting shrubs.” If you are certain of the year of the fire, put this in the Site history section. You may also record more general historic information if you lack the precise date of a fire (such as most recent fire appears to be 10-20 years ago).

Site history, stand age, comments: Briefly describe the stand age/seral stage, disturbance history, nature and extent of land use, and other site environmental and vegetation factors, such as distribution of species. Examples of disturbance history: fire, landslides, avalanching, drought, flood, animal burrowing, or pest outbreak. Also, try to estimate year or frequency of disturbance. Examples of land use: grazing, timber harvest, or mining. Examples of other site factors: exposed rocks, soil with fine-textured sediments, high litter/duff build-up, multi-storied vegetation structure, or other stand dynamics.

Disturbance code / Intensity (L,M,H): List codes for potential or existing impacts on the stability of the plant community. See code list for impacts and definitions of levels of disturbance. Characterize each impact each as **L** (=Light), **M** (=Moderate), or **H** (=Heavy). Disturbance is evaluated on a stand basis.

II. Habitat and Vegetation Description

California Wildlife Habitat Relationships (CWHR)

For CWHR, identify the size/height class of the plot using the following tree, shrub, and/or herbaceous categories. These categories are based on functional life forms.

Tree DBH: Circle one of the tree size classes provided when the tree canopy closure exceeds 10% of the total cover, or if young tree density indicates imminent tree dominance. Size class is based on the average diameter at breast height (dbh) of each trunk (standard breast height is 4.5ft or 137cm). When marking the main size class,

make sure to estimate the mean diameter of all trees over the entire stand, and weight the mean toward the larger tree dbh's. The "**T6 multi-layered**" dbh size class signifies a multi-layered tree canopy (with a size class T3 and/or T4 layer growing under a T5 layer and a distinct height separation between the classes) exceeding 60% total cover. Stands in the T6 class need also to contain at least 10% cover of size class 5 (>24" dbh) trees growing over a distinct layer with at least 10% combined cover of trees in size classes 3 (>6-11" dbh) or 4 (>11-24" dbh).

Shrub: Circle one of the shrub size classes provided when shrub canopy closure exceeds 10% (except in desert types) by recording which class is predominant in the survey. Shrub size class is based on the average amount of crown decadence (dead standing vegetation on live shrubs when looking across the crowns of the shrubs).

Herbaceous: Circle one of the herb height classes when herbaceous cover exceeds 2% by recording the predominant class in the survey. Note: *This height class is based on the average plant height at maturity, not necessarily at the time of observation.*

III. Interpretation of Stand

Field-assessed vegetation Alliance name: Enter the name of the Alliance following the [Manual of California Vegetation Online](#). Please use scientific nomenclature, e.g., *Quercus agrifolia* forest. An Alliance is based on the dominant or diagnostic species of the stand, and usually reflects the uppermost and/or dominant height stratum. A dominant species covers the greatest area. A diagnostic species is consistently found in some vegetation types but not others.

The field-assessed Alliance name may not exist in the present classification, in which case you can provide a new Alliance name in this field. If this is the case, also make sure to state that it is not in the MCV under "Explain" below.

Field-assessed Association name (optional): Enter the name of the species in the Alliance and additional dominant/diagnostic species from any strata. In following naming conventions, species in differing strata are separated with a slash, and species in the uppermost stratum are listed first (e.g., *Quercus douglasii* / *Toxicodendron diversilobum*). Species in the same stratum are separated with a dash (e.g., *Quercus lobata* – *Quercus douglasii*).

The field-assessed Association name may not exist in the present classification, in which you can provide a new Association name in this field.

Adjacent Alliances/direction: Identify other vegetation types that are directly adjacent to the stand being assessed by noting the dominant species (or known type). Also note the distance in meters from the GPS waypoint and the direction in degrees that the adjacent alliance is found (e.g., *Amsinckia tessellata* / 50m, 360° N or *Eriogonum fasciculatum* / 100m, 110°).

Confidence in Alliance identification: (L, M, H) With respect to the "Field-assessed Alliance name," note whether you have L (=Low), M (=Moderate), or H (=High) confidence in the interpretation of this Alliance name.

Explain: Please elaborate if your “Confidence in Alliance identification” is low or moderate. Low confidence can occur from such things as a poor view of the stand, an unusual mix of species that does not meet the criteria of any described Alliance, or a low confidence in your ability to identify species that are significant members of the stand.

Phenology: Indicate early (E), peak (P), or late (L) phenology for each of the strata. For herbs, this generally indicates if species are in flower and/or fruit and are therefore identifiable. For shrubs and trees, this attribute generally refers to cover, e.g., a tree that is fully leafed out will be considered peak (P) even if it is not in flower. Phenology is useful for cover estimation and species identification issues and should be elaborated upon in the next field.

Other identification or mapping information: Discuss any further problems with the identification of the assessment or issues that may be of interest to mappers. Note if this sample represents a type that is likely too small to map.

IV. Vegetation Description

Database #: Copy the database # from Page 1.

Overall Cover of Vegetation

Provide an estimate of cover for the life-form categories below. Record a specific number for the total aerial cover or “bird’s-eye view” looking from above for each category, estimating cover for the living plants only. Litter/duff should not be included in these estimates.

The *porosity* of the vegetation should be taken into consideration when estimating percent foliar cover for all categories below: consider how much of the sky you can see when you are standing under the canopy of a tree, or how much light passes through the canopy of the shrub layer to help you estimate foliar cover.

% NonVasc cover: The total cover of all lichens, bryophytes (mosses, liverworts, hornworts), and cryptogamic crust on substrate surfaces including downed logs, rocks and soil, but not on standing or inclined trees or vertical rock surfaces.

Total % Vasc Veg cover: The total cover of all vascular vegetation taking into consideration the porosity, or the holes, in the vegetation, and disregarding overlap¹ of the various tree, shrub, and/or herbaceous layers and species.

¹ Porosity reduces the total cover of the canopy. Overlapping strata should not be included in the total cover percent; for instance, if a shrub is growing under a tree, only the cover of the tree will be added into the total; the cover of the shrub will be disregarded, except for the amount by which it fills in the porosity of the tree canopy.

% Cover by Layer

Conifer Tree /Hardwood Tree: The total foliar cover (considering porosity) of all live tree species, disregarding overlap¹ of individual trees. Estimate conifer and hardwood covers separately. **Please note:** These cover values should not include the coverage of regenerating tree species (i.e., tree seedlings and saplings).

Regenerating Tree: The total foliar cover of seedlings and saplings, disregarding overlap¹ of individual recruits. See seedling and sapling definitions below.

Shrub: The total foliar cover (considering porosity) of all live shrub species disregarding overlap¹ of individual shrubs.

Herbaceous: The total cover (considering porosity) of all herbaceous species, disregarding overlap¹ of individual herbs.

Height Class by Layer

Modal height for conifer tree / hardwood tree, regenerating tree, shrub, and herbaceous categories. Record an average height value for each category by estimating the mean height for each group. Please use the following height intervals to record a height class: 1 = <1/2 m, 2 = 1/2-1 m, 3 = 1-2 m, 4 = 2-5 m, 5 = 5-10 m, 6 = 10-15 m, 7 = 15-20 m, 8 = 20-35 m, 9 = 35-50 m, 10 => 50 m.

Note: For the herbaceous layer height, this height class is based on the average plant height at the time of observation, as opposed to how this is recorded in the CWHR section (at maturity).

Species List and Coverage

For Rapid Assessments: List up to 20 species that are dominant or that are characteristically consistent within the assessment area. These species may or may not be abundant, but they should be constant representatives in the survey. When different layers of vegetation occur, make sure to list species from each stratum. As a general guide, make sure to list at least 1-2 of the most abundant species per stratum. There is a heavy line on the form under the 20th line to limit the RA section of the species list.

Note: If constant, diagnostic, or interesting species occur outside the assessment area but in the stand, list the species and estimated stand cover in the Site History section.

For Relevés: list all species present in the plot, using a second species list page if necessary.

** If using a second species list page, note "Continued" on the bottom of the first page and be sure to note the **Database #** on the second page.

For both sample types, provide the stratum:

T = Tree. A woody perennial plant that has a single trunk.

A = SApling. 1" - <6" dbh and young in age, OR small trees that are <1" dbh, are clearly of appreciable age, and are kept short by repeated browsing, burning, or other disturbance. Includes trees that are re-sprouting from roots or stumps following fire, logging or other disturbance. These re-sprouts may exhibit a shrubby form, with multiple small trunks, but are species that are generally considered trees. If a majority of the trunks are >6" dbh, then the re-sprouts would be recorded under the "Tree" stratum.

E = SEedling. A tree species clearly of a very young age that is <1" dbh or has not reached breast height. Applies only to trees propagating from seed; resprouts are not recorded here even if they meet the size requirements.

S = Shrub. A perennial, woody plant, that is multi-branched and doesn't die back to the ground every year.

H = Herb. An annual or perennial that dies down to ground level every year.

N = Non-vascular. Includes moss, lichen, liverworts, hornworts, cryptogammic crust, and algae.

Be consistent and don't break up a single species into two separate strata. The only time it would be appropriate to do so is when one or more tree species are regenerating, in which case the SEedling and/or SApling strata should be recorded for that species. These may be noted on the same line, e.g.:

Strata	Species	%Cover	C
T/A/E	Quercus douglasii	40/<1/<1	

In some cases, the stratum of a particular species might not be obvious. Some examples are *Juniperus californica*, which has the size and growth habit of a shrub, but it is considered a tree, and mistletoe, which is considered a shrub. It is useful to have a list of species with ambiguous strata for each project. Consult the MCV or contact VegCAMP if you are unsure.

C. If a species collection is made, it should be indicated in the collection column with a "C" (for collected). If the species is later keyed out, cross out the species name or description and write the keyed species name in pen on the data sheet. Do not erase what was written in the field, because this information can be used if specimens get mixed up later. If the specimen is then thrown out, add a "T" to the "C" in the collection column (CT = thrown out after confirmation) or cross out the "C". If the specimen is kept but is still not confidently identified, add a "U" to the "C" in the collection column (CU = collected and unconfirmed). In this case the unconfirmed species epithet should be put in parentheses [e.g., *Hordeum (murinum)*]. If the specimen is kept and is confidently identified, add a "C" to the existing "C" in the collection column (CC = collected and confirmed). If the specimen is later deposited in an herbarium, add a "D" to the existing "C" in the collection column (CD = collected and deposited) and note the receiving herbarium.

Use Jepson Manual nomenclature. Write out the genus and species of the plant. Do not abbreviate except for dominant species that do not have ambiguous codes. If you aren't sure there aren't duplicate codes, don't use a code. When uncertain of an identification (which you intend to confirm later) use parentheses to indicate what part of the determination needs to be confirmed. For example, you could write out *Brassica (nigra)* if you are sure it is a *Brassica* but you need further clarification on the specific epithet.

Provide the % absolute foliar cover for each species listed, considering porosity. When estimating, it is often helpful to think of coverage in terms of the following cover intervals at first:

<1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%.

Keeping these classes in mind, refine your estimate to a specific percentage. All species percent covers may total over 100% because of overlap. Include the percent cover of snags (standing dead) of trees and shrubs. Use the code "SNAG." Note their species, if known, in the "Species" column (i.e. SNAG – *Quercus wislizeni*).

For Rapid Assessments, make sure that the major non-native species occurring in the stand also are listed in the space provided in the species list with their strata and % cover.

For Relevés, all non-native species should be included in the species list.

Also, for Relevés, record the <1% cover in one of two categories: "r" for trace (i.e., rare in plot, or solitary individuals) and "+" for <1% but not rare or solitary individuals.

Unusual species: List species that are locally or regionally rare, endangered, or atypical (e.g., range extension or range limit) within the stand. This field will be useful to the Program for obtaining data on regionally or locally significant populations of plants.

Note: Field forms are generally filled out in pencil, so that changes may be made easily while working in the plot or stand. Once out of the stand, however, entries on the field form should not be erased, but should be crossed out and corrected in a different-colored ink.

Appendix C: Vegetation type descriptions

This appendix provides all of the mapping units, in same hierarchical order as the key, that were utilized in producing the map. For each mapping unit, the classification level (Macrogroup, Group, Alliance, Association) associated with each map unit is provided along with the description from the floristic key, found in *Appendix F*. Examples of NAIP 2020 are followed by Google Earth imagery (various years). Infrared NAIP imagery (not provided) was used to show species that stood out more on infrared than on natural color imagery.

Agriculture Mapping Unit



The agriculture map unit includes land used primarily for the production of food, fiber, and livestock. This unit is defined as planted and maintained, and not fallow for longer than a five-year period. The map unit may also be applied to lands where specific agricultural use cannot be determined with existing imagery (e.g. plots of land in an agricultural area that were previously used as orchard or citrus but have been cleared with no obvious land use on the base imagery).

Bare Sand Mapping Unit



Sand on beaches with little to no vegetation. If present, vegetation is less than 2%.

Built-up and Urban Disturbance Mapping Unit



Built-up areas include permanent and semi-permanent structures that are occupied/used or abandoned. Built-up areas can include residential, commercial and services, industrial, and transportation uses, as well as their associated disturbed lands. Areas under construction are also included. Associated impervious surfaces such as parking lots and playgrounds are normally included in the built-up area. Small areas of naturally occurring vegetation may be included in the built-up area if they are below MMU. Other vegetation within the polygon can include exotic plantings associated with the land use such as lawns, gardens, hedgerows, and trees.

Perennial Stream Channel Mapping Unit



The Perennial Stream Channel map unit consists of stream channels in which water is present during all or most of the year. This category may also include temporarily exposed flats adjacent to the main channel. This sparsely vegetated category is mapped when riparian vegetation comprises less than 8 to 10 percent cover. Water must be present over most of the polygon on all image datasets. Temporarily exposed flats and channels can be visible during several weeks of the year or during longer periods in seasons with below-average rainfall.

Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit



This class includes perennial or seasonally flooded water bodies, either occurring naturally in the landscape or impounded by earthen dams that receive their water completely from the upstream watershed. Some of these features are seasonal and become completely dry usually in the late summer to early fall while other features retain water throughout most of the year.

Western North American Sparsely Vegetated Rivershore Mapping Unit



This mapping unit includes areas where there was no vegetation or very sparse vegetation along the margins of streams and other water bodies, or in the channels of dried-up seasonal waterways.

***Sequoia sempervirens* Alliance**



Sequoia sempervirens dominates, co-dominates, or characterizes (rarely with as little as 5% cover) stands near streams, along all slopes and aspects, or on ridges. Associated trees include *Acer macrophyllum*, *Notholithocarpus densiflorus*, *Pseudotsuga menziesii*, *Torreya californica*, and *Umbellularia californica*, which are typically sub- to co-dominant but may occasionally exceed *Sequoia* in cover. *accinium ovatum*, *Oxalis oregana*, and *Woodwardia fimbriata* may intermix in the understory.

***Sequoia sempervirens* – *Pseudotsuga menziesii* – *Notholithocarpus densiflorus* Association**



***Sequoia sempervirens* - *Umbellularia californica* Association**



***Pinus ponderosa* Alliance**



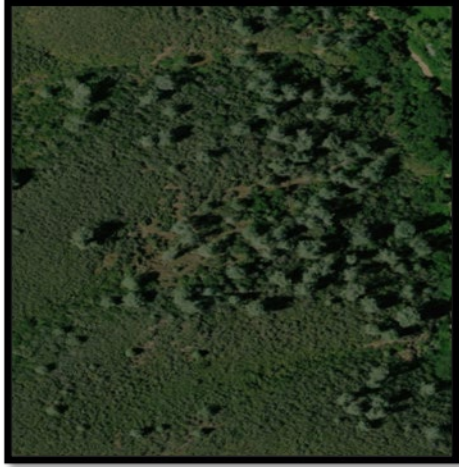
Pinus ponderosa is dominant or co-dominant in the overstory, usually at greater than 20% absolute cover and with a dense understory of shrubs.

***Pseudotsuga menziesii* - (*Notholithocarpus densiflorus* - *Arbutus menziesii*) Alliance**



Pseudotsuga menziesii is dominant or co-dominant with *Arbutus menziesii*, *Notholithocarpus densiflorus*, *Quercus agrifolia*, *Q. chrysolepis*, or *Umbellularia californica*.

***Pinus sabiniana* Alliance**



Pinus sabiniana dominates or co-dominates in the tree overstory, shrubs may exceed pine in cover.

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



***Pinus muricata* - *Pinus radiata* Alliance**



Naturally occurring stands of *Pinus radiata* or *Pinus muricata* dominant, co-dominant with conifers, or subdominant with hardwoods in the tree overstory and/or regenerating tree layer. The understory may include moderate to dense cover of shrubs such as *Arctostaphylos* spp., *Baccharis pilularis*, *Gaultheria shallon*, *Toxicodendron diversilobum* and *Vaccinium ovatum*. Most stands of Monterey Pine in Santa Cruz County are planted or naturalized except for a limited area between Ano Nuevo and Davenport.

***Pinus radiata* – *Quercus agrifolia* / *Toxicodendron diversilobum* Association**



***Juniperus californica* Alliance**



Stands dominated or co-dominated by *Juniperus californica*. While no surveys were collected, the alliance may potentially occur in northeast Santa Clara Co. with *Pinus sabiniana* and *Quercus douglasii*.

***Hesperocyparis macrocarpa* - *Pinus radiata* Semi-Natural Alliance**



Stands dominated or co-dominated by planted or naturalized conifer species including *Hesperocyparis macrocarpa*, *Pinus pinea*, and/or *Pinus radiata*.

***Notholithocarpus densiflorus* Alliance**



Notholithocarpus densiflorus is strongly dominant in the tree canopy or co- occurs with sub-dominant to co-dominant *Arbutus menziesii* or *Umbellularia californica*.

***Aesculus californica* Alliance**



Aesculus californica dominates in open to moderately dense woodlands. If *Umbellularia californica* is present, it is sub-dominant. A variety of herbs may be found in the understory.

***Umbellularia californica* Alliance**



Umbellularia californica is either dominant or co-dominant with *Quercus agrifolia* in open to dense woodlands. Found in a variety of upland settings, such as coastal bluffs, inland ridges, steep north-facing slopes, rocky outcrops and post-fire landscapes.

***Umbellularia californica* – *Quercus agrifolia* / *Toxicodendron diversilobum* Association**



***Umbellularia californica* / *Toxicodendron diversilobum* Association**



***Quercus* (*agrifolia*, *douglasii*, *garryana*, *kelloggii*, *lobata*, *wislizeni*) Alliance**



Multiple *Quercus* tree species intermix (at least three species) and it is difficult to assign to an alliance defined by one oak species. Co-dominating oaks may include *Quercus agrifolia*, *Quercus chrysolepis*, *Quercus douglasii*, *Quercus kelloggii*, *Quercus lobata*, *Quercus parvula*, and/or *Q. wislizeni*.

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



Quercus chrysolepis is dominant or co-dominant with *Arbutus menziesii* or *Umbellularia californica* in the tree overstory. *Quercus wislizeni* is occasionally found as a sub-dominant tree.

***Quercus chrysolepis* – *Umbellularia californica* Association**



***Quercus douglasii* Alliance**



Quercus douglasii dominates or co-dominates with *Aesculus californica*, *Pinus sabiniana*, *Quercus agrifolia*, or *Arbutus menziesii* in the tree overstory. The understory herbaceous layer is often moderately dense to dense, with a mixture of native and non-native forbs and grasses.

***Quercus douglasii* – *Aesculus californica* / grass Association**



***Quercus douglasii* – *Pinus sabiniana* / grass Association**



***Quercus douglasii* – *Quercus agrifolia* Association**



***Quercus kelloggii* Alliance**



Quercus kelloggii or *Quercus* × *morehus* dominates or co-dominates with *Pinus ponderosa*, *Pseudotsuga menziesii*, *Q. agrifolia*, *Q. chrysolepis*, and/or *Umbellularia*

californica in the tree overstory. *Arbutus menziesii* is often present as a sub-dominant species. Stands are found inland, above maritime influence, often on northerly slopes.

***Quercus lobata* Alliance**



Quercus lobata dominates or co-dominates with *Quercus agrifolia*, *Q. douglasii*, *Q. kelloggii*, and/or *Umbellularia californica* in the tree overstory in an upland habitat. Stands are typically found on slopes and summit valleys with an open grassy understory and *Toxicodendron diversilobum* is a common understory shrub.

***Quercus lobata* – *Quercus agrifolia* / grass Association**



***Quercus lobata* – *Quercus douglasii* Association**



***Quercus wislizeni* - *Quercus chrysolepis* (shrub) Alliance**



Quercus agrifolia, *Q. parvula*, *Q. wislizeni* or other *Quercus* spp. dominates and/or co-dominates as a shrub, co-occurring with *Umbellularia*, *Adenostoma*, and a variety of other shrubs that prefer more mesic, northerly exposures. *Quercus parvula* and *Q. wislizeni* are not always morphologically distinct.

***Quercus agrifolia* Alliance**



Quercus agrifolia dominates or co-dominates with *Arbutus menziesii* in the canopy in an upland setting. The understory herbaceous layer often contains a mixture of native and non-native herbs and/or shrubs.

***Quercus agrifolia* – *Aesculus californica* Association**



***Quercus agrifolia* / *Adenostoma fasciculatum* – (*Salvia mellifera*) Association**



***Quercus agrifolia* / *Arctostaphylos (crustacea)* Association**



***Salix gooddingii* - *Salix laevigata* Alliance**



Salix laevigata dominates along streams, rivers, ditches, floodplains, and lake edges. Associated trees and shrubs include *Alnus rhombifolia*, *Quercus agrifolia*, *Rubus*, *Salix*, and others.

***Populus fremontii* - *Fraxinus velutina* - *Salix gooddingii* Alliance**



Populus fremontii dominates or co-dominates with *Acer negundo*, *Juglans*, and/or *Salix*, sometimes with *Populus* having as little as 5% absolute cover.

***Platanus racemosa* - *Quercus agrifolia* Alliance**



Quercus agrifolia dominates in a riparian setting, or *Platanus racemosa* is dominant, co-dominant, or characteristically present at >15% relative cover in the tree canopy of riparian habitats with *Acer macrophyllum*, *Acer negundo*, *Aesculus californica*, *Juglans hindsii*, *Quercus agrifolia*, *Quercus lobata*, *Salix laevigata*, or *Umbellularia californica*.

***Populus trichocarpa* Alliance**



Populus trichocarpa dominates or co-dominates in the tree overstory. Stands for this type will often have other riparian trees present. A variety of shrubs and herbs may be found in the understory, including *Cornus sericea*, *Rubus ursinus*, *Salix lasiolepis*, and *Stachys bullata*.

***Alnus rhombifolia* Alliance**



Alnus rhombifolia dominates or co-dominates with *Acer macrophyllum*, *Platanus racemosa*, or *Umbellularia californica* in the tree overstory. *Umbellularia californica* may be higher in cover, though stands for this type will often have other riparian trees along with *Alnus rhombifolia* to be classed here. A variety of shrubs and herbs may be found in the understory, including *Rubus*, *Toxicodendron*, and numerous ferns. Careful identification of alder stands closer to the coast is necessary to differentiate from *A. rubra* stands.

***Acer macrophyllum* - *Alnus rubra* Alliance**



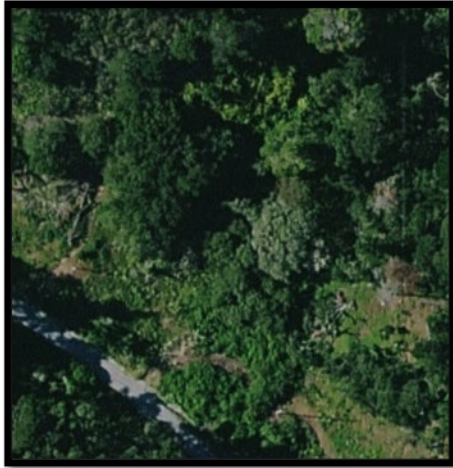
Alnus rubra dominates in the tree canopy in riparian settings, typically within a few miles of the coast. The understory is often comprised of one to many species of *Rubus*, *Salix lasiolepis*, and *Sambucus racemosa*, which sometimes exceed *Alnus* in cover. *Alnus rubra* stands were encountered in riparian or swampy bottomlands but can also occur along rocky streambeds in similar settings to *A. rhombifolia* stands. Careful identification of the *Alnus* species is important closer to the coast.

***Eucalyptus (globulus, camaldulensis)* Semi-Natural Association**



A tree species of *Eucalyptus*, *Acacia melanoxylon*, or *Ailanthus altissima* dominates in planted or naturalized stands. Often found in groves, windbreaks, uplands, and along stream courses. Stands were observed but rarely sampled.

***Cornus sericea* Alliance**



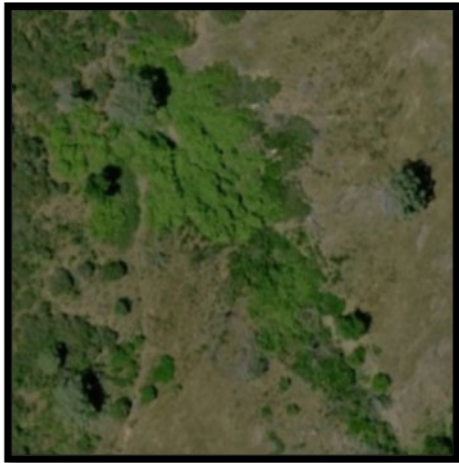
Cornus sericea is dominant in the shrub layer or co-dominant with plants such as *Salix* spp. Emergent riparian trees and shrubs such as *Rubus ursinus*, *Salix* spp. and *Toxicodendron diversilobum* are often present

***Frangula californica* - *Rhododendron occidentale* - *Salix breweri* Alliance**



Frangula californica and/or *Rhododendron occidentale* dominate or co- dominate together with *Rubus*. Stands are found along springs, seeps, and ravines in wetland and riparian settings, often on sedimentary and serpentine substrates that retain water much of the year.

***Salix lasiolepis* Alliance**



Salix lasiolepis dominates or co-dominates with *Rubus spp.* or *Baccharis pilularis* along stream banks and benches, slope seeps, and drainage stringers. Emergent riparian trees are often present, such as *Acer*, *Alnus*, *Fraxinus*, *Salix*, and others.

***Baccharis salicifolia* Alliance**

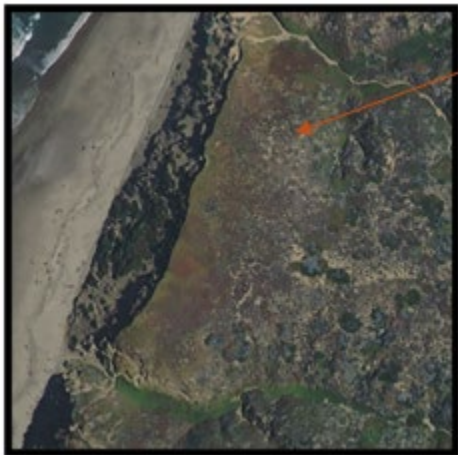


Baccharis salicifolia dominates or co-dominates in the shrub canopy with *Artemisia californica*, *Baccharis pilularis*, *Rubus spp.*, *Salix exigua*, *Salix lasiolepis*, and *Sambucus nigra*. Emergent trees may be present at low cover, including *Pinus sabiniana*, *Platanus racemosa*, *Populus fremontii*, *Quercus spp.* or *Salix spp.*

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



Prunus virginiana dominates in the shrub overstory, often on steep north-facing slopes.
***Eriogonum wrightii* - *Eriogonum heermannii* - *Buddleja utahensis* Alliance**



Eriogonum wrightii is dominant in the shrub overstory.
***Ericameria nauseosa* Alliance**



Ericameria nauseosa is dominant in the shrub overstory. No stands were sampled, but the alliance may occur within the project area.

***Lupinus arboreus* Alliance**



Lupinus arboreus dominates or co-dominates with *Baccharis pilularis* and/or *Rubus ursinus*, often with high cover of grasses including *Bromus diandrus*, *Holcus lanatus*, *Lolium perenne*, *Vulpia bromoides*, and other non-native herbaceous species.

***Lupinus chamissonis* - *Ericameria ericoides* Alliance**



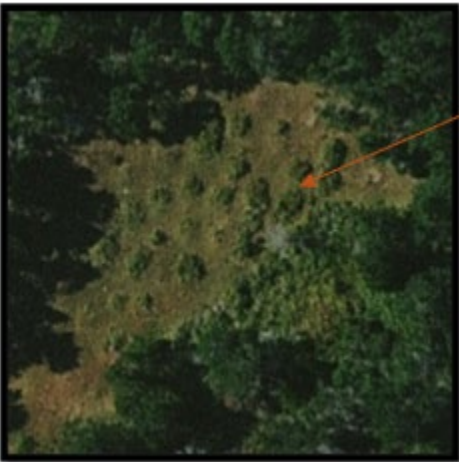
Along the immediate shoreline, *Ericameria ericoides* and/or *Lupinus chamissonis* dominate as individuals or in combination as co-dominants with *Baccharis pilularis* or *Lupinus arboreus*.

***Malacothamnus fasciculatus* - *Malacothamnus* spp. Alliance**



A species of *Malacothamnus* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Artemisia californica*, *Cercocarpus montanus*, *Eriogonum fasciculatum*, *Heteromeles arbutifolia*, *Lotus scoparius*, and *Salvia mellifera*. Emergent trees may be present at low cover, including *Platanus racemosa* or *Quercus agrifolia*.

***Diplacus aurantiacus* Alliance**



Diplacus aurantiacus is strongly dominant, often on steep slopes and ridgetops. Other coastal scrub may be present at lower cover.

***Baccharis pilularis* Alliance**



Baccharis pilularis dominates or co-dominates with *Frangula californica*, *Toxicodendron diversilobum*, or *Rubus spp.* in the shrub overstory. A variety of native and non-native forbs and grasses may intermix in the herbaceous layer, sometimes with higher cover than *Baccharis* – including *Avena*, *Bromus*, *Danthonia*, *Deschampsia*, *Elymus glaucus*, *Festuca*, *Hypochaeris*, *Nassella pulchra*, and others.

***Baccharis pilularis* Association**



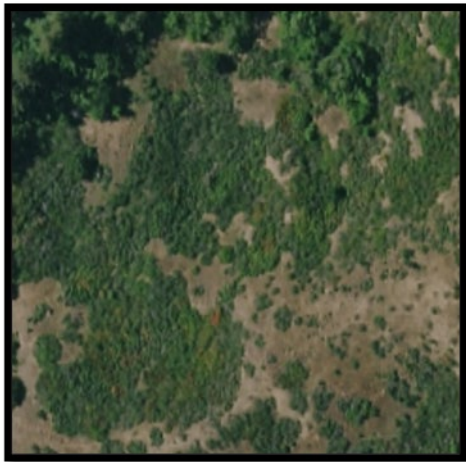
***Baccharis pilularis* – *Artemisia californica* Association**



***Baccharis pilularis* – *Ceanothus thyrsiflorus* Association**



***Baccharis pilularis* – *Toxicodendron diversilobum* Association**



***Baccharis pilularis* / *Eriophyllum staechadifolium* Association**



***Frangula californica* ssp. *californica* – *Baccharis pilularis* / *Scrophularia californica* Association**



***Ceanothus thyrsiflorus* Alliance**



Ceanothus thyrsiflorus or *C. incanus* dominates in the overstory shrub layer, often with moderately dense cover. *Diplacus aurantiacus*, *Heteromeles*, *Pseudotsuga menziesii*, *Quercus wislizeni*, and other species may intermix as sub-dominants in the shrub and tree layers. Stands of *C. incanus* are included in the *C. thyrsiflorus* Alliance since they are more limited in distribution and are ecologically similar to *C. thyrsiflorus*.

***Gaultheria shallon* – *Rubus (ursinus)* Alliance**



Gaultheria shallon, *Holodiscus discolor*, *Rubus parviflorus*, and/or *Rubus ursinus* dominate or co-dominate with *Baccharis pilularis*, *Holcus lanatus*, or *Toxicodendron diversilobum* on hillslopes, rock outcrops, coastal bluffs, or flats.

***Toxicodendron diversilobum* Alliance**



Toxicodendron diversilobum dominates, sometimes intermixing with sub- dominant *Baccharis pilularis* and *Rubus spp.* For this project, stands were encountered close to the coast, although they are likely to occur inland as well.

***Toxicodendron diversilobum* – (*Baccharis pilularis*) Association**



***Artemisia californica* - (*Salvia leucophylla*) Alliance**



Artemisia californica dominates and may intermix with *Baccharis pilularis*, *Diplacus aurantiacus*, and/or *Toxicodendron diversilobum*.

***Salvia mellifera* – (*Artemisia californica*) Alliance**



Salvia mellifera dominates or co-dominates with *Artemisia californica*, *Diplacus aurantiacus*, *Eriogonum fasciculatum*, or *Lotus scoparius*. If *Adenostoma fasciculatum* is present, it is not co-dominant.

Californian Ruderal Grassland, Meadow, & Scrub Group



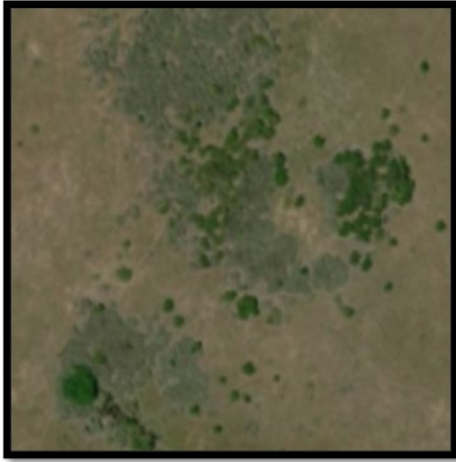
Helichrysum petiolare, *Maytenus boaria*, *Rosa eglanteria*, *R. rubiginosa*, *Pittosporum*, or other non-native shrubs dominant in open to dense stands, where they are often invading coastal grasslands.

***Arctostaphylos* (*crustacea*, *tomentosa*) Alliance**



Arctostaphylos crustacea dominates or co-dominates with *Adenostoma fasciculatum*, *Arctostaphylos regismontana*, *Ceanothus cuneatus*, *C. papillosus*, *Frangula californica*, *Heteromeles arbutifolia*, *Quercus parvula*, or *Q. wislizeni* var. *frutescens*. Trees are often present but at low cover.

***Arctostaphylos crustacea* – *Adenostoma fasciculatum* – *Ceanothus* (*cuneatus*, *papillosus*) Association**



***Arctostaphylos morroensis* Shrubland Alliance**



Arctostaphylos morroensis is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Arctostaphylos crustacea*, *Artemisia californica*, *Baccharis pilularis*, *Ceanothus cuneatus* var. *fascicularis*, *Diplacus aurantiacus*, *Ericameria ericoides*, *Eriodictyon altissimum*, *Frangula californica*, *Prunus illicifolia*, and *Salvia mellifera*. Emergent trees may be present at low cover, including *Quercus agrifolia*.

***Cercocarpus montanus* Alliance**



Cercocarpus montanus (= *C. betuloides*) dominates the stand, sometimes with *Adenostoma fasciculatum* or *Prunus ilicifolia* as codominants or subdominants. *Artemisia californica* and *Ribes californicum* are often present.

***Quercus berberidifolia* Alliance**



Quercus berberidifolia dominates or co-dominates with *Adenostoma fasciculatum*, *Ceanothus cuneatus*, and/or other chaparral shrubs.

***Quercus berberidifolia* – *Adenostoma fasciculatum* Association**



***Quercus berberidifolia* – *Ceanothus cuneatus* Association**



***Prunus ilicifolia* - *Heteromeles arbutifolia* - *Ceanothus spinosus* Alliance**



Ceanothus ferrisiae, *Heteromeles arbutifolia*, *Prunus ilicifolia*, and/or *Ptelea crenulata* dominate or co-dominate in the shrub layer with *Baccharis pilularis*, *Rhamus crocea*, *R. ilicifolia*, and/or *Toxicodendron diversilobum*. *Sanicula crassicaulis* and other herbs such as *Clinopodium douglasii* may be present to abundant in the understory.

***Arctostaphylos glandulosa* Alliance**



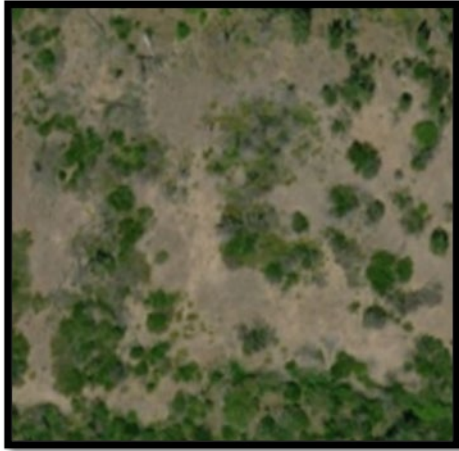
Arctostaphylos glandulosa or *A. x campbelliae* dominates or co-dominates with *Adenostoma fasciculatum* and/or *Quercus wislizeni* on convexities, outcrops, ridges, or slopes. Sometimes *Q. wislizeni* may be a tree, though often it is shrubby in stands sampled. Soils may be derived from sandstone, serpentine, or gabbro.

Species commonly found as emergent trees or sub-dominant shrubs include *Arbutus menziesii*, *Arctostaphylos* spp., *Diplacus aurantiacus*, and *Heteromeles arbutifolia*.

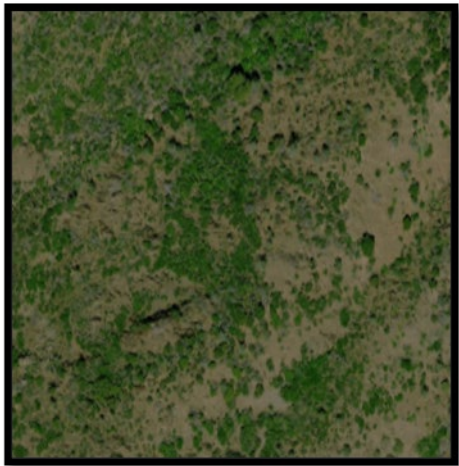
***Arctostaphylos glandulosa* – *Adenostoma fasciculatum* Association**



***Arctostaphylos glandulosa* – *Adenostoma fasciculatum* – *Quercus berberidifolia*
Association**



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



Arctostaphylos canescens and/or *A. manzanita* dominate or co-dominate, sometimes with co-dominant *Adenostoma fasciculatum*. Found typically on volcanic, Franciscan, and greenstone substrates. One alliance is recognized for all three *Arctostaphylos* vegetation types, with associations specific to each species.

***Arctostaphylos glauca* Alliance**



Arctostaphylos glauca is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Arctostaphylos glandulosa*, *Artemisia californica*, *Ceanothus cuneatus*, *Cercocarpus montanus*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Quercus durata*, *Quercus wislizeni*, *Rhamnus ilicifolia*, and *Salvia mellifera*. Emergent trees may be present at low cover, including *Quercus agrifolia* or *Quercus wislizeni* var. *wislizeni*.

***Arctostaphylos glauca* – *Adenostoma fasciculatum* Association**



***Ceanothus cuneatus* Alliance**



Ceanothus cuneatus dominates or co-dominates with *Adenostoma fasciculatum*, often on convexities with westerly exposures. A variety of shrubs may intermix, including *Arctostaphylos*, *Baccharis*, *Eriodictyon*, *Heteromeles*, *Quercus durata*, and others.

***Ceanothus cuneatus* – *Adenostoma fasciculatum* Association**



***Adenostoma fasciculatum* Alliance**



Adenostoma fasciculatum dominates or is co-dominant with a coastal sage scrub species such as *Artemisia californica*, *Baccharis pilularis*, soft-leaved *Ceanothus* spp., *Diplacus aurantiacus*, *Eriophyllum confertiflorum*, or *Lupinus albifrons*.

***Adenostoma fasciculatum* - (*Ceanothus cuneatus*) Association**



***Adenostoma fasciculatum* - *Salvia* spp. Alliance**



Adenostoma fasciculatum and *Salvia mellifera* co-dominate.

***Bolboschoenus maritimus* Alliance**



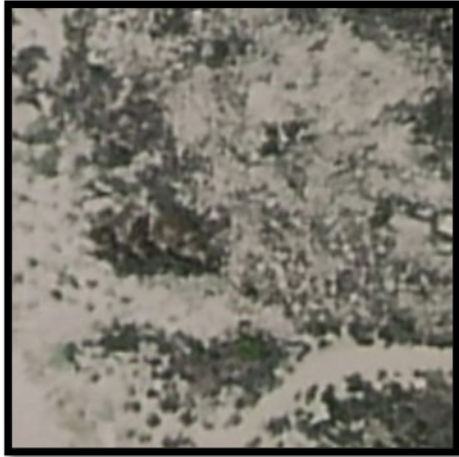
Bolboschoenus maritimus or *B. robustus* dominates or co-dominates with *Sarcocornia* (= *Salicornia*) *pacifica*.

***Distichlis spicata* - *Frankenia salina* Coastal Alliance**



Distichlis spicata dominates in salty habitats along the coast and in high salt marsh settings or co-dominates with *Frankenia salina* and/or *Jaumea carnosa*. Non-native grasses including *Avena* spp. and *Bromus hordeaceus* may have high cover and *Sarcocornia pacifica* may be present as a sub-dominant.

***Grindelia stricta* Provisional Association**



Grindelia stricta or *Grindelia hirsutula* dominates or co-dominates with *Distichlis spicata*, or non-native herbs such as *Polypogon monspeliensis*, *Rumex crispus*, and *Bromus diandrus*. Stands may be found on slightly elevated or drier ground adjacent to salt or alkaline marshes, tidal flats, levees, and road margins.

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



Sarcocornia pacifica dominates or co-dominates with *Atriplex prostrata*, *Cotula coronopifolia*, *Distichlis spicata*, *Frankenia salina*, *Grindelia stricta*, *Jaumea carnosa*, and/or *Lepidium latifolium*. Stands found in coastal salt marshes, alkali flats, and wetland mudflats.

***Sarcocornia pacifica* – *Jaumea carnosa* – *Distichlis spicata* Association**



***Cynodon dactylon* – *Crypsis* spp. - *Paspalum* spp. Alliance**



Crypsis spp., *Cynodon dactylon*, *Cyperus eragrostis*, *Mollugo verticillata*, *Panicum millaceum*, *Paspalum* spp., and/or other non-native plants > 80% relative cover individually or collectively in the herbaceous layer.

Arid West Interior Freshwater Marsh Group



Schoenoplectus and/or *Typha* dominate in the herbaceous layer. Stands are found along streams, ditches, shores, bars, and channels of river mouth estuaries; around ponds and lakes; and in sloughs, swamps, and freshwater to brackish marshes

Schoenoplectus (acutus, californicus) Alliance



Schoenoplectus acutus or *Schoenoplectus californicus* dominates or co-dominates with other herbs including *Typha* spp. Occurs in both freshwater and tidal marshes, along ponds and lagoons.

Schoenoplectus pungens – Argentina edegii Provisional Association



***Schoenoplectus americanus* Alliance**



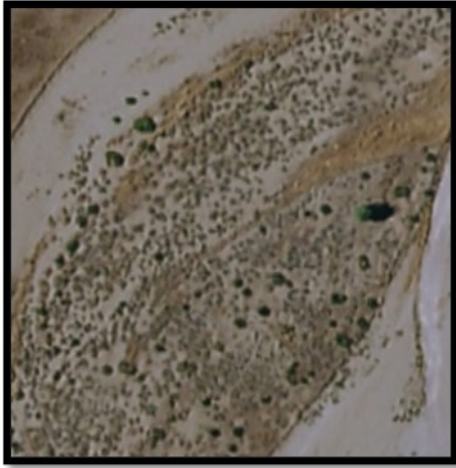
Schoenoplectus americanus or *Schoenoplectus pungens* dominates or co- dominates with other herbs. Occurs in fresh or brackish conditions.

Vancouverian Freshwater Wet Meadow & Marsh Group



Argentina egedii, *Bolboschoenus maritimus*, *B. robustus*, *Carex nudata*, *C. obnupta*, *C. praegracilis*, *C. pansa*, *C. subbracteata*, *Eleocharis macrostachya*, *Juncus covillei*, *J. effusus*, *J. hesperius*, *J. lescurii*, *J. patens*, *J. occidentalis*, *J. phaeocephalus*, *J. xiphioides*, *Oenanthë*, and/or *Scirpus microcarpus* dominate or co-dominate in mesic or wetland settings. *Holcus*, *Hypochaeris*, *Leontodon*, *Rumex* and *Vulpia bromoides* may intermix with similar cover. Stands may be found along seasonally flooded brackish marshes, coastal sand dunes, swales and plains, shallowly inundated woods, meadows, roadside ditches, mudflats, coastal swamps, lakeshores, marshes, and riverbanks.

***Heterotheca (oregona, sessiliflora)* Alliance**



Heterotheca oregona dominates or co-dominates along gravel bars in floodplains, riparian terraces and stream banks.

Western North American Cliff, Scree, & Rock Vegetation Macrogroup



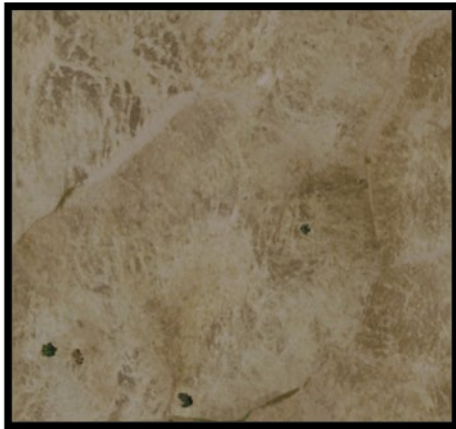
Allium falcifolium, *E. luteolum*, *E. nudum*, *Polypodium californicum*, *Sedum spathulifolium*, *Selaginella bigelovii*, and/or *Streptanthus glandulosus* characterize or dominate stands on exposed rock.

***Dudleya cymosa* - *Dudleya lanceolata* / Lichen - Moss Alliance**



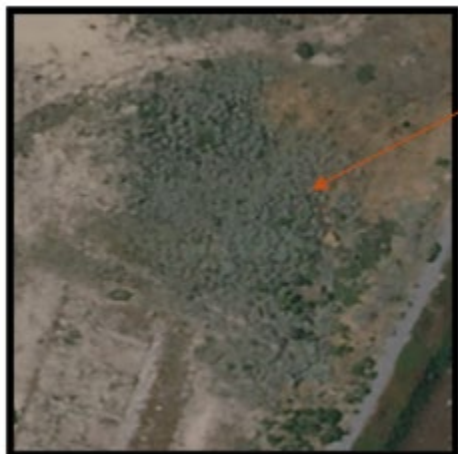
The native *Dudleya farinosa* or other *Dudleya* spp. is characteristic, dominant, or co-dominant with herbs such as *Eriogonum latifolium*, *Vulpia bromoides*, and others. Lichen is characteristic and often dominant (with *Dudleya* sometimes lacking). Often on rocky coastal bluffs, cliffs, headlands, and bedrock outcrops

Californian Annual & Perennial Grassland Macrogroup



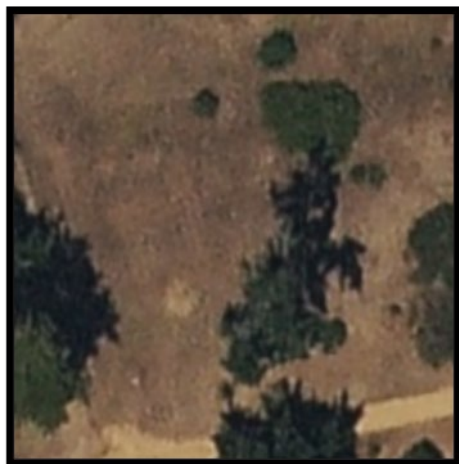
Native and non-native annual forb/grass vegetation AND native perennial grasslands growing within the California Mediterranean climate. Stands are generally found in relatively drier sites than those in the Vancouverian Macrogroups which are more common near the coast. Includes vegetation characterized by, but not limited to *Amsinckia*, *Avena*, *Brassica*, *Bromus*, *Centaurea*, *Cynosurus*, *Elymus glaucus*, *Eschscholzia*, *Lasthenia californica*, *Lolium*, *Lupinus*, *Melica*, *Nassella*, *Plagiobothrys nothofulvus*, *Plantago erecta*, *Pteridium aquilinum*, and *Vulpia microstachys*.

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



Perennial forbs such as *Calyptidium monospermum*, *Corethrogyne filaginifolia*, *Eriogonum nudum*, *Erysimum teretifolium*, *Heterotheca sessiliflora*, *Pteridium aquilinum*, *Sidalcea malviflora* or *Viola pedunculata* dominate or co-dominate with other herbs, OR two or more of these species are characteristically present in stands, sometimes with high cover of non-native annuals. Habitats include the sandhills of Santa Cruz Co.

***Eschscholzia (californica)* - *Lupinus (nanus)* Alliance**



Eschscholzia californica, *Lupinus bicolor*, and/or *L. nanus* dominate or co- dominate with a variety of native and non-native forbs and grasses, sometimes on thin soils with buried rocks.

***Nassella* spp. – *Melica* spp. Alliance**



Melica californica, *M. torreyana*, and/or *Nassella* spp. are dominant, co-dominant or characteristic in stands. *Avena*, *Bromus*, *Hemizonia congesta*, *Lolium perenne*, *Plantago erecta*, *P. lanceolata*, and/or *Trifolium* spp. intermix as dominant, co-dominant or characteristic taxa in associations of this alliance.

***Avena* spp. - *Bromus* spp. Semi-Natural Alliance**



Avena, *Brachypodium*, *Briza*, *Bromus*, *Erodium* and/or *Hypochaeris* dominate individually or in combination

***Brassica nigra* - *Centaurea (solstitialis, melitensis)* Semi-Natural Alliance**



Brassica nigra, *Raphanus sativus*, *Carduus pycnocephalus*, *Carthamus lanatus*, *Centaurea solstitialis*, *Silybum marianum*, or another non-native forb dominates in the herbaceous layer, often in old or active agriculture lands.

***Conium maculatum* - *Foeniculum vulgare* Semi-Natural Alliance**



Conium maculatum, *Ageratina adenophora*, *Dipsacus fullonum*, *D. sativus*, or *Foeniculum vulgare* dominates herbaceous stands, though various other taxa are likely present.

***Cortaderia (jubata, selloana)* Semi-Natural Alliance**



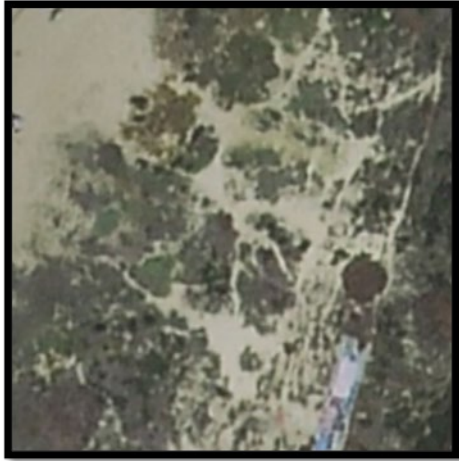
Cortaderia jubata or *Cortaderia selloana* dominates in naturalized stands, sometimes in dense clumps; or other non-native herbs such as *Echium candicans* dominant or co-dominant with *Cortaderia jubata*. Likely to occur in Santa Cruz Co.

***Festuca idahoensis* – (*Danthonia californica* – *Koeleria macrantha*) Association**



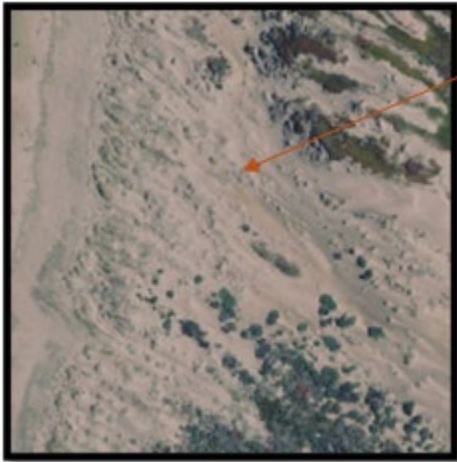
Festuca idahoensis, *F. californica*, *F. rubra* and/or *Danthonia californica* dominate or characterize stands. *Nassella pulchra* may be co-dominant. *Bromus carinatus*, *Elymus glaucus*, *Plantago erecta*, and a variety of native and non-native forbs and grasses may intermix as sub-dominants. *Festuca*, *Danthonia* or *Perideridia kelloggii* and other native species share at least 10% relative cover in the herb layer, with other non-native grasses and forbs sometimes having higher cover (e.g., *Cynosurus echinatus*, *Hypochaeris radicata*, and *Vulpia bromoides*). Occasionally, the larger *Festuca californica* may replace *F. idahoensis* in somewhat shadier or less exposed sites.

Pacific Coastal Beach & Dune Macrogroup



Native species, including *Abronia latifolia*, *Ambrosia chamissonis*, *Artemisia pycnocephala*, *Leymus mollis*, *Lathyrus littoralis*, and/or other herbs, are characteristic to dominant on dunes or coastal bluffs. Plants are adapted to salt spray, wind and shifting sands and are thus capable of colonizing relatively unstable and sterile substrates.

***Leymus mollis* Alliance**



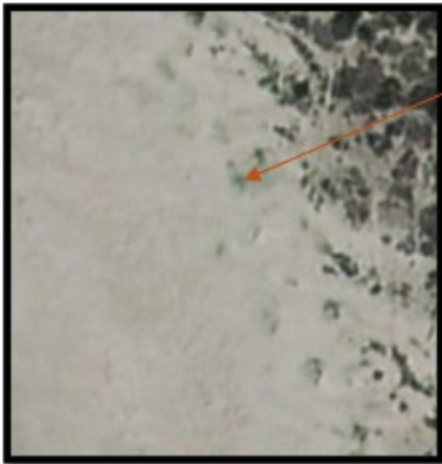
Leymus mollis dominates or is characteristically present in the herbaceous layer. *Abronia*, *Ambrosia chamissonis*, *Artemisia pycnocephala*, *Cakile*, and other herbaceous species may be present as sub-dominants.

***Abronia latifolia* - *Ambrosia chamissonis* Alliance**

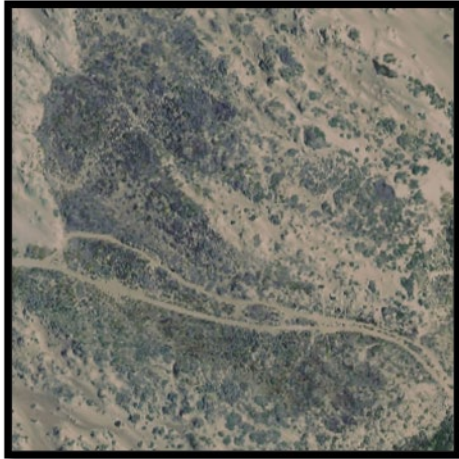


Abronia latifolia, *Ambrosia chamissonis*, *Calystegia soldanella*, and/or *Lathyrus littoralis* are characteristically present to dominant, sometimes with *Armeria maritima*, *Camissonia cheiranthifolia*, *Cardionema ramosissimum*, *Poa douglasii*, or *Polygonum paronychia* occurring as associated species. Non-native species such as *Cakile maritima*, *Carpobrotus* spp., and *Ammophila arenaria* may also be present.

***Abronia latifolia* – *Calystegia soldanella* – *Lathyrus littoralis* Association**



***Eriophyllum staechadifolium* - *Erigeron glaucus* - *Eriogonum latifolium* Alliance**



Armeria maritima, *Artemisia pycnocephala*, *Erigeron glaucus*, *Eriophyllum staechadifolium*, *Eriogonum latifolium*, and/or *Fragaria chiloensis* dominate or characterize stabilized dunes, sea bluffs and exposed coastal terraces. Shrubs such as *Baccharis pilularis*, *Lupinus arboreus*, *L. versicolor*, and *Rubus ursinus* may be present at low cover. Other native forbs and grasses may be present including *Achillea millefolium*, *Angelica hendersonii*, *Bromus carinatus*, *Daucus pusillus* and/or *Dudleya* spp.

***Armeria maritima* – *Plantago (maritima)* Provisional Association**



***Artemisia pycnocephala* Association**



***Eriogonum parvifolium* Association**



***Lupinus chamissonis* – *Ericameria ericoides* Alliance**



Along the immediate shoreline, *Ericameria ericoides* and/or *Lupinus chamissonis* dominate as individuals or in combination as co-dominants with *Baccharis pilularis* or *Lupinus arboreus*.

***Ammophila arenaria* Semi-Natural Alliance**



Ammophila arenaria is strongly dominant in the herbaceous layer.

***Mesembryanthemum* spp. - *Carpobrotus* spp. Alliance**



Carpobrotus and/or *Mesembryanthemum* dominate on bluffs, dunes, or disturbed lands, often forming impenetrable mats that prevent natives from establishing.

***Cakile (edentula, maritima)* Provisional Semi-Natural Alliance**



Cakile edentula and/or *C. maritima* are strongly dominant along active beaches at the debris line.

Appendix D: List of Vegetation Types Present in the California State Parks in the Central California Foothills and Coastal Mountains Ecoregion

Macrogroup Mapping Unit	Group Mapping Unit	Alliance Mapping Unit	Association Mapping Unit	Count	Avg Acres	Sum Acres
Vancouverian Coastal Rainforest Macrogroup	Californian Coastal Redwood Forest Group	Sequoia sempervirens Alliance		126	15.6	1963.5
			Sequoia sempervirens – Pseudotsuga menziesii – Notholithocarpus densiflorus Association	6	29.22	175.3
			Sequoia sempervirens – Umbellularia californica Association	12	15.6	187
			Sequoia sempervirens Association	4	56.9	227.5
Southern Vancouverian Montane-Foothill Forest Macrogroup	Californian Montane Conifer Forest & Woodland Group	Pinus ponderosa Alliance		2	1.02	2.04
Southern Vancouverian Dry Foothill Forest & Woodland Macrogroup	Californian Moist Coastal Mixed Evergreen Forest Group	Pseudotsuga menziesii – (Notholithocarpus densiflorus) - Arbutus menziesii Alliance		9	4	36

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
Californian Forest & Woodland Macrogroup	Californian Conifer Forest & Woodland Group	Pinus sabiniana Alliance		146	5.25	766.13
			Pinus sabiniana / Ceanothus cuneatus – (Rhamnus ilicifolia) Association	5	5.2	26.02
		Pinus muricata – Pinus radiata Alliance		86	12.56	1080.1
			Pinus radiata – Quercus agrifolia / Toxicodendron diversilobum Association	2	145.42	290.84
Great Basin- Intermountain Dry Shrubland & Grassland	Mojave Mid-Elevation Mixed Desert Scrub Group	Juniperus californica Alliance		55	4.51	247.86
Californian Ruderal Forest Macrogroup	Californian Ruderal Forest Group	Hesperocyparis macrocarpa – Pinus radiata Semi-Natural Alliance		86	3.54	299.5
Southern Vancouverian Dry Foothill Forest & Woodland Macrogroup	Californian Moist Coastal Mixed Evergreen Forest Group	Notholithocarpus densiflorus Alliance		73	4.86	354.7
Californian Forest & Woodland Macrogroup	Californian Broadleaf Forest & Woodland Group	Aesculus californica Alliance		273	3.55	969.9
		Umbellularia californica Alliance		180	5.8	1051.9

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Umbellularia californica – Quercus agrifolia / Toxicodendron diversilobum Association	21	14.66	307.94
			Umbellularia californica / Toxicodendron diversilobum Association	5	3.05	15.25
			Umbellularia californica Association	14	9.36	131.04
		Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni) Alliance		43	13.18	567.04
		Quercus agrifolia Alliance		744	10.83	7991.83
			Quercus agrifolia – Aesculus californica Association	2	4.2	8.39
			Quercus agrifolia / Adenostoma fasciculatum – (Salvia mellifera) Association	3	4.49	13.46
			Quercus agrifolia / Arctostaphylos (crustacea) Association	21	7.88	165.45
			Quercus agrifolia / Artemisia californica Association	2	2.61	5.23
		Quercus chrysolepis (tree) Alliance		31	12.45	358.9

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Quercus chrysolepis – Umbellularia californica Association	6	14.47	86.85
		Quercus douglasii Alliance		1420	10.77	15290.5
			Quercus douglasii – Aesculus californica / grass Association	1	N/A	10.47
			Quercus douglasii – Pinus sabiniana / grass Association	286	10.36	2963.58
			Quercus douglasii – Quercus agrifolia Association	100	17.06	1705.46
		Quercus kelloggii Alliance		1	N/A	13.96
		Quercus lobata Alliance		46	6.36	292.5
			Quercus lobata – Quercus agrifolia / grass Association	2	5.76	11.52
			Quercus lobata – Quercus douglasii Association	15	6.49	97.32
Interior Warm & Cool Desert Riparian Forest Macrogroup	Western Interior Riparian Forest & Woodland Group	Salix gooddingii – Salix laevigata Alliance		1	N/A	1.48
		Populus fremontii – Fraxinus velutina – Salix gooddingii Alliance		3	2.17	6.52
		Platanus racemosa – Quercus agrifolia Alliance		49	3.86	188.91

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
	Californian Mixed Annual/Perennial Freshwater Vernal Pool/Swale Bottomland Group	Populus trichocarpa Alliance		27	7.58	163.54
		Alnus rhombifolia Alliance		9	6.68	60.09
		Acer macrophyllum – Alnus rubra Alliance		20	8.64	172.78
Californian Ruderal Forest Macrogroup	Californian Ruderal Forest Group	Eucalyptus spp. - Ailanthus altissima - Robinia pseudoacacia Semi-Natural Alliance		6	2.62	15.73
			Eucalyptus (globulus, camaldulensis) Semi-Natural Association	54	7.7	384.84
Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup	Vancouverian Wet Shrubland Group	Cornus sericea Alliance		4	1.02	4.07
		Frangula californica – Rhododendron occidentale – Salix breweri Alliance		295	5.31	1562.85

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Frangula californica ssp. californica Provisional Association	1	N/A	1.75
	Vancouverian Wet Shrubland Group	Rubus spectabilis - Morella californica Alliance		20	1.59	31.82
Southwestern North American Warm Desert Freshwater Marsh & Bosque Macrogroup	Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland Group	Salix lasiolepis Alliance		221	6.03	1281.1
		Baccharis salicifolia Alliance		1	N/A	1.17
Cool Interior Chaparral Macrogroup	Western North American Montane Scrub Group	Ribes quercetorum – Rhus trilobata – Frangula californica Alliance		4	2.21	8.83
	Intermountain Semi-Desert Steppe & Shrubland Group	Ericameria nauseosa Alliance		1	N/A	1.08
Californian Coastal Scrub Macrogroup	Californian Coastal-Foothill Seral Scrub Group	Diplacus aurantiacus Alliance		3	2.28	6.84
		Baccharis pilularis Alliance		941	5.08	4729.69
			Baccharis pilularis Association	2	2.42	4.84
			Baccharis pilularis – Artemisia californica Association	24	5.1	122.4

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Baccharis pilularis – Ceanothus thyrsiflorus Association	2	5.24	10.49
			Baccharis pilularis – Toxicodendron diversilobum Association	6	3.05	18.3
			Baccharis pilularis / Eriophyllum staechadifolium Association	1	N/A	6.45
			Frangula californica ssp. californica – Baccharis pilularis / Scrophularia californica Association	56	6.13	343
		Ceanothus thyrsiflorus Alliance		179	3.5	626.58
		Gaultheria shallon - Rubus (ursinus) Alliance		3	0.65	8.51
			Rubus ursinus Association	2	0.65	1.3
		Toxicodendron diversilobum Alliance		74	2.64	193.07
			Toxicodendron diversilobum – (Baccharis pilularis) Association	9	3.48	31.35
	Central & Southern Californian Coastal Sage Scrub Group	Artemisia californica – (Salvia leucophylla) Alliance		438	4.43	1938.96
		Salvia mellifera – (Artemisia californica) Alliance		271	6.33	1714.62

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
	Coastal Baja California Norte Maritime Succulent Scrub Group	Coreopsis gigantea Alliance		2	3.18	6.36
Californian Coastal Scrub Macrogroup	Californian Ruderal Grassland, Meadow & Scrub Group			2	0.94	1.87
		Acacia spp. - Grevillea spp. - Leptospermum laevigatum Provisional Semi-Natural Alliance		12	3.69	44.26
			Acacia (cyclops, dealbata) Association	12	3.69	44.26
Californian Chaparral Macrogroup	Californian Maritime Chaparral Group	Arctostaphylos (crustacea, tomentosa) Alliance		156	9.21	1436.75
			Arctostaphylos crustacea – Adenostoma fasciculatum – Ceanothus (cuneatus, papillosus) Association	37	11.49	425.15
Californian Chaparral Macrogroup	Californian Maritime Chaparral Group	Arctostaphylos morroensis Shrubland Alliance		16	13.02	208.26
	Californian Mesic & Pre-Montane Chaparral Group	Cercocarpus montanus Alliance		21	2.64	55.53
		Quercus berberidifolia Alliance		131	3.5	458.54

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Quercus berberidifolia – Adenostoma fasciculatum Association	24	2.83	67.98
			Quercus berberidifolia – Ceanothus cuneatus Association	1	N/A	14.45
		Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance		230	5	1126
		Arctostaphylos glandulosa Alliance		196	7.78	1446.14
			Arctostaphylos glandulosa – Adenostoma fasciculatum Association	61	9.37	571.79
			Arctostaphylos glandulosa – Adenostoma fasciculatum – Quercus berberidifolia Association	23	12.61	289.91
	Californian Xeric Chaparral Group			10	8.26	82.58
		Arctostaphylos (canescens, manzanita, stanfordiana) Alliance		5	19.54	97.72
		Arctostaphylos glauca Alliance		83	6.58	545.86
			Arctostaphylos glauca – Adenostoma fasciculatum Association	26	6.46	167.82

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
		Ceanothus cuneatus Alliance		171	8.87	1516.9
			Ceanothus cuneatus – Adenostoma fasciculatum Association	168	8.96	1505.83
		Adenostoma fasciculatum Alliance		1378	7	9641
			Adenostoma fasciculatum – (Ceanothus cuneatus) Association	188	8.99	1690.86
		Adenostoma fasciculatum – Salvia spp. Alliance		61	29.34	1789.86
Western North American Freshwater Aquatic Vegetation Macrogroup				1	N/A	0.1
North American Pacific Coastal Salt Marsh Macrogroup	Temperate Pacific Salt Marsh Group	Bolboschoenus maritimus Alliance		1	N/A	0.47
		Distichlis spicata – Frankenia salina Coastal Alliance		35	1.91	66.76
			Grindelia stricta Provisional Association	1	N/A	1.54
		Sarcocornia pacifica (Salicornia depressa) Alliance	None	33	22.54	722.38

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Sarcocornia pacifica – Jaumea carnosa – Distichlis spicata Association	1	N/A	2.97
Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup	Western North American Ruderal Marsh, Wet Meadow & Shrubland Group			5	4.67	23.37
Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup	Temperate Pacific Freshwater Wet Mudflat Group	Heterotheca (oregona, sessiliflora) Alliance		11	3.69	40.59
		Cynodon dactylon – Crypsis spp. – Paspalum spp. Semi-Natural Alliance		1	N/A	0.97
Arid West Interior Freshwater Marsh Macrogroup	Arid West Interior Freshwater Marsh Group			6	4.86	29.16
		Carex obnupta - Oenanthe sarmentosa - Scripus microcarpus Alliance		4	1.4	5.67
			Juncus lescurii Association	4	1.4	5.67
		Schoenoplectus (acutus, californicus) Alliance		18	2.05	45.25

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
		Schoenoplectus americanus Alliance		3	1.92	5.76
			Schoenoplectus pungens – Argentina edegii Provisional Association	1	N/A	0.17
		Typha (angustifolia, domingensis, latifolia) Alliance		3	0.82	2.46
Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup	Vancouverian Freshwater Wet Meadow & Marsh Group			36	4	144.05
Western North American Ruderal Grassland & Shrubland Macrogroup	Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group	Conium maculatum – Foeniculum vulgare Semi-Natural Alliance		6	1.16	6.96
		Cortaderia (jubata, selloana) Semi-Natural Alliance		21	2.9	60.81
Southern Vancouverian Lowland Grassland & Shrubland Macrogroup	Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie Group	Festuca idahoensis – Danthonia californica Alliance		1	N/A	1.35
			Festuca idahoensis – (Danthonia californica – Koeleria macrantha) Association	1	N/A	1.38

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
Pacific Coastal Beach & Dune Macrogroup	North Pacific Maritime Dune & Coastal Beach Group	Leymus mollis Alliance		6	3.18	19.07
Pacific Coastal Beach & Dune Macrogroup				1	N/A	2.09
	Californian Coastal Beach & Dune Group	Abronia latifolia - Ambrosia chamissonis Alliance		93	4.27	650.75
		Abronia latifolia - Ambrosia chamissonis Alliance	Abronia latifolia – Calystegia soldanella – Lathyrus littoralis Association	7	4.46	31.24
		Eriophyllum staechadifolium – Erigeron glaucus – Eriogonum latifolium Alliance		161	2.87	461.87
			Armeria maritima – Plantago (maritima) Provisional Association	3	2.7	8.09
			Artemisia pycnocephala Association	51	2.7	137.54
			Eriogonum parvifolium Association	18	2.58	46.49
		Lupinus arboreus Alliance		14	6.4	89.56
		Lupinus chamissonis – Ericameria ericoides Alliance		287	10.81	2991.54

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
			Ericameria ericoides Association	26	9.9	257.3
			Lupinus chamissonis – Ericameria ericoides Association	36	21.85	786.42
			Lupinus chamissonis Association	52	7.74	400.09
North Pacific Coastal Ruderal Grassland & Shrubland Macrogroup	North Pacific Maritime Coastal Ruderal Dune Group	Ammophila arenaria Semi-Natural Alliance		12	1.09	66
		Mesembryanthemum spp. – Carpobrotus spp. Semi-Natural Alliance		131	3.78	499.48
		Cakile (edentula, maritima) Provisional Semi-Natural Alliance		25	1.09	38.39
Western North American Cliff, Scree, & Rock Vegetation Macrogroup	None			116	1.4	162.7
	Californian Cliff, Scree & Rock Vegetation Group	Dudleya cymosa – Dudleya lanceolata / Lichen – Moss Alliance		4	0.96	3.82
Californian Annual & Perennial Grassland Macrogroup	None			1201	12.44	14843.9

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
	Californian Perennial Grassland Group	Corethrogyne filaginifolia – Eriogonum (elongatum, nudum) Alliance		5	2.78	10.65
		Nassella spp. – Melica spp.		1	N/A	1.69
	Californian Annual Grassland & Forb Meadow Group			3	4.46	13.37
		Eschscholzia (californica) – Lupinus (nanus) Alliance		1	N/A	1.14
	Californian Ruderal Grassland, Meadow & Scrub Group			2	2.11	4.21
		Avena spp. – Bromus spp. Semi-Natural Alliance		1	N/A	1.61
		Brassica nigra – Centaurea (solstitialis, melitensis) Semi-Natural Alliance		9	2.78	25.06
	Non-Vegetation and Other Mapping Units	Agriculture Mapping Unit		4	30.81	123.1
		Bare Sand Mapping Unit		169	22.78	3131.36
		Built-up and Urban Disturbance Mapping Unit		91	4.89	403.68

<u>Macrogroup Mapping Unit</u>	<u>Group Mapping Unit</u>	<u>Alliance Mapping Unit</u>	<u>Association Mapping Unit</u>	<u>Count</u>	<u>Avg Acres</u>	<u>Sum Acres</u>
		Perennial Stream Channel Mapping Unit		23	5.23	120.32
		Small Earthen-dammed Ponds and Naturally Occurring Lakes Mapping Unit		25	1.41	35.25
		Water (used to map streams and lakes in Pismo SB and Oceano Dunes SVRA only)		11	7.14	78.55
		Western North American Sparsely Vegetated Rivershore Mapping Unit		11	4.56	50.19

Appendix E: Map attribute descriptions

General attribute descriptions

Mapping Unit: Macrogroup, group, or alliance level

MU Finest Level: Association level

HtClass: Height in meters (categories defined below)

CWHR: Tree dbh in inches (categories defined below)

ConiferCover: Percent of Birdseye Total Cover by conifers

HdwdCover: Percent of Birdseye Total Cover by hardwoods (and not covered by overstory conifer trees)

TreeCover: Percent of Birdseye Total Cover by trees (canopy closure – sum of conifers and hardwoods % cover)

ShrubCover: Percent of Birdseye Total Cover by shrubs (and not covered by trees)

HerbCover: Percent of Birdseye Total Cover by herbaceous (and not covered by trees or shrubs)

Clearing: Presence of obvious disturbance related to human activities like mowing, scraping, disking, and ground clearing (categories defined below)

Roadedness: Ratio of stand affected by roadedness

ExoticCover: Percent invasive species cover (categories described below)

MethodID: Method of identification (categories described below)

EditorInitials: Editor's initials

Notes: Any notes about the stand

Method ID

Rapid Assessment or Relevé, current: there is a 2021 or 2022 survey point for a RA or Relevé

Photo Interpretation: photo-interpreters make a determination based on signature when no survey data is present

Adjacent Rapid Assessment or Relevé: there is a Rapid Assessment or relevé nearby with photos or adjacent stand information on the datasheet

Pre-map Reconnaissance form: 2021 or 2022 Reconnaissance information is present

Pre-map Reconnaissance formless: 2021 or 2022 Reconnaissance information is present or when informal field markers taken by GIC were utilized to assist in the mapping process

Post-linework observation form: Observation after linework was created, with a form

Post-linework observation formless: Observation after linework was created, without a form

Other Information, older surveys: when past survey information is present

Accuracy Assessment: an Accuracy Assessment was completed in that polygon

Height Class Codes

1 = <1/2m

2 = 1/2-1m

3 = 1-2m

4 = 2-5m

5 = 5-10m

6 = 10-15m

7 = 15-20m

8 = 20-35m

9 = 35-50m

10 = >50m

Stand-level dbh Size Class Codes (CWHR)

1 = Seedlings (< 1")

2 = Saplings (1-6")

3 = Pole (6-11")

4 = Small (11-24")

5 = Medium - Large (> 24")

6 = Multi Layered Medium to Large Trees over smaller trees in Densities >60%

Clearing Disturbance Codes

1. High Disturbance: Over 66% of the polygon is affected with roads, trails, disked activity or scrapes on the landscape.
2. Moderate Disturbance: Between 33% and 66% of the polygon is affected with roads, trails, disked activity or scrapes on the landscape.
3. Minimal Disturbance: At least 5% and less than 33% of the polygon is affected with roads, trails, disked activity or scrapes on the landscape. Polygons adjacent to major disturbances are also placed into this category.

Invasive Species Content (ExoticCover)

1. High Invasive Plant Content: Over 66% of the polygon is affected with invasive plants; percent cover is relative to the native vegetation and natural bare ground (rock cover).
2. Moderate Invasive Plant Content: Between 33% and 66% of the polygon is affected with invasive plants.
3. Low Invasive Plant Content: At least 5% and less than 33% of the polygon is affected with invasive plants.
4. No Observable Invasive Plant Component: Less than 5% of the polygon is affected with invasive plants.

Appendix F: Vegetation Key

KEY TO NATURAL AND SEMI-NATURAL VEGETATION OF SANTA CLARA AND SANTA CRUZ COUNTIES

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

Class B. Vegetation dominated, co-dominated, or characterized by woody shrubs in the canopy. Shrubs usually have at least 10% cover. Tree species, if present, generally total less than 10% absolute cover. Herbaceous species may have higher cover than shrubs = **Shrubland Vegetation**

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

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

Section I: Woodlands and forests dominated or characterized by needle or scale-leaved conifer trees. Includes *Hesperocyparis*, *Pinus*, *Pseudotsuga*, and *Sequoia*.

1. Temperate rainforest dominated or co-dominated by *Sequoia sempervirens*. Found either at the bottoms with cold air drainage or along ridgetops with fog influence in the Santa Cruz Mountains.

Vancouverian Coastal Rainforest Macrogroup

Californian Coastal Redwood Forest Group

1a. *Sequoia sempervirens* dominates, co-dominates, or characterizes (rarely with as little as 5% cover) stands near streams on terraces, along all slopes and aspects, or on ridges. Associated trees include *Acer macrophyllum*, *Arbutus menziesii*, *Notholithocarpus densiflorus*, *Pseudotsuga menziesii*, *Torreya californica*, and *Umbellularia californica*, which are typically sub- to co-dominant but may occasionally exceed *Sequoia* in cover. *Vaccinium ovatum*, *Oxalis oregana*, *Polystichum munitum*, *Toxicodendron diversilobum*, *Woodwardia fimbriata*, and other shrubs and herbs may intermix in the understory.

***Sequoia sempervirens* Alliance**

Sequoia sempervirens Association

Sequoia sempervirens – *Acer macrophyllum* – *Umbellularia californica* Association

Sequoia sempervirens – *Arbutus menziesii* / *Vaccinium ovatum* Association

Sequoia sempervirens – *Notholithocarpus densiflorus* / *Vaccinium ovatum* Association
Sequoia sempervirens – *Pseudotsuga menziesii* – *Notholithocarpus densiflorus* Association
Sequoia sempervirens – *Pseudotsuga menziesii* – *Umbellularia californica* Association
Sequoia sempervirens – *Umbellularia californica* Association
Sequoia sempervirens / *Oxalis oregana* Association
Sequoia sempervirens / (*Pteridium aquilinum*) – *Woodwardia fimbriata* Riparian Association
Sequoia sempervirens / *Polystichum munitum* Association

2. *Pinus ponderosa* or *Pseudotsuga menziesii*, dominate stands or co-dominate in combination with hardwoods in the tree overstory in cool-temperate coniferous forests and woodlands influenced by warm, relatively dry summers and cool rainy winters.

2a. *Pinus ponderosa* is dominant or co-dominant in the overstory, usually at greater than 15% absolute cover, with other trees such as *Arbutus menziesii*, *Quercus agrifolia*, and/or *Quercus chrysolepis*, along with an open to dense understory of shrubs.

Southern Vancouverian Montane-Foothill Forest Macrogroup

Californian Montane Conifer Forest & Woodland Group

***Pinus ponderosa* Alliance**

Pinus ponderosa – (*Quercus agrifolia* – *Arbutus menziesii*) Provisional Association

2b. *Pinus ponderosa* is dominant, though tree cover is usually less than 20% absolute cover, with an understory of shrubs, subshrubs, and herbs characteristic of sand parkland. It occurs in sandhill habitats of Santa Cruz County.

Pinus ponderosa / *Chorizanthe pungens* Association

2c. *Pseudotsuga menziesii* is dominant or co-dominant with *Arbutus menziesii*, *Notholithocarpus densiflorus*, *Quercus agrifolia*, *Q. chrysolepis*, or *Umbellularia californica*. If *P. menziesii* co-dominates with *Quercus kelloggii* key to that alliance (*Q. kelloggii* Alliance (step 5c4) below).

Southern Vancouverian Dry Foothill Forest & Woodland Macrogroup

Californian Moist Coastal Mixed Evergreen Forest Group

***Pseudotsuga menziesii* – (*Notholithocarpus densiflorus* – *Arbutus menziesii*) Alliance**

Pseudotsuga menziesii / (*Toxicodendron diversilobum*) Association

Pseudotsuga menziesii – *Arbutus menziesii* Association

Pseudotsuga menziesii – *Chrysolepis chrysophylla* – *Notholithocarpus densiflorus* Association

Pseudotsuga menziesii – *Notholithocarpus densiflorus* – *Umbellularia californica* / *Toxicodendron diversilobum* Association

Pseudotsuga menziesii – *Notholithocarpus densiflorus* / *Vaccinium ovatum* Association*
Pseudotsuga menziesii – *Quercus agrifolia* Association
Pseudotsuga menziesii – *Quercus chrysolepis* Association
Pseudotsuga menziesii – *Quercus kelloggii* Association
Pseudotsuga menziesii – *Umbellularia californica* / (*Toxicodendron diversilobum*) Association
Pseudotsuga menziesii – (*Umbellularia californica*) / *Frangula californica* Association*
Pseudotsuga menziesii – *Umbellularia californica* / *Polystichum munitum* Association*
Pseudotsuga menziesii / *Baccharis pilularis* Association*
Pseudotsuga menziesii / *Corylus cornuta* / *Polystichum munitum* Association*

3. Other closed-cone or xerophyllic conifers, including *Hesperocyparis* spp., *Juniperus californica*, *Pinus attenuata*, *Pinus coulteri*, *Pinus muricata*, *Pinus radiata*, or *Pinus sabiniana* is dominant or co-dominant in the overstory.

Californian Forest & Woodland Macrogroup

Californian Conifer Forest & Woodland Group

3a. *Hesperocyparis abramsiana* dominates on slopes of low-nutrient sandstone or granitic substrates. Chaparral shrubs can be similar or higher in cover than the tree cover, including *Adenostoma fasciculatum*, *Arctostaphylos crustacea*, and *A. sensitiva*, and regenerating *Quercus parvula* var. *shrevei* or hybrids with *Quercus wislizeni* are commonly found in stands.

Hesperocyparis (pigmaea, abramsiana, macrocarpa, goveniana)
Alliance
Hesperocyparis abramsiana / *Arctostaphylos* spp. – *Adenostoma fasciculatum* Provisional Association

3b. *Pinus attenuata* dominates or co-dominates with *Quercus chrysolepis* in the tree overstory; shrubs are typically present with an intermittent to dense cover various shrubs such as *Arctostaphylos crustacea*, *A. sensitiva*, *A. canescens*, *A. manzanita* and *Vaccinium ovatum* in the understory. Sites are usually nutrient-poor rocky slopes including shale, siltstone, and serpentine.

***Pinus attenuata* Alliance**
Pinus attenuata / *Arctostaphylos (crustacea)* Provisional Association
Pinus attenuata / *Arctostaphylos (manzanita, canescens)* Provisional Association

3c. *Pinus coulteri* dominates or co-dominates in the tree overstory. This alliance occurs in Santa Clara County but is not common. Survey data is limited to one reconnaissance of a post-fire stand in the Diablo Range.

***Pinus coulteri* Alliance**
Pinus coulteri – *Quercus wislizeni* Association*

3d. *Pinus sabiniana* dominates in the tree overstory; shrubs are typically present in the understory and may exceed pine in cover. Sites often transition to chaparral and often nutrient-poor serpentine or meta-sedimentary.

***Pinus sabiniana* Alliance**

Pinus sabiniana / *Artemisia californica* – *Ceanothus ferrisiae* – *Heteromeles arbutifolia* Association

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

Pinus sabiniana / herbaceous Association

Pinus sabiniana / *Quercus durata* Association

3e. *Pinus radiata* is dominant or co-dominant in naturally occurring stands with other conifers, or rarely subdominant with hardwoods in the tree overstory and/or regenerating tree layer. The understory may include moderate to dense cover of shrubs such as *Arctostaphylos* spp., *Baccharis pilularis*, *Gaultheria shallon*, *Toxicodendron diversilobum* and *Vaccinium ovatum*. Most stands of Monterey Pine in Santa Cruz County are planted or naturalized except for a limited area of native stands between Ano Nuevo and Davenport.

***Pinus muricata* – *Pinus radiata* Alliance**

Pinus radiata – *Quercus agrifolia* / *Toxicodendron diversilobum* Association

Pinus radiata / *Toxicodendron diversilobum* Association

3f. *Juniperus californica* is dominant in stands. While no surveys were collected, the alliance may potentially occur in northeast Santa Clara Co. with *Pinus sabiniana* and *Quercus douglasii*.

Great Basin-Intermountain Dry Shrubland & Grassland Macrogroup

Mojave Mid-Elevation Mixed Desert Scrub Group

Juniperus californica* Alliance

3g. Stands dominated or co-dominated by planted or naturalized conifer species including *Hesperocyparis macrocarpa*, *Pinus pinea*, and/or *Pinus radiata*.

Californian Ruderal Forest Macrogroup

Californian Ruderal Forest Group

Hesperocyparis macrocarpa* – *Pinus radiata* Semi-Natural Alliance

3g1. *Pinus radiata* dominates the conifer canopy. Planted stands of *Pinus radiata* are found along roadsides or on slopes where they were introduced. Note that native populations of *Pinus radiata* occur in Santa Cruz Co. in a limited area between Ano Nuevo and Davenport; these would key to the *Pinus muricata* – *Pinus radiata* Alliance above.

Pinus radiata plantations Semi-Natural Association*

3g2. Planted *Hesperocyparis macrocarpa* dominates in patches or along roads. In this region of California, stands are considered semi-natural since they are not naturally occurring.

Hesperocyparis macrocarpa Ruderal Semi-Natural Association*

Section II. Woodlands, forests, and riparian vegetation characterized and/or dominated mainly by native and non-native broad-leaved evergreen and

deciduous trees. Includes species of *Aesculus*, *Acer*, *Alnus*, *Arbutus*, *Fraxinus*, *Juglans*, *Notholithocarpus*, *Populus*, *Quercus*, *Salix*, and *Umbellularia*.

4. Vegetation dominated, co-dominated, or characterized by one or more of the following broadleaf trees: *Arbutus menziesii*, *Chrysolepis chrysophylla*, or *Notholithocarpus densiflorus*.

4a. Broadleaf trees such as *Arbutus menziesii* or *Notholithocarpus densiflorus* dominate, co-dominate, or characterize moist, coastal, mixed evergreen forests and woodlands.

4a1. *Arbutus menziesii* is either dominant with sub-dominant *Quercus agrifolia* or is dominant to co-dominant with *Quercus kelloggii* and/or *Umbellularia californica*. *Pseudotsuga menziesii*, *Heteromeles arbutifolia*, and *Toxicodendron diversilobum* are often present. If *Arbutus* is sub- to co-dominant with *Quercus agrifolia*, *Q. chrysolepis*, or *Notholithocarpus densiflorus*, key to the one of these alliances instead of *A. menziesii*.

Southern Vancouverian Dry Foothill Forest & Woodland Macrogroup

Californian Moist Coastal Mixed Evergreen Forest Group

***Arbutus menziesii* Alliance**

Arbutus menziesii – (*Quercus agrifolia*) Association

Arbutus menziesii – *Umbellularia californica* Association

4a2. *Notholithocarpus densiflorus* is strongly dominant in the tree canopy or co-occurs with sub-dominant to co-dominant *Arbutus menziesii* or *Umbellularia californica*.

***Notholithocarpus densiflorus* Alliance**

Notholithocarpus densiflorus Association

Notholithocarpus densiflorus – *Arbutus menziesii* Association

Notholithocarpus densiflorus – *Quercus chrysolepis* Association

Notholithocarpus densiflorus / *Vaccinium ovatum* Association*

4b. *Chrysolepis chrysophylla* is dominant to co-dominant in dense, clonal stands occurring on upper slopes and ridges, often transitional between forest and chaparral. *Vaccinium ovatum* is often present and can be co-dominant in the shrub layer.

Californian Chaparral Macrogroup

Californian Maritime Chaparral Group

***Arctostaphylos (nummularia, sensitiva)* – *Chrysolepis chrysophylla* Alliance**

Chrysolepis chrysophylla / *Vaccinium ovatum* Association

5. Vegetation dominated or co-dominated by the following broadleaf, primarily upland tree species: *Aesculus californica*, *Quercus agrifolia*, *Q. chrysolepis*, *Q. douglasii*, *Q. kelloggii*, *Q. lobata*, *Q. parvula*, *Q. wislizeni*, and/or *Umbellularia californica*.

Californian Forest & Woodland Macrogroup

Californian Broadleaf Forest & Woodland Group

5a. *Aesculus californica* dominates in open to moderately dense woodlands. If *Umbellularia californica* is present, it is sub-dominant. A variety of herbs may be found in the understory.

***Aesculus californica* Alliance**

Aesculus californica Association

Aesculus californica – *Umbellularia californica* Association

Aesculus californica / *Toxicodendron diversilobum* / Moss Association

5b. *Umbellularia californica* is either dominant or co-dominant with *Quercus agrifolia* in open to dense woodlands. If *Quercus agrifolia* is co-dominant and the shrub layer is significant with toyon, scrub oak, or manzanita, key to the *Quercus agrifolia* Alliance. Found in a variety of upland settings, such as coastal bluffs, inland ridges, steep north-facing slopes, rocky outcrops and post-fire landscapes. If *U. californica* is found in a riparian setting, key to *Acer macrophyllum* – *Alnus rubra* Alliance. If *U. californica* is co-dominant with *Arbutus*, *Acer*, or *Pinus sabiniana* on serpentine, or *Pseudotsuga menziesii*, *Quercus chrysolepis*, *Q. lobata*, *Q. kelloggii*, or *Sequoia*, key to one of these other hardwood or conifer alliances instead.

***Umbellularia californica* Alliance**

Umbellularia californica Association

Umbellularia californica – *Quercus agrifolia* / *Toxicodendron diversilobum* Association

Umbellularia californica – *Quercus wislizeni* Association

Umbellularia californica / *Polystichum munitum* Association

Umbellularia californica / *Toxicodendron diversilobum* Association

5c. One or more species of *Quercus* listed above (step 5) dominates or co-dominates in the tree overstory.

5c1. Multiple *Quercus* tree species intermix (at least three species) and it is difficult to assign to an alliance defined by one oak species. Co-dominating oaks may include *Quercus agrifolia*, *Quercus chrysolepis*, *Quercus douglasii*, *Quercus kelloggii*, *Quercus lobata*, *Quercus parvula*, and/or *Q. wislizeni*. If one or two oak species dominate read steps to key to individual oak alliances below.

***Quercus (agrifolia, douglasii, garryana, kelloggii, lobata, wislizeni)* Alliance**

Mixed oak – *Quercus agrifolia* / *Toxicodendron diversilobum*

Mixed oak – *Quercus kelloggii* / grass

Quercus douglasii – *Quercus lobata* – *Quercus agrifolia* / *Toxicodendron diversilobum* Association

5c2. *Quercus chrysolepis* is dominant or co-dominant with *Arbutus menziesii* or *Umbellularia californica* in the tree overstory. *Quercus wislizeni* is occasionally found as a sub-dominant tree.

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

Quercus chrysolepis Association*

Quercus chrysolepis – *Arbutus menziesii* – *Notholithocarpus densiflorus* var. *densiflorus* Association

Quercus chrysolepis – *Umbellularia californica* Association
Quercus chrysolepis / *Arctostaphylos crustacea* Association
Quercus chrysolepis / *Quercus (wislizeni, parvula)* Association*

5c3. *Quercus douglasii* dominates or co-dominates with *Aesculus californica*, *Pinus sabiniana*, *Quercus agrifolia*, or *Arbutus menziesii* in the tree overstory. The understory herbaceous layer is often moderately dense to dense, with a mixture of native and non-native forbs and grasses.

***Quercus douglasii* Alliance**

Quercus douglasii – *Aesculus californica* / grass Association
Quercus douglasii – *Pinus sabiniana* / *Ceanothus cuneatus* – *Cercocarpus montanus* Association
Quercus douglasii – *Pinus sabiniana* / grass Association
Quercus douglasii – *Quercus agrifolia* Association
Quercus douglasii – *Quercus wislizeni* – *Pinus sabiniana* Association
Quercus douglasii / Mixed herbaceous Association
Quercus douglasii / *Toxicodendron diversilobum* / grass Association

5c4. *Quercus kelloggii* or *Quercus × morehus* dominates or co-dominates with *Pinus ponderosa*, *Pseudotsuga menziesii*, *Q. agrifolia*, *Q. chrysolepis*, and/or *Umbellularia californica* in the tree overstory. *Arbutus menziesii* is often present as a sub-dominant species. Stands are found inland, above maritime influence, often on northerly slopes.

***Quercus kelloggii* Alliance**

Quercus kelloggii – *Arbutus menziesii* – *Quercus agrifolia* Association
Quercus kelloggii – *Pinus ponderosa* Association
Quercus kelloggii – *Pseudotsuga menziesii* – *Acer macrophyllum* Association
Quercus kelloggii – *Quercus chrysolepis* Association
Quercus kelloggii / grass – herb Association
Quercus kelloggii / *Toxicodendron diversilobum* Association

5c5. *Quercus lobata* dominates or co-dominates with *Quercus agrifolia*, *Q. douglasii*, *Q. kelloggii*, and/or *Umbellularia californica* in the tree overstory in an upland habitat. Stands are typically found on slopes and summit valleys with an open grassy understory and *Toxicodendron diversilobum* is a common understory shrub. If the habitat is riparian, go to **step 6**.

***Quercus lobata* Alliance**

Quercus lobata – *Quercus agrifolia* / Grass Association
Quercus lobata – *Quercus douglasii* Association
Quercus lobata / *Baccharis pilularis* – *Diplacus aurantiacus* Association
Quercus lobata / Grass Association

5c6. *Quercus agrifolia*, *Q. parvula*, *Q. wislizeni* or other *Quercus* spp. dominates and/or co-dominates as a shrub, co-occurring with *Umbellularia*, *Adenostoma*, and a variety of other shrubs that prefer more mesic, northerly exposures. *Quercus parvula* and *Q. wislizeni* are not always morphologically distinct.

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

Quercus agrifolia – *Quercus chrysolepis* – *Quercus parvula* (shrub) Provisional Association

Quercus parvula (shrub) Provisional Association*

5c7. The tree form of *Quercus parvula* and/or *Q. wislizeni* dominates or co-dominates in the tree canopy, often with *Arbutus menziesii*, *Pseudotsuga menziesii*, and/or *Umbellularia californica*. If the oaks have a shrubby habit or are regenerating and intermixing with a variety of other shrub species, key to the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance above.

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

Quercus (*parvula*, *wislizeni*) – *Arbutus menziesii* / *Toxicodendron diversilobum* Association

Quercus parvula var. *shrevei* Association

Quercus wislizeni – *Aesculus californica* Association

Quercus wislizeni / *Heteromeles arbutifolia* Association*

5c8. *Quercus agrifolia* dominates or co-dominates with *Arbutus menziesii* in the canopy in an upland setting (see step 6 for riparian settings). If *Q. douglasii* (or hybrid *Q. ×eplingii*), *Q. lobata*, or *Q. wislizeni* is co-dominant to dominant, key to one of these other alliances instead of *Q. agrifolia*. If codominant with *Umbellularia californica*, key here if shrub understory is significant and includes toyon, scrub oak, or manzanita. The understory herbaceous layer often contains a mixture of native and non-native herbs and/or shrubs. If the habitat is riparian, go to **step 6**.

***Quercus agrifolia* Alliance**

Quercus agrifolia Association

Quercus agrifolia – *Aesculus californica* Association

Quercus agrifolia – *Arbutus menziesii* – *Umbellularia californica* Association

Quercus agrifolia – *Arbutus menziesii* / *Corylus cornuta* – *Rubus* spp. Association

Quercus agrifolia – *Quercus kelloggii* Association

Quercus agrifolia – *Umbellularia californica* / *Heteromeles arbutifolia* – *Quercus berberidifolia* Association

Quercus agrifolia / *Adenostoma fasciculatum* – (*Salvia mellifera*) Association*

Quercus agrifolia / *Arctostaphylos* (crustacea) Association

Quercus agrifolia / *Artemisia californica* Association

Quercus agrifolia / *Frangula californica* – *Heteromeles arbutifolia* Association

Quercus agrifolia / grass Association

Quercus agrifolia / *Toxicodendron diversilobum* Association

6. *Acer negundo*, *Juglans hindsii*, *Platanus racemosa*, *Populus fremontii*, *Quercus agrifolia*, *Quercus lobata*, or *Salix laevigata* is dominant, co-dominant or characteristic in permanently moist or riparian settings, where sub-surface water is available all year. Nearby upland vegetation is often dominated by broadleaf evergreen or deciduous trees, as opposed to conifers.

Interior Warm & Cool Desert Riparian Forest Macrogroup

Western Interior Riparian Forest & Woodland Group

6a. *Acer negundo* dominates in the tree overstory, often along major streams and rivers, with other riparian plants such as *Fraxinus*, *Populus*, *Rubus*, and *Salix*. Stands are considered rare in the state and may be small and monospecific.

***Acer negundo* Alliance**

Acer negundo / (*Rubus ursinus*) Association

6b. *Salix laevigata* dominates along streams, rivers, ditches, floodplains, and lake edges. If *Populus fremontii* is emergent with >5% absolute cover, key to the *Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance. Associated trees and shrubs include *Alnus rhombifolia*, *Quercus agrifolia*, *Rubus*, *Salix*, and others. Note that *Salix gooddingii* does not occur in the Santa Cruz Mountains.

***Salix gooddingii* – *Salix laevigata* Alliance**

Salix laevigata Association

Salix laevigata – (*Cornus sericea* – *Ribes* spp.) / *Scirpus microcarpus* – *Carex* spp. Association

Salix laevigata / *Salix lasiolepis* Association

6c. *Juglans hindsii* or hybrids dominate in stands along riparian corridors, floodplains, and terraces. Other riparian species may be present, including *Acer*, *Fraxinus*, *Platanus*, *Rubus* and *Sambucus*. Understory is variable and often includes *Sambucus nigra* or *Rubus* spp.

***Juglans hindsii* and Hybrids Alliance**

Juglans hindsii / *Sambucus nigra* Provisional Association

6c. *Populus fremontii* dominates or co-dominates with *Acer negundo*, *Juglans*, and/or *Salix*, sometimes with *Populus* having as little as 5% absolute cover. If *Juglans hindsii* is co-dominant, but *Populus* has at least 20% relative cover in the tree layer, key to this alliance.

***Populus fremontii* – *Fraxinus velutina* – *Salix gooddingii* Alliance**

Populus fremontii / *Rubus ursinus* Association

Populus fremontii – *Salix laevigata* / *Salix lasiolepis* – *Baccharis salicifolia* Association

6d. *Quercus agrifolia* dominates in a riparian setting, or *Platanus racemosa* is dominant, co-dominant, or characteristically present at >15% relative cover in the tree canopy of riparian habitats with *Acer macrophyllum*, *Acer negundo*, *Aesculus californica*, *Juglans hindsii*, *Quercus agrifolia*, *Quercus lobata*, *Salix laevigata*, or *Umbellularia californica*. If *Alnus rhombifolia* is codominant, key to *Alnus rhombifolia* Alliance. If *Populus fremontii* or *Populus trichocarpa* is present, key to the alliance of the species with the most cover.

***Platanus racemosa* – *Quercus agrifolia* Alliance**

Platanus racemosa – *Quercus agrifolia* Association

Platanus racemosa – *Quercus lobata* Association

Platanus racemosa – *Salix laevigata* / *Salix lasiolepis* – *Baccharis salicifolia* Association

Platanus racemosa / annual grass Association
Platanus racemosa / *Baccharis salicifolia* Association
Platanus racemosa / *Toxicodendron diversilobum* Association
Quercus agrifolia / *Salix lasiolepis* Association
Umbellularia californica – *Platanus racemosa* Association

6e. *Quercus lobata* dominates or co-dominates with *Fraxinus latifolia*, *Quercus agrifolia*, *Quercus kelloggii*, *Salix lasiolepis*, and/or *Umbellularia californica* in the tree overstory. Stands are typically found along valley bottoms and lower slopes on seasonally saturated soils that may flood intermittently. Common understory shrubs include *Rosa californica*, *Rubus* spp., and *Toxicodendron diversilobum*.

***Quercus lobata* Riparian Alliance**

Quercus lobata – *Quercus agrifolia* / *Toxicodendron diversilobum* – (*Symphoricarpos* spp.) Association
Quercus lobata / *Rubus ursinus* – *Rosa californica* Association
Quercus lobata / herbaceous semi-riparian Association

7. *Alnus rhombifolia*, *Alnus rubra*, *Acer macrophyllum*, *Fraxinus latifolia*, *Populus trichocarpa*, and/or *Salix lucida* are dominant, co-dominant, or characteristic of broadleaf riparian tree vegetation. Stands are more likely to occur near cool temperate coniferous forests, unlike vegetation of the Western Interior Riparian Forest & Woodland Group described above. Found along riparian corridors, incised canyons, seeps, stream banks, mid-channel bars, floodplains, and terraces

Vancouverian Flooded & Swamp Forest Macrogroup

North-Central Pacific Lowland Riparian Forest Group

7a. *Populus trichocarpa* dominates or co-dominates with *Alnus rubra* in the tree overstory. Stands for this type will often have other riparian trees present. A variety of shrubs and herbs may be found in the understory, including *Cornus sericea*, *Rubus ursinus*, *Salix lasiolepis*, and *Stachys bullata*.

***Populus trichocarpa* Alliance**

Populus trichocarpa Association
Populus trichocarpa – *Alnus rubra* Provisional Association
Populus trichocarpa – *Quercus agrifolia* Association
Populus trichocarpa – *Salix laevigata* Association
Populus trichocarpa / *Salix lasiolepis* Association
Populus trichocarpa / *Cornus sericea* / *Carex obnupta* Association

7b. *Alnus rhombifolia* dominates or co-dominates with *Acer macrophyllum*, *Platanus racemosa*, or *Umbellularia californica* in the tree overstory. *Umbellularia californica* may be higher in cover, though stands for this type will often have other riparian trees along with *Alnus rhombifolia* to be classed here. If *Fraxinus latifolia* is co-dominant, key to the *Fraxinus latifolia* Alliance below. A variety of shrubs and herbs may be found in the understory, including *Rubus*, *Toxicodendron*, and numerous ferns. Careful identification of alder stands closer to the coast is necessary to differentiate from *A. rubra* stands.

***Alnus rhombifolia* Alliance**

Alnus rhombifolia Association

Alnus rhombifolia – *Acer macrophyllum* Association

Alnus rhombifolia – *Platanus racemosa* Association

Alnus rhombifolia – *Umbellularia californica* – (*Quercus chrysolepis*) Association

Alnus rhombifolia / *Carex (nudata)* Association

7c. *Alnus rubra* dominates in the tree canopy in riparian settings, typically within a few miles of the coast. The understory is often comprised of one to many species of *Rubus*, *Salix lasiolepis*, and *Sambucus racemosa*, which sometimes exceed *Alnus* in cover. If *Salix lucida* is co-dominant, key to that *Salix* alliance. *Alnus rubra* stands were encountered in riparian or swampy bottomlands but can also occur along rocky streambeds in similar settings to *A. rhombifolia* stands. Careful identification of the *Alnus* species is important closer to the coast.

***Acer macrophyllum* – *Alnus rubra* Alliance**

Alnus rubra / *Rubus spectabilis* – *Sambucus racemosa* Association

Alnus rubra / *Salix lasiolepis* – *Rubus* spp. Association

7d. *Acer macrophyllum* dominates or co-dominates with *Umbellularia californica* in riparian stands, OR *Umbellularia californica* is dominant in riparian stands with *Acer macrophyllum* or *Pseudotsuga menziesii* characteristically present. An understory of riparian shrubs such as *Rubus* spp. or *Rhododendron occidentale* are sometimes present.

***Acer macrophyllum* – *Alnus rubra* Alliance**

Acer macrophyllum / (*Rubus ursinus*) Association

Acer macrophyllum – *Pseudotsuga menziesii* / *Polystichum munitum* Association

Umbellularia californica – *Acer macrophyllum* Association

Umbellularia californica / *Rhododendron occidentale* Association*

7e. *Salix lucida* ssp. *lasiandra* dominates in the overstory, sometimes with higher or similar cover by shrubs in the understory, such as *Rubus* spp. and *Salix lasiolepis*. Sometimes *Alnus rubra* may be co-dominant with *S. lucida*, and adjacent stands may be dominated by *Alnus* spp., *Quercus agrifolia* or conifers.

***Salix lucida* ssp. *lasiandra* Alliance**

Salix lucida ssp. *lasiandra* Association

7f. *Fraxinus latifolia* dominates or co-dominates with *Acer negundo*, *Umbellularia californica*, or *Salix laevigata* in the tree overstory.

***Fraxinus latifolia* Alliance**

Fraxinus latifolia Association*

Fraxinus latifolia – *Salix laevigata* Association

8. A non-native tree species dominates in planted or naturalized stands.

Californian Ruderal Forest Macrogroup and Group

8a. A tree species of *Eucalyptus*, *Acacia melanoxylon*, or *Ailanthus altissima* dominates in planted or naturalized stands. Often found in groves, windbreaks, uplands, and along stream courses. Stands were observed but rarely sampled.

For tall shrubby species of *Acacia*, see the Californian Ruderal Grassland, Meadow & Scrub Group in **Section II, 8d**.

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

Eucalyptus (*globulus*, *camaldulensis*) Semi-Natural Association

Ailanthus altissima Semi-Natural Association*

Acacia melanoxylon Provisional Semi-Natural Association*

8b. *Myoporum laetum* or *Schinus molle* dominant in open to dense stands.

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

Schinus molle Semi-Natural Association*

Class B. Shrubland Vegetation

Section I. Riparian or moist hillside settings with vegetation dominated or co-dominated by the following shrubs: *Baccharis salicifolia*, *Frangula californica* (including all subspecies), *Lonicera involucrata*, *Morella californica*, *Prunus virginiana*, *Rhododendron occidentale*, *Rosa californica*, *Rubus armeniacus*, *R. spectabilis*, *Salix breweri*, *S. exigua*, *S. lasiolepis*, *S. melanopsis*, *S. sitchensis*, *Sambucus nigra*, and/or *Sambucus racemosa*. *Note: if *Rubus ursinus* or *Rubus parviflorus* dominates, key to the *Gaultheria shallon* – *Rubus (ursinus)* Alliance in Section II below (step 5b4).

1. Non-native shrub *Rubus armeniacus*, *Rosa eglanteria*, or *Delairea odorata* is strongly dominant in riparian sites, mesic clearings, disturbed areas and stock ponds.

Interior West Ruderal Flooded & Swamp Forest & Woodland Macrogroup

Interior West Ruderal Riparian Forest & Scrub Group

***Rubus armeniacus* – *Sesbania punicea* – *Ficus carica* Semi-Natural Alliance**

Rubus armeniacus Semi-Natural Association

Delairea odorata Semi-Natural Association*

2. *Cornus sericea*, *Lonicera involucrata*, *Morella californica*, *Rubus spectabilis*, *Salix sitchensis* and/or *Sambucus racemosa* dominate or co-dominate with other *Rubus* spp.

2a. Vegetation dominated or co-dominated by *Morella californica* and/or *Rubus spectabilis*. Stands may be small and are generally found close to the coast on moist or wet soils, ravines, and riparian areas.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Wet Shrubland Group

***Rubus spectabilis* – *Morella californica* Alliance**

Morella californica – *Rubus* spp. Provisional Association*

Rubus spectabilis Association*

2b. *Sambucus racemosa* dominates in the shrub overstory, often preferring riparian streams, seeps along slopes, and moist post-fire slopes where there was past disturbance.

***Rubus spectabilis* – *Morella californica* Alliance**

Sambucus racemosa – (*Rubus ursinus*) Provisional Association

2c. *Cornus sericea* is dominant in the shrub layer or co-dominant with plants such as *Salix* spp. Emergent riparian trees and shrubs such as *Rubus ursinus*, *Salix* spp. and *Toxicodendron diversilobum* are often present.

***Cornus sericea* Alliance**

Cornus sericea – *Salix (lasiolepis, exigua)* Association

2d. *Salix sitchensis* dominates or co-dominates with *S. lasiolepis* along coastal or low elevation streams, lagoons. A variety of sub-dominant trees and shrubs may be present, including *Alnus*, *Morella*, and *Rubus*.

***Salix hookeriana* – *Salix sitchensis* – *Spiraea douglasii* Alliance**

Salix sitchensis Provisional Association

3. *Frangula californica*, *Prunus virginiana*, *Rhododendron occidentale*, *Salix breweri*, *S. exigua*, *S. lasiolepis*, *S. melanopsis*, and/or *Sambucus nigra* dominant or co-dominant with *Baccharis pilularis* or *Rubus* spp.

3a. *Frangula californica* and/or *Rhododendron occidentale* dominate or co-dominate together with *Rubus*. Stands are found along springs, seeps, and ravines in wetland and riparian settings, often on sedimentary and serpentine substrates that retain water much of the year. If *Frangula californica* is dominant in upland settings along with *Baccharis pilularis* or other upland plants, key to the *Baccharis* alliance (Section II.7b.)

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Wet Shrubland Group

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

Frangula californica ssp. *californica* Provisional Association

Frangula californica ssp. *tomentella* / *Cirsium fontinale* var. *campylon* –
Mimulus guttatus Association

Rhododendron occidentale – *Frangula californica* ssp. *tomentella*
Provisional Association

3b. *Baccharis salicifolia*, *Rosa californica*, *Salix exigua*, or *S. lasiolepis* dominates or co-dominates along streams banks and benches, rivers, or close to springs.

Southwestern North American Warm Desert Freshwater Marsh & Bosque Macrogroup

Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland Group

3b1. *Salix exigua* dominates along rivers and streams, or close to springs. They are often the first plants to colonize bars and cut banks, followed later by trees such as *Acer* and *Salix* spp.

***Salix exigua* Alliance**

Salix exigua Association

3b2. *Salix lasiolepis* dominates or co-dominates with *Rubus* spp. or *Baccharis pilularis* along stream banks and benches, slope seeps, and drainage stringers. If *Cornus sericea* is co-dominant, key to that alliance. Emergent riparian trees are often present, such as *Acer*, *Alnus*, *Fraxinus*, *Salix*, and others.

***Salix lasiolepis* Alliance**

Salix lasiolepis Association

Salix lasiolepis – *Rubus* spp. Association

Salix lasiolepis – *Salix lucida* Association

3b3. *Baccharis salicifolia* dominates or co-dominates in the shrub canopy with *Artemisia californica*, *Baccharis pilularis*, *Rubus* spp., *Salix exigua*, *Salix lasiolepis*, and *Sambucus nigra*. Emergent trees may be present at low cover,

including *Pinus sabiniana*, *Platanus racemosa*, *Populus fremontii*, *Quercus* spp. or *Salix* spp.

***Baccharis salicifolia* Alliance**
Baccharis salicifolia Association

3b4. *Rosa californica* dominates or co-dominates in the shrub canopy with *Artemisia californica*, *Baccharis pilularis*, *Rubus armeniacus*, *Salix lasiolepis*, *Salvia mellifera*, *Sambucus nigra*, and *Symphoricarpos mollis*. Emergent trees may be present at low cover, including *Salix laevigata*.

***Rosa californica* Alliance**
Rosa californica Association

3c. *Sambucus nigra* dominates in the shrub overstory, often preferring stream terraces, bottomlands, and localized areas in uplands, where there was past disturbance.

Western North American Montane Marsh, Wet Meadow & Shrubland Macrogroup
Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland Group

***Rhus trilobata* – *Crataegus rivularis* – *Forestiera pubescens* Alliance**
Sambucus nigra Association

3d. *Prunus virginiana* dominates in the shrub overstory, often on steep north-facing slopes.

Cool Interior Chaparral Macrogroup

Western North American Montane Scrub Group

***Ribes quercetorum* – *Rhus trilobata* – *Frangula californica* Alliance**
Prunus virginiana Coast Range Association

Section II. Coastal scrub, dune/bluff, and disturbance-following vegetation dominated or co-dominated by drought-deciduous or seral (both deciduous and evergreen) shrubs. Includes *Artemisia californica*, *Baccharis pilularis*, *Ceanothus thyrsiflorus*, *Corylus cornuta*, *Ericameria ericoides*, *Ericameria nauseosa*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *Eriogonum wrightii*, *Frangula californica*, *Garrya elliptica*, *Gaultheria shallon*, *Holodiscus discolor*, *Keckiella corymbosa*, *Lupinus albifrons*, *Lupinus arboreus*, *Lupinus chamissonis*, *Rubus ursinus*, *Salvia mellifera*, and *Toxicodendron diversilobum*. Resprouting, deep-rooted, sclerophyllous shrubs may at times be characteristic, but not dominant.

4. *Eriogonum wrightii* is dominant in the shrub overstory.

Great Basin-Intermountain Dry Shrubland & Grassland Macrogroup

Mojave Mid-Elevation Mixed Desert Scrub Group

***Eriogonum wrightii* – *Eriogonum heermannii* – *Buddleja utahensis* Alliance**
Eriogonum wrightii (ssp. *subscaposum*, ssp. *wrightii*) Association

5. *Ericameria nauseosa* is dominant in the shrub overstory. No stands were sampled, but the alliance may occur within the project area.

Intermountain Semi-Desert Steppe & Shrubland Group

Ericameria nauseosa* Alliance

6. *Ericameria ericoides*, *Lupinus arboreus*, and/or *Lupinus chamissonis* are dominant, co-dominant, or characteristic (sometimes with as little as 5% cover) in the shrub overstory on coastal dunes, bluffs, or inland sandy and disturbed soils. A variety of herbs, including many of the following non-natives, may be present with high cover in the understory: *Bromus diandrus*, *Carduus*, *Holcus*, *Rumex acetosella*, and *Vulpia bromoides*.

Pacific Coastal Beach & Dune Macrogroup

Californian Coastal Beach & Dune Group

6a. *Lupinus arboreus* dominates or co-dominates with *Baccharis pilularis* and/or *Rubus ursinus*, often with high cover of grasses including *Bromus diandrus*, *Holcus lanatus*, *Lolium perenne*, *Vulpia bromoides*, and other non-native herbaceous species.

***Lupinus arboreus* Alliance**

Lupinus arboreus Association

Baccharis pilularis – *Lupinus arboreus* Association*

6b. *Ericameria ericoides* and/or *Lupinus chamissonis* dominate as individuals or in combination as co-dominants with *Baccharis pilularis* or *Lupinus arboreus*; occurring along the immediate coast.

***Lupinus chamissonis* – *Ericameria ericoides* Alliance**

Ericameria ericoides Association

Lupinus chamissonis Association*

Lupinus chamissonis – *Ericameria ericoides* Association*

6c. *Ericameria ericoides* dominates or co-dominates with other sandhill shrubs such as *Lupinus albifrons* away from the immediate shoreline on sandy soils with recent disturbance typically with other diagnostic “sand hills” herbaceous plants.

Californian Coastal Scrub Macrogroup

Californian Coastal-Foothill Seral Scrub Group

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

Lupinus albifrons – *Lotus scoparius* / *Chorizanthe pungens* Association

7. Shrublands dominated or co-dominated by native, coastal scrub and disturbance-following shrubs or by naturalized, or planted species, including *Artemisia californica*, *Baccharis pilularis*, *Ceanothus thyrsiflorus*, *Cistus*, *Cytisus*, *Eriodictyon californicum*, *Eriogonum fasciculatum*, *Gaultheria shallon*, *Genista*, *Heterotheca sessiliflora*, *Lupinus albifrons*, *Rubus parviflorus*, *Rubus ursinus*, *Toxicodendron diversilobum*, and/or *Ulex europaeus*.

Californian Coastal Scrub Macrogroup

7a. *Diplacus aurantiacus*, *Eriodictyon californicum*, *Keckiella corymbosa*, *Lepechinia calycina*, *Lupinus albifrons*, *Malacothamnus* spp., or *Prunus emarginata* dominates in the overstory.

Californian Coastal-Foothill Seral Scrub Group

7a1. *Eriodictyon californicum*, *Lepechinia calycina*, *Lotus scoparius*, *Lupinus albifrons*, or *Pickeringia montana*, dominates or co-dominates with other seral scrub, often in stands that are open and/or display recent evidence of fire or other disturbance such as road cuts. Other coastal scrub may be present at lower cover, including *Artemisia californica*, *Baccharis pilularis*, and *Toxicodendron diversilobum*. The understory may be composed of mixed native and non-native herbs, which sometimes have higher cover than the overstory shrubs.

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

Eriodictyon californicum / Herbaceous Association

Lotus scoparius Association

Lupinus albifrons Association*

Lupinus albifrons – *Lotus scoparius* / *Chorizanthe pungens* Association

7a2. *Diplacus aurantiacus* strongly dominant, often on steep slopes and ridgetops. Other coastal scrub may be present at lower cover. If *D. aurantiacus* is co-dominant with *Adenostoma fasciculatum* or *Artemisia californica*, see those respective alliances.

***Diplacus aurantiacus* Alliance**

Diplacus (*aurantiacus*, *puniceus*) Association

7a3. A species of *Malacothamnus* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Artemisia californica*, *Cercocarpus montanus*, *Eriogonum fasciculatum*, *Heteromeles arbutifolia*, *Lotus scoparius*, and *Salvia mellifera*. Emergent trees may be present at low cover, including *Platanus racemosa* or *Quercus agrifolia*.

***Malacothamnus fasciculatus* – *Malacothamnus* spp. Alliance**

Malacothamnus (*aboriginum*, *fremontii*, *hallii*) Provisional Association

7b. *Baccharis pilularis*, *Ceanothus incanus*, *C. thyrsiflorus*, *Corylus cornuta*, *Frangula californica*, *Garrya elliptica*, *Gaultheria shallon*, *Holodiscus discolor*, *Prunus virginiana*, *Rubus parviflorus*, *Rubus ursinus*, and/or *Toxicodendron diversilobum* dominate or co-dominate as shrubs. Shrubs are typically evergreen or winter-deciduous, not sclerophyllous or drought-deciduous species. Found along cool, coastal strips or on sheltered inland draws and lower slopes, where species are tolerant of disturbance and trees tend to be excluded.

Californian North Coastal & Mesic Scrub Group

7b1. *Baccharis pilularis* dominates or co-dominates with *Frangula californica*, *Toxicodendron diversilobum*, or *Rubus* spp. in the shrub overstory. If

Calamagrostis nutkaensis or *Carex obnupta* have equal or higher cover than *B. pilularis*, key to the *Calamagrostis nutkaensis* Alliance (see Class C, step 9b3). If *Corylus cornuta* is codominant, key to that alliance below. If stands have greater cover of *Ceanothus thyrsiflorus* or *Toxicodendron diversilobum* than *Baccharis pilularis*, key to those respective alliances. Stands that have greater cover of *Artemisia californica*, usually key to that alliance. A variety of native and non-native forbs and grasses may intermix in the herbaceous layer, sometimes with higher cover than *Baccharis* – including *Avena*, *Bromus*, *Danthonia*, *Deschampsia*, *Elymus glaucus*, *Eriophyllum staechadifolium*, *Festuca*, *Hypochaeris*, *Nassella pulchra*, and others.

***Baccharis pilularis* Alliance**

Baccharis pilularis Association

Baccharis pilularis – *Artemisia californica* Association

Baccharis pilularis – *Ceanothus thyrsiflorus* Association*

Baccharis pilularis – (*Frangula californica*) – *Rubus* spp. Association

Baccharis pilularis – *Toxicodendron diversilobum* Association

Baccharis pilularis / (*Nassella pulchra* – *Elymus glaucus* – *Bromus carinatus*) Association

Baccharis pilularis / Annual Grass – Herb Association

Baccharis pilularis / *Carex obnupta* – *Juncus patens* Association*

Baccharis pilularis / *Danthonia californica* Association*

Baccharis pilularis / *Deschampsia cespitosa* Association*

Baccharis pilularis / *Eriophyllum staechadifolium* Association

7b2. *Frangula californica* dominates or co-dominates with *Baccharis pilularis*, *Diplacus aurantiacus*, *Morella californica*, *Oemleria cerasiformis*, *Salix lasiolepis*, and/or *Toxicodendron diversilobum* in the shrub overstory. Stands occur on slopes above salt marsh and in upland coastal bluff on mesic slopes, related to stands of *Baccharis pilularis*. (also see Class B. **3a** above)

***Baccharis pilularis* Alliance**

Frangula californica ssp. *californica* – *Baccharis pilularis* / *Scrophularia californica* Association

7b3. *Ceanothus thyrsiflorus* or *C. incanus* dominates in the overstory shrub layer, often with moderately dense cover. *Diplacus aurantiacus*, *Heteromeles*, *Pseudotsuga menziesii*, *Quercus wislizeni*, and other species may intermix as sub-dominants in the shrub and tree layers. If *Baccharis pilularis* is present, *Ceanothus thyrsiflorus* is greater in cover. Stands of *C. incanus* are included in the *C. thyrsiflorus* Alliance since they are more limited in distribution and are ecologically similar to *C. thyrsiflorus*.

***Ceanothus thyrsiflorus* Alliance**

Ceanothus incanus Association

Ceanothus thyrsiflorus – (*Rubus ursinus*) Association

Ceanothus thyrsiflorus – *Baccharis pilularis* – *Toxicodendron diversilobum* Association

7b4. *Gaultheria shallon*, *Holodiscus discolor*, *Rubus parviflorus*, and/or *Rubus ursinus* dominate or co-dominate with *Baccharis pilularis*, *Holcus lanatus*, or *Toxicodendron diversilobum* on hillslopes, rock outcrops, coastal bluffs, or flats.

***Gaultheria shallon* – *Rubus (ursinus)* Alliance**

Holodiscus discolor – *Baccharis pilularis* – *Rubus ursinus* Association*

Rubus parviflorus Association

Rubus ursinus Association

7b5. *Toxicodendron diversilobum* dominates, sometimes intermixing with sub-dominant *Baccharis pilularis* and *Rubus* spp. If *B. pilularis* is present and greater than 50% relative cover, key to the *Baccharis pilularis* Alliance (step 5b1). For this project, stands were encountered close to the coast, although they are likely to occur inland as well.

***Toxicodendron diversilobum* Alliance**

Toxicodendron diversilobum – (*Baccharis pilularis*) Association

7b6. *Corylus cornuta* dominates or co-dominates with *Baccharis pilularis* and other shrubs as a medium-tall scrub on steep concave slopes with northern to eastern exposures surrounded by *Pseudotsuga menziesii*. Other shrubs may include *Baccharis pilularis*, *Frangula californica*, *Rubus ursinus*, *Vaccinium ovatum*, and *Toxicodendron diversilobum*.

***Corylus cornuta* var. *californica* Alliance**

Corylus cornuta / *Polystichum munitum* Association

7b7. *Garrya elliptica* dominates with other shrubs such as *Baccharis pilularis* and *Toxicodendron diversilobum* as well as herbaceous species such as *Polystichum munitum*. Emergent trees may be present at low cover, including *Umbellularia californica*.

***Baccharis pilularis* Alliance**

Garrya elliptica Provisional Association*

7c. *Artemisia californica* or *Salvia mellifera* dominates and may intermix with *Baccharis pilularis*, *Diplacus aurantiacus*, *Eriodictyon californicum*, and/or *Toxicodendron diversilobum*.

Central & Southern Californian Coastal Sage Scrub Group

7c1. *Artemisia californica* dominates and may intermix with *Baccharis pilularis*, *Diplacus aurantiacus*, and/or *Toxicodendron diversilobum*. If *Baccharis pilularis* is present, *Artemisia californica* is greater in cover for this alliance. If *Adenostoma fasciculatum* is present, it is not co-dominant. If the cover of *Eriophyllum staechadifolium* and the other nominate species in the *Eriophyllum staechadifolium* – *Erigeron glaucus* – *Eriogonum latifolium* Alliance is more than twice the cover of *Artemisia*, key to that alliance in the herbaceous part of the key. If *Eriodictyon californicum* or *Diplacus aurantiacus* is co-dominant, key here.

***Artemisia californica* – (*Salvia leucophylla*) Alliance**

Artemisia californica Association

Artemisia californica – *Diplacus aurantiacus* Association

Artemisia californica / *Nassella (pulchra)* Association

7c2. *Salvia mellifera* dominates or co-dominates with *Artemisia californica*, *Diplacus aurantiacus*, *Eriogonum fasciculatum*, or *Lotus scoparius*. If *Adenostoma fasciculatum* is present, it is not co-dominant.

***Salvia mellifera* – (*Artemisia californica*) Alliance**

Salvia mellifera Association

Salvia mellifera – *Artemisia californica* Association

7c3. *Eriogonum fasciculatum* dominates or co-dominates with *Artemisia californica*, *Baccharis pilularis*, *Diplacus aurantiacus*, *Encelia californica*, *Encelia farinosa*, *Isocoma menziesii*, *Lotus scoparius*, *Malacothamnus fasciculatus*, *Salvia apiana* or *Salvia mellifera*. Emergent trees may be present at low cover including *Juniperus californica*. Mapped but not sampled.

Eriogonum fasciculatum* Alliance

Eriogonum fasciculatum Association*

7d. *Albizia lophantha*, *Cistus* spp., *Cotoneaster* spp., *Cytisus scoparius*, *Genista monspessulana*, *Grevillea* spp., *Helichrysum petiolare*, *Rosa rubiginosa*, *Ulex europaeus*, or other Mediterranean shrubs not native to California dominates in naturalized or planted stands. May be found invading disturbed areas, grasslands, or forest openings.

7d1. A non-native *Acacia*, *Albizia lophantha*, *Grevillea*, and/or *Leptospermum laevigatum* dominates or co-dominate together in the tall shrub or low tree canopy. If *Acacia melanoxylon* is dominant, key to the *Eucalyptus* spp. – *Ailanthus altissima* – *Robinia pseudoacacia* Woodland Semi-Natural Alliance.

Californian Ruderal Grassland, Meadow & Scrub Group

***Acacia* spp. – *Grevillea* spp. – *Leptospermum laevigatum* Provisional Semi-Natural Alliance**

Acacia (cyclops, dealbata) Association

7d2. *Myoporum laetum* or *Schinus molle* strongly dominant in open to dense stands.

Californian Ruderal Forest Group

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

Schinus molle Semi-Natural Association*

7d3. *Cistus* spp., *Cotoneaster* spp., *Cytisus scoparius*, *Genista monspessulana*, *Hypericum canariense*, *Ulex europaeus*, or other broom plants dominate in the shrub overstory. Fire promotes broom invasions in woodland settings; however, broom or other non-native Mediterranean scrub may invade coastal grasslands without fire.

Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

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

Cotoneaster (*lacteus*, *pannosus*) Provisional Semi-Natural Association*

Cytisus scoparius Provisional Semi-Natural Association*

Genista monspessulana Semi-Natural Association

Hypericum canariense Provisional Semi-Natural Association*

Spartium junceum Semi-Natural Association

Ulex europaeus Provisional Semi-Natural Association*

7d4. *Helichrysum petiolare*, *Maytenus boaria*, *Rosa eglanteria*, *R. rubiginosa*, *Pittosporum*, or other non-native shrubs dominant in open to dense stands, where they are often invading coastal grasslands.

Californian Ruderal Grassland, Meadow & Scrub Group (key to group level only)

Section III. Shrub vegetation dominated by evergreen sclerophyll-leaved species, including many that have developed growth strategies driven by a Mediterranean climate. Most of the core diagnostic species are endemic to California, including *Adenostoma*, *Arctostaphylos*, *Ceanothus cuneatus*, *C. leucodermis*, *C. oliganthus*, *Cercocarpus montanus*, *Chrysolepis chrysophylla*, *Quercus berberidifolia*, *Q. durata*, and shrubby *Q. parvula* var. *shrevei* or *Q. wislizeni*.

Californian Chaparral Macrogroup

8. *Arctostaphylos crustacea*, *A. andersonii*, *A. glutinosa*, *A. imbricata*, *A. sensitiva*, *A. silvicola*, *A. uva-ursi*, *Chrysolepis chrysophylla* var. *minor*, or *Vaccinium ovatum* dominates or co-dominates in maritime chaparral stands.

Californian Maritime Chaparral Group

8a. *Arctostaphylos glutinosa*, *A. sensitiva*, *A. uva-ursi*, *Chrysolepis chrysophylla* var. *minor*, and/or *Vaccinium ovatum* dominates or co-dominates with *Adenostoma fasciculatum*, *Arctostaphylos crustacea*, *Ceanothus thyrsiflorus*, or other shrubs. *Pinus attenuata* or *P. muricata* and *Pteridium aquilinum* are often present. Stands are often transitional between forest and chaparral.

***Arctostaphylos (nummularia, sensitiva)* – *Chrysolepis chrysophylla* Alliance**

Arctostaphylos glutinosa Provisional Association

Arctostaphylos sensitiva Association

Chrysolepis chrysophylla / *Vaccinium ovatum* Association

8b. *Arctostaphylos crustacea* dominates or co-dominates with *Adenostoma fasciculatum*, *Arctostaphylos regismontana*, *Ceanothus cuneatus*, *C. papillosus*, *Frangula californica*, *Heteromeles arbutifolia*, *Quercus parvula*, or *Q. wislizeni* var. *frutescens*. Trees are often present but at low cover.

***Arctostaphylos (crustacea, tomentosa)* Alliance**

Arctostaphylos crustacea Association

Arctostaphylos crustacea – *Adenostoma fasciculatum* – *Ceanothus (cuneatus, papillosus)* Association

8c. *Arctostaphylos silvicola* or *Arctostaphylos andersonii* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Arctostaphylos crustacea*, *Artemisia californica*, *Ceanothus cuneatus*, *Diplacus aurantiacus*, *Ericameria ericoides*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, *Frangula californica*, *Heteromeles arbutifolia*, *Lupinus albifrons*, and *Vaccinium ovatum*. Emergent trees may be present at low cover, including *Arbutus menziesii*, *Pinus attenuata*, *Pinus ponderosa*, *Pseudotsuga menziesii* or *Quercus agrifolia*. If *Arctostaphylos silvicola* is co-dominant with *A. sensitiva*, key to the *Arctostaphylos (nummularia, sensitiva) – Chrysopsis chrysophylla* Alliance.

Arctostaphylos (crustacea, tomentosa) Alliance

Arctostaphylos (andersonii, pallida) Provisional Association

Arctostaphylos silvicola Association

9. *Arctostaphylos glandulosa*, *A. x campbelliae*, *Ceanothus ferrisiae*, *Ceanothus papillosus*, *Cercocarpus montanus*, *Heteromeles arbutifolia*, *Prunus ilicifolia*, *Ptelea crenulata*, *Quercus berberidifolia*, *Quercus wislizeni*, and/or *Quercus durata* dominate or co-dominate with *Adenostoma fasciculatum*. Stands are mostly found inland from the coastal fog belt and are often composed of large shrubs occupying mesic sites such as north-facing slopes, concavities, and toeslopes with well-drained soils.

Californian Mesic & Pre-Montane Chaparral Group

9a. *Cercocarpus montanus* (= *C. betuloides*) dominates the stand, sometimes with *Adenostoma fasciculatum* or *Prunus ilicifolia* as codominants or subdominants. *Artemisia californica* and *Ribes californicum* are often present.

Cercocarpus montanus Alliance

Cercocarpus montanus – Adenostoma fasciculatum Association

Cercocarpus montanus – Prunus ilicifolia Association

Cercocarpus montanus var. *glaber* Association

9b. *Quercus berberidifolia* dominates or co-dominates with *Adenostoma fasciculatum*, *Ceanothus cuneatus*, and/or other chaparral shrubs.

Quercus berberidifolia Alliance

Quercus berberidifolia Association

Quercus berberidifolia – Adenostoma fasciculatum Association

Quercus berberidifolia – Arctostaphylos glauca Association

Quercus berberidifolia – Ceanothus cuneatus Association

9c. *Ceanothus ferrisiae*, *Heteromeles arbutifolia*, *Prunus ilicifolia*, and/or *Ptelea crenulata* dominate or co-dominate in the shrub layer with *Baccharis pilularis*, *Rhamnus crocea*, *R. ilicifolia*, and/or *Toxicodendron diversilobum*. *Sanicula crassicaulis* and other herbs such as *Clinopodium douglasii* may be present to abundant in the understory.

Prunus ilicifolia – Heteromeles arbutifolia – Ceanothus spinosus Alliance

Ceanothus ferrisiae – Heteromeles arbutifolia Association

Heteromeles arbutifolia Serpentine Association

Prunus ilicifolia ssp. *ilicifolia – Heteromeles arbutifolia* Association

Prunus ilicifolia – *Rhamnus (crocea, ilicifolia)* Association
Prunus ilicifolia ssp. *Illicifolia* / *Sanicula crassicaulis* Association

9d. *Quercus durata* dominates or co-dominates with various shrubs including *Adenostoma fasciculatum*, *Arctostaphylos glauca*, *Frangula californica* ssp. *tomentella*, *Heteromeles arbutifolia* and/or shrubby *Umbellularia californica*. Soils are ultramafic soils (e.g., serpentine, gabbro). Herbaceous layer may be well-developed including *Chlorogalum* spp., *Festuca* spp., *Lolium perenne*, or *Melica torreyana*.

***Quercus durata* Alliance**

Quercus durata Association

Quercus durata – *Adenostoma fasciculatum* Provisional Association

Quercus durata – *Arctostaphylos glauca* – *Artemisia californica* / *Grass* Provisional Association

Quercus durata – *Arctostaphylos glauca* – *Garrya congdonii* / *Melica torreyana* Provisional Association

Quercus durata – *Frangula californica* ssp. *tomentella* – *Arctostaphylos glauca* Provisional Association

Quercus durata – *Heteromeles arbutifolia* – *Umbellularia californica* Provisional Association

9e. *Arctostaphylos glandulosa* or *A. x campbelliae* dominates or co-dominates with *Adenostoma fasciculatum*, *Quercus berberidifolia*, and/or *Quercus wislizeni* on convexities, outcrops, ridges, or slopes. Sometimes *Q. wislizeni* may be a tree, though often it is shrubby in stands sampled. Soils may be derived from sandstone, shale, serpentine, or gabbro. Species commonly found as emergent trees or sub-dominant shrubs include *Arbutus menziesii*, *Arctostaphylos* spp., *Diplacus aurantiacus*, and *Heteromeles arbutifolia*. *A. glandulosa* is found in the Diablo Range and not found in the Santa Cruz Mountains, where *A. crustacea* is the primary burl-forming species.

***Arctostaphylos glandulosa* Alliance²**

Arctostaphylos glandulosa Association*

Arctostaphylos glandulosa – *Adenostoma fasciculatum* Association*

Arctostaphylos glandulosa – *Adenostoma fasciculatum* – *Quercus berberidifolia* Association

9f. *Ceanothus papillosus* dominates or co-dominates in the shrub canopy with *Adenostoma fasciculatum*, *Arctostaphylos glandulosa*, *Ceanothus cuneatus*, *Eriodictyon californicum*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Quercus wislizeni*, *Salvia mellifera*, and *Toxicodendron diversilobum* in post-fire settings.

² The *Arctostaphylos glandulosa* Alliance is placed in the Pre-Montane Chaparral Group of the USNVC. For this project, it is also related to the Xeric Chaparral Group because some stands occupy exposed southerly-facing sites with shallow soils, yet the alliance is typically found in areas with higher moisture from fog and rain as compared to *Adenostoma fasciculatum* and related xeric chaparral alliances with shallow soils.

Emergent trees may be present at low cover, including *Pinus coulteri*, *Pinus ponderosa*, *Quercus agrifolia*, *Quercus chrysolepis*, or *Umbellularia californica*.

***Ceanothus papillosus* Alliance**

Ceanothus papillosus – *Adenostoma fasciculatum* Association*

Ceanothus papillosus – *Eriodictyon californicum* Association

10. *Ceanothus leucodermis*, *C. oliganthus*, *Quercus wislizeni* var. *frutescens*, and/or *Quercus parvula*, dominate or co-dominate in the shrub overstory. These shrublands are more frost tolerant and typically found at higher, cooler, or more mesic sites than the California Xeric Chaparral Group.

Californian Mesic & Pre-Montane Chaparral Group

10a. *Ceanothus leucodermis* or *Ceanothus oliganthus* dominates in shrublands that are often found in localized patches following fires. If *Quercus wislizeni* is co-dominant, key to the *Quercus wislizeni* – *Quercus chrysolepis* (shrub) Alliance directly below.

***Ceanothus (oliganthus, tomentosus)* Alliance**

Ceanothus leucodermis Association*

Ceanothus oliganthus Association

10b. *Quercus agrifolia*, *Q. parvula*, *Q. wislizeni* or other *Quercus* spp. dominate and/or co-dominate as shrubby regenerating trees or short trees, co-occurring with *Umbellularia*, *Adenostoma*, and a variety of other shrubs that prefer more mesic, northerly exposures. *Quercus parvula* and *Q. wislizeni* are not always morphologically distinct. When *Q. wislizeni* or *Q. parvula* dominates or co-dominates as an overstory tree, key to the *Quercus wislizeni* – *Quercus parvula* (tree) Alliance. *Umbellularia californica* is often emergent, while a variety of thick- and soft-leaved shrubs intermix as sub-dominants.

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

Quercus agrifolia – *Quercus chrysolepis* – *Quercus parvula* (shrub) Provisional Association

Quercus parvula (shrub) Provisional Association*

11. Sclerophyll (i.e., thick-leaved) shrublands dominated by one or more of the following taxa: *Adenostoma fasciculatum*, *Arctostaphylos canescens*, *Arctostaphylos glauca*, or *Ceanothus cuneatus*. Most stands occur on well-drained soils along exposures that are in full sun much of the growing season, including upper slopes, spur ridges, and convexities.

Californian Xeric Chaparral Group

11a. *Arctostaphylos canescens* and/or *A. manzanita* dominate or co-dominate, sometimes with co-dominant *Adenostoma fasciculatum*. *A. canescens* is restricted to Tertiary sandstones and shales in the Santa Cruz Mountains, flanking the San Andreas fault. One alliance is recognized for all three *Arctostaphylos* vegetation types, with associations specific to each species.

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

Arctostaphylos canescens Provisional Association

Arctostaphylos canescens – *Arctostaphylos glandulosa* – *Adenostoma fasciculatum*
Provisional Association*
Arctostaphylos manzanita Association*

11b. *Arctostaphylos glauca* is dominant or co-dominant in the shrub canopy with *Adenostoma fasciculatum*, *Arctostaphylos glandulosa*, *Artemisia californica*, *Ceanothus cuneatus*, *Cercocarpus montanus*, *Heteromeles arbutifolia*, *Quercus berberidifolia*, *Quercus durata*, *Quercus wislizeni*, *Rhamnus ilicifolia*, and *Salvia mellifera*. Emergent trees may be present at low cover, including *Quercus agrifolia* or *Quercus wislizeni* var. *wislizeni*. Found typically on volcanic, Franciscan, serpentine, and greenstone substrates.

***Arctostaphylos glauca* Alliance**
Arctostaphylos glauca Association
Arctostaphylos glauca – *Adenostoma fasciculatum* Association
Arctostaphylos glauca – *Artemisia californica* – *Salvia mellifera* Association
Arctostaphylos glauca / *Melica torreyana* Association

11c. *Ceanothus cuneatus* dominates or co-dominates with *Adenostoma fasciculatum*, often on convexities with westerly exposures. A variety of shrubs may intermix, including *Arctostaphylos* spp., *Baccharis pilularis*, *Eriodictyon*, *Heteromeles*, *Quercus durata*, and others.

***Ceanothus cuneatus* Alliance**
Ceanothus cuneatus – (*Arctostaphylos* spp.) Maritime Provisional Association
Ceanothus cuneatus – *Adenostoma fasciculatum* Association

11d. *Adenostoma fasciculatum* dominates or is co-dominant with a scrub species such as *Baccharis pilularis*, soft-leaved *Ceanothus* spp., *Diplacus aurantiacus*, *Eriodictyon californicum*, *Eriophyllum confertiflorum*, or *Lupinus albifrons*. If *A. fasciculatum* co-dominates with *Arctostaphylos* spp., *Ceanothus cuneatus*, *Cercocarpus montanus*, *Quercus berberidifolia*, or *Q. durata*, key to one of the latter alliances instead of *A. fasciculatum*.

***Adenostoma fasciculatum* Alliance**
Adenostoma fasciculatum Association
Adenostoma fasciculatum – (*Ceanothus cuneatus*) Association
Adenostoma fasciculatum – (*Lotus scoparius* – *Eriodictyon* spp.) Association
Adenostoma fasciculatum – *Diplacus aurantiacus* Association
Adenostoma fasciculatum – *Heteromeles arbutifolia* / *Melica torreyana* Association

11e. *Adenostoma fasciculatum* and *Salvia mellifera* co-dominate.

***Adenostoma fasciculatum* – *Salvia* spp. Alliance**
Adenostoma fasciculatum – *Salvia mellifera* Association

Class C. Herbaceous & Sparse Vegetation

Section I. Vegetation of: a) freshwater wetland or riparian settings with water or wet ground present temporarily, seasonally, or throughout the growing season, b) saline or alkaline lowlands where water accumulates in the winter, or c) tidal salt or brackish marshes with seasonal or ephemeral inundations. Includes herbaceous vegetation dominated, co-dominated, or characterized by: *Argentina* (= *Potentilla*), *Azolla*, *Bidens*, *Baccharis douglasii* (= *B. glutinosa*), *Bolboschoenus*, *Carex*, *Ceratophyllum*, *Distichlis*, *Eleocharis macrostachya*, *Grindelia stricta*, *Hydrocotyle*, *Juncus arcticus*, *J. effusus*, *J. lescurii*, *J. patens*, *Lasthenia glaberrima*, *Lemna*, *Lepidium latifolium*, *Leymus triticoides*, *Ludwigia*, *Mimulus guttatus*, *Nuphar*, *Oenanthe*, *Persicaria*, *Pleuropogon*, *Potamogeton*, *Ruppia*, *Sarcocornia* (= *Salicornia*), *Schoenoplectus*, *Scirpus*, *Sparganium*, *Spartina*, *Stuckenia*, *Typha*, and/or *Xanthium*.

1. Freshwater stands dominated by aquatic, floating or submerged plants, including *Azolla*, *Ceratophyllum*, *Hydrocotyle*, *Lemna*, *Ludwigia*, *Nuphar*, *Potamogeton*, *Sparganium*, and/or *Stuckenia*. Found along slow-moving streams, still ponds, lakes, or on ground surfaces after water levels have dropped.

Western North American Freshwater Aquatic Vegetation Macrogroup

1a. *Ludwigia hexapetala* or *L. peploides* dominates, creating mats in shallow water or over wet soil. Other aquatic plants such as *Azolla*, *Lemna*, *Myriophyllum aquaticum*, *Polygonum*, and *Sparganium* may be present.

North American Temperate Ruderal Aquatic Vegetation Group

***Ludwigia (hexapetala, peploides) – Eichhornia crassipes* Semi-Natural Alliance**

Ludwigia (hexapetala, peploides) Semi-Natural Association

1b. *Azolla filiculoides* or *Azolla microphylla* dominates or characterizes stands on water or wet ground surfaces. If *Lemna* is co-dominant, key to this alliance.

Western North American Temperate Freshwater Aquatic Vegetation Group

***Azolla (filiculoides, microphylla)* Alliance**

Azolla (filiculoides, microphylla) Association

1c. *Ceratophyllum*, *Hydrocotyle*, *Lemna*, *Nuphar*, *Potamogeton*, *Sparganium*, and/or *Stuckenia* dominates in water or on surfaces of streams, ponds or lakes.

Western North American Temperate Freshwater Aquatic Vegetation Group

1c1. *Ceratophyllum demersum* dominates.

***Ceratophyllum demersum* Aquatic Provisional Alliance**

Ceratophyllum demersum Western Provisional Association

1c2. *Nuphar lutea* dominates on the water surface. Algae and a variety of hydrophytes may intermix, including *Alisma*, *Carex*, *Hippuris vulgaris*, *Lemna*, *Polygonum*, and *Oenanthe*.

Nuphar lutea* Freshwater Aquatic Provisional Alliance

Nuphar lutea ssp. *polysepala* Provisional Association*

1c3. *Hydrocotyle ranunculoides* dominant on the water surface of coastal lagoons and freshwater lakes growing with *Lemna* spp. and *Scirpus microcarpus*.

Hydrocotyle (ranunculoides, umbellata) Alliance

Hydrocotyle ranunculoides Association

1c4. *Sparganium eurycarpum* is dominant in wetlands or freshwater with other forbs including *Agrostis pallens*, *Oenanthe sarmentosa*, and *Rumex conglomeratus*.

Sparganium (angustifolium) Alliance

Sparganium eurycarpum Provisional Association

1c4. *Potamogeton* or *Stuckenia* is dominant or co-dominant in freshwater at or near the surface with other aquatic species including *Ceratophyllum demersum* or *Lemna* spp.

***Stuckenia (pectinata) – Potamogeton* spp. Alliance**

Potamogeton spp. Association

Stuckenia pectinata Association

2. Salt and brackish marshes and estuaries dominated or co-dominated by *Atriplex prostrata*, *Bolboschoenus*, *Cotula coronopifolia*, *Distichlis*, *Lilaeopsis occidentalis*, *Ruppia*, *Sarcocornia* (= *Salicornia*), *Spartina* and/or *Zostera*. *Argentina egedii* may also be dominant in high tidal salt marsh. May appear as sparsely vegetated mudflats at low tide, or during restoration. Mudflats with trace amounts of cover by herbs are included here (see 2e2).

2a. *Bolboschoenus maritimus*, *Distichlis spicata*, *Frankenia salina*, *Grindelia stricta*, *Sarcocornia* (= *Salicornia*), *Spartina*, *Suaeda calceoliformis*, and/or *Triglochin* spp. Dominant or co-dominant tidal salt marshes to brackish marshes. *Argentina egedii* may also be dominant in high tidal salt marsh.

North American Pacific Coastal Salt Marsh Macrogroup

Temperate Pacific Salt Marsh Group

2a1. *Bolboschoenus maritimus* or *B. robustus* dominates or co-dominates with *Sarcocornia* (= *Salicornia*) *pacifica*.

***Bolboschoenus maritimus* Alliance**

Bolboschoenus maritimus Association

Bolboschoenus maritimus – *Sarcocornia pacifica* Association*

2a2. *Argentina egedii* dominates in high tidal salt marsh with *Distichlis spicata* and other salt-tolerant plants such as *Atriplex prostrata* or *Frankenia salina*.

***Distichlis spicata – Frankenia salina* Coastal Alliance**

Argentina egedii – *Distichlis spicata* Provisional Association

2a3. *Distichlis spicata* dominates in alkali seeps or other salty habitats without direct marine influence.

***Cressa truxillensis* – *Distichlis spicata* Alliance**

2a4. *Distichlis spicata* dominates in salty habitats along the coast and in high salt marsh settings, or co-dominates with *Frankenia salina* and/or *Jaumea carnosa*. Non-native grasses including *Avena* spp. and *Bromus hordeaceus* may have high cover and *Sarcocornia pacifica* may be present as a sub-dominant.

***Distichlis spicata* – *Frankenia salina* Coastal Alliance**

Distichlis spicata Association

Distichlis spicata – *Ambrosia chamissonis* Association

Distichlis spicata – annual grasses Association*

Distichlis spicata – *Frankenia salina* – *Jaumea carnosa* Association

Distichlis spicata – *Sarcocornia pacifica* Association

2a5. *Frankenia salina* is strongly dominant or codominates with *Grindelia stricta* or *Sarcocornia pacifica* in tidal marsh settings with other salt tolerant plants such as *Limonium californicum* and *L. ramosissimum*. *Sarcocornia pacifica* may be present as a sub-dominant.

***Distichlis spicata* – *Frankenia salina* Coastal Alliance**

Frankenia salina – *Limonium californicum* – *Monanthochloe littoralis* – *Sarcocornia pacifica* Association

2a6. *Limonium californicum* and *Frankenia salina* are present and in combination are greater than 30% relative cover of the stand. Grasses such as *Hordeum depressum* and *Bromus carinatus* may have higher cover in tidal marsh settings.

***Distichlis spicata* – *Frankenia salina* Coastal Alliance**

Frankenia salina – *Limonium californicum* – *Monanthochloe littoralis* – *Sarcocornia pacifica* Association

2a7. *Sarcocornia pacifica* dominates or co-dominates with *Atriplex prostrata*, *Cotula coronopifolia*, *Distichlis spicata*, *Jaumea carnosa*, and/or *Lepidium latifolium*. Stands found in coastal salt marshes, alkali flats, and wetland mudflats.

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

Sarcocornia pacifica – *Atriplex prostrata* Association

Sarcocornia pacifica – *Cotula coronopifolia* Association*

Sarcocornia pacifica – *Jaumea carnosa* – *Distichlis spicata* Association

Sarcocornia pacifica – *Schoenoplectus americanus* Association

Sarcocornia pacifica Tidal Association

2a8. *Spartina foliosa* dominates or co-dominates with *Grindelia stricta* or *Sarcocornia pacifica* on mudflats, banks, berms, and margins of bays and deltas.

***Spartina foliosa* Alliance**

Spartina foliosa Association

Spartina foliosa – *Sarcocornia pacifica* Association

2a9. *Grindelia stricta* or *Grindelia hirsutula* dominates or co-dominates with *Distichlis spicata*, *Sarcocornia pacifica*, or non-native herbs such as *Polypogon monspeliensis*, *Rumex crispus*, and *Bromus diandrus*. If *Spartina foliosa* co-

dominates, key to that alliance. Stands may be found on slightly elevated or drier ground adjacent to salt or alkaline marshes, tidal flats, levees, and road margins.

***Distichlis spicata* – *Frankenia salina* Coastal Alliance**

Grindelia stricta Provisional Association

2b. Non-native species such as *Atriplex prostrata*, *Cotula coronopifolia*, *Crypsis* spp., *Cynodon dactylon*, *Cyperus eragrostis*, *Mollugo verticillata*, *Panicum millaceum*, and/or *Paspalum* spp. dominate in low-lying sloughs and other disturbed alkaline or saline wetlands

Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group

2b1. *Atriplex prostrata* and/or *Cotula coronopifolia* dominates or co-dominates.

***Atriplex prostrata* – *Cotula coronopifolia* Semi-Natural Alliance**

Atriplex prostrata Semi-Natural Association

Cotula coronopifolia Semi-Natural Association*

2b2. *Crypsis* spp., *Cynodon dactylon*, *Cyperus eragrostis*, *Mollugo verticillata*, *Panicum millaceum*, *Paspalum* spp., and/or other non-native plants > 80% relative cover individually or collectively in the herbaceous layer.

***Cynodon dactylon* – *Crypsis* spp. – *Paspalum* spp. Semi-Natural Alliance**

Crypsis (schoenoides, vaginiflora) Semi-Natural Association

2c. *Ruppia* spp. dominant submersed in brackish to fresh water. Stands are likely in the counties.

Ditchgrass Saline Aquatic Vegetation Macrogroup

Widgeongrass Bed Group

Ruppia (cirrhosa, maritima)* Alliance

2d. *Zostera marina* and/or *Z. pacifica* dominate in tidal and aquatic marine settings.

Temperate Seagrass Aquatic Vegetation Macrogroup

Temperate Pacific Seagrass Bed Group

Zostera (marina, pacifica)* Pacific Aquatic Alliance

Zostera marina Association*

2e. Mudflats or dry pond bottoms (sometimes in sites undergoing restoration) with trace amounts of cover by herbs.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Temperate Pacific Freshwater Wet Mudflat Group

2e1. *Lilaeopsis occidentalis* dominates in coastal salt marsh settings.

Lilaeopsis occidentalis* Provisional Alliance

2e2. Mudflats or dry pond bottoms (sometimes in sites undergoing restoration) with trace amounts of cover by *Agrostis avenacea*, *Sarcocornia pacifica*, *Sesuvium*, and others. Cover by plants is sparse and/or uneven.

Mudflat/Dry Pond Bottom Mapping Unit

3. Freshwater or brackish stands dominated by *Argentina*, *Carex pansa*, *C. obnupta*, *C. praegracilis*, *Juncus effusus*, *J. lescurii*, *J. patens*, *Oenanthe*, *Schoenoplectus*, *Scirpus microcarpus*, and/or *Typha*, where water is present throughout all or most of the growing season. Soils have high organic content and may be poorly aerated.

3a. *Schoenoplectus* and/or *Typha* dominate in the herbaceous layer. Stands are found along streams, ditches, shores, bars, and channels of river mouth estuaries; around ponds and lakes; and in sloughs, swamps, and freshwater to brackish marshes.

Arid West Interior Freshwater Marsh Macrogroup

Arid West Interior Freshwater Marsh Group

3a1. *Schoenoplectus acutus* or *Schoenoplectus californicus* dominates or co-dominates with other herbs including *Typha* spp. Occurs in both freshwater and tidal marshes, along ponds and lagoons.

Schoenoplectus (acutus, californicus) Alliance

Schoenoplectus acutus Association

Schoenoplectus californicus Association

Schoenoplectus californicus – *Schoenoplectus acutus* Association

3a2. *Schoenoplectus americanus* or *Schoenoplectus pungens* dominates or co-dominates with other herbs. Occurs in fresh or brackish conditions.

Schoenoplectus americanus Alliance

Schoenoplectus americanus Association

Schoenoplectus pungens – *Argentina egedii* Provisional Association

3a3. *Typha latifolia*, *T. angustifolia*, and/or *T. domingensis* dominate in semi-permanently flooded freshwater or brackish marshes. If *Schoenoplectus acutus* or *S. californicus* is co-dominant, key to the *Schoenoplectus* Alliance.

Typha (angustifolia, domingensis, latifolia) Alliance

Typha (latifolia, angustifolia) Association

Typha domingensis Association

3b. *Argentina egedii*, *Bolboschoenus maritimus*, *B. robustus*, *Carex nudata*, *C. obnupta*, *C. praegracilis*, *C. pansa*, *C. subbracteata*, *Eleocharis macrostachya*, *Juncus covillei*, *J. effusus*, *J. hesperius*, *J. lescurii*, *J. patens*, *J. occidentalis*, *J. phaeocephalus*, *J. xiphioides*, *Oenanthe*, and/or *Scirpus microcarpus* dominate or co-dominate in mesic or wetland settings. *Holcus*, *Hypochaeris*, *Leontodon*, *Rumex* and *Vulpia bromoides* may intermix with similar cover. Stands may be found along seasonally flooded brackish marshes, coastal sand dunes, swales and plains, shallowly inundated woods, meadows, roadside ditches, mudflats, coastal swamps, lakeshores, marshes, and riverbanks.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Freshwater Wet Meadow & Marsh Group

3b1. *Carex praegracilis*, *C. pansa*, *C. subbracteata*, or *C. tumulicola* dominates or co-dominates with *Holcus lanatus* or *Lolium perenne*. Stands of *C. praegracilis* are not restricted to the coast and may be found in interior moist meadows and hillside depressions.

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

Carex pansa Provisional Association*

Carex praegracilis Lowland Provisional Association

Carex tumulicola Provisional Association*

3b2. *Carex obnupta* and/or *Scirpus microcarpus* dominates or co-dominates with other shrubs and herbs including *Argentina egedii*, *Baccharis pilularis*, *Juncus effusus*, *J. patens*, *Oenanthе sarmentosa*, *Rubus ursinus*, and *Salix* spp. across a variety of freshwater and brackish settings near the coast. May grow adjacent to *Schoenoplectus californica* or *Typha* stands.

Carex obnupta – Oenanthе sarmentosa – Scirpus microcarpus Alliance

Carex obnupta Association

Carex obnupta – Juncus patens Association*

Scirpus microcarpus Pacific Coast Association*

3b3. *Juncus effusus*, *J. patens*, *J. hesperius*, *J. occidentalis*, *J. phaeocephalus*, *J. subbracteata* and/or *J. xiphioides* dominate individually or in combination near the coast or farther inland. Co-dominant species may include *Carex densa*, *Holcus lanatus*, *Hypochaeris radicata*, *Juncus bufonius*, and *Vulpia bromoides*.

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

Juncus effusus Association

Juncus patens Association

Juncus patens – Holcus lanatus Provisional Association*

Juncus patens – Juncus occidentalis Provisional Association*

Juncus phaeocephalus Association

Juncus xiphioides Association

3b4. *Juncus lescurii* dominates or co-dominates with *Argentina egedii*, *Carex obnupta*, or *Distichlis spicata* in slightly brackish marshes or seeps near salt marshes.

Carex obnupta – Oenanthе sarmentosa – Scirpus microcarpus Alliance

Juncus lescurii Association*

3b5. *Argentina egedii* (= *A. anserina* or *Potentilla anserina* ssp. *pacifica*) dominates or co-dominates with *Calamagrostis nutkaensis*, *Carex obnupta*, *Holcus lanatus*, *Juncus* spp., *Leontodon taraxacoides*, *Lotus corniculatus*, *Schoenoplectus californicus*, and *Trifolium wormskioldii* in brackish to freshwater marsh habitats. If *Distichlis spicata* is present in a high tidal salt marsh environment, key to the *Distichlis* alliance.

Carex obnupta – Oenanthе sarmentosa – Scirpus microcarpus Alliance

Argentina egedii – (*Juncus lescurii*) Association
Carex obnupta – *Argentina egedii* Provisional Association*

3b6. *Oenanthe sarmentosa* dominates or co-dominates with *Argentina egedii* or other herbs in freshwater to slightly brackish marshes.

***Carex obnupta* – *Oenanthe sarmentosa* – *Scirpus microcarpus* Alliance**
Oenanthe sarmentosa Association

4. Wetland herbaceous vegetation dominated or characterized by *Alisma* spp., *Bidens frondosa*, *Baccharis douglasii* (= *B. glutinosa*), *Bolboschoenus glaucus*, *Carex barbarae*, *C. densa*, *C. nudata*, *C. serratodens*, *Cirsium fontinale*, *Euthamia occidentalis*, *Grindelia* spp., *Heterotheca oregona*, *Hoita orbicularis*, *Juncus arcticus*, *Lepidium latifolium*, *Leymus triticoides*, *Mimulus guttatus*, *Persicaria* (= *Polygonum*) *lapathifolia*, or *Xanthium strumarium*. Stands occupy settings where saturated soil or standing water throughout the growing season are key characteristics.

4a. Stands dominated or characterized by the species of *Carex*, *Juncus*, *Leymus*, or *Mimulus* mentioned above.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Freshwater Wet Meadow & Marsh Group

4a1. *Carex barbarae* dominates in seasonally or intermittently saturated wetlands.

***Carex barbarae* Alliance**
Carex barbarae Association

4a2. *Carex nudata* dominates with other herbs lower in cover including *Equisetum* spp. along rocky streams and streambanks.

***Carex nudata* Alliance**
Carex nudata Association

4a3. *Carex serratodens* dominates or co-dominates with *Agoseris heterophylla*, *Juncus arcticus*, *J. occidentalis*, *Leymus triticoides*, or *Mimulus guttatus*. Stands are often found in serpentine seeps and meadows.

***Juncus (effusus, patens)* – *Carex (pansa, praegracilis)* Alliance**
Carex serratodens Association

4a4. *Carex densa* dominates individually or in combination near the coast or farther inland in wet meadows. Co-dominant species may include *Holcus lanatus*, *Mentha pulegium*, *Plantago lanceolatum*, and *Ranunculus californicus*.

***Juncus (effusus, patens)* – *Carex (pansa, praegracilis)* Alliance**
Carex densa Provisional Association

4a5. *Carex amplifolia* dominates in wet areas with *C. gynodynamis* and *Juncus* spp.

***Juncus (effusus, patens)* – *Carex (pansa, praegracilis)* Alliance**
Carex amplifolia – *Carex gynodynamis* Provisional Association

4a6. *Juncus arcticus* (var. *balticus* or *mexicanus*) dominates in freshwater, brackish, or alkaline settings. *Argentina egedii*, *Carex* spp., *Mentha pulegium* and other hydrophytes may intermix as sub-dominants.

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

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

4a7. *Leymus triticoides* dominates or co-dominates with *Avena*, *Bromus*, *Carduus pycnocephalus*, *Lolium perenne*, or other grasses or forbs. Stands are found on poorly drained floodplains, valley bottoms, and brackish marsh margins.

***Leymus cinereus* – *Leymus triticoides* Alliance**

Leymus triticoides Association

Leymus triticoides – *Bromus* spp. – *Avena* spp. Association

Leymus triticoides – *Lolium perenne* Association*

4a8. *Mimulus guttatus* or another wetland *Mimulus* species dominates or co-dominates in the herbaceous layer with *Juncus* spp. or non-native grasses such as *Lolium perenne* and *Polypogon monspeliensis*. Stands are found in moist or saturated settings along streams, ephemeral cascades, ditches, fens, seeps, and springs often with high cover of moss.

***Mimulus guttatus* – *Cirsium* spp. – *Stachys* spp. Alliance**

Mimulus guttatus Association

4a9. *Cirsium fontinale* dominates or it co-dominates with wetland herbs including *Carex*, *Hemizonia congesta* ssp. *luzulifolia*, *Lolium perenne*, and others. Stands are found in seeps, springs, and drainages. *C. fontinale* is an indicator of serpentine wetlands in Santa Clara and San Mateo counties.

***Mimulus guttatus* – *Cirsium* spp. – *Stachys* spp. Alliance**

Cirsium fontinale Association

4b. Stands dominated or characterized by non-native, ruderal, or disturbance-adapted taxa: *Alisma* spp., *Bidens frondosa*, *Baccharis douglasii* (= *B. glutinosa*), *Cyperus erythrorhizos*, *Euthamia*, *Gnaphalium palustre*, *Hoita*, *Bolboschoenus glaucus*, *Lepidium*, *Persicaria*, and/or *Xanthium*.

4b1. *Lepidium latifolium*, *Dittrichia graveolens*, *Pseudognaphalium luteoalbum*, *Xanthium spinosum*, or similar non-native forb dominates in the herbaceous layer along intermittently and seasonally flooded freshwater and brackish marshes and riparian corridors. In alkaline or saline settings, *Distichlis spicata* is commonly present.

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group

***Lepidium latifolium* – *Lactuca serriola* Semi-Natural Alliance**

Dittrichia graveolens – *Pseudognaphalium luteoalbum* Provisional Semi-Natural Association

Lepidium latifolium Semi-Natural Association*

4b2. *Persicaria* (= *Polygonum*) spp., *Alisma* spp., *Cyperus erythrorhizos*, *Gnaphalium palustre*, and/or *Xanthium strumarium* co-dominate or dominate in marshes and regularly disturbed vernal wet ponds, fields, and stream terraces.

Temperate Pacific Freshwater Wet Mudflat Group

***Polygonum lapathifolium* – *Xanthium strumarium* Alliance**

Alisma (*triviale*) Provisional Association*

Cyperus erythrorhizos – *Gnaphalium palustre* Provisional Association

Polygonum (*amphibium*, *lapathifolium*) Association

Xanthium strumarium Association

4b3. *Baccharis douglasii* (= *B. glutinosa*), *Euthamia occidentalis*, *Helenium puberulum*, *Hoita orbicularis*, *Bidens* spp., and/or the native herb *Ludwigia palustris* dominates or co-dominates in wetlands with emergent shrubs such as *Rubus ursinus*.

Temperate Pacific Freshwater Wet Mudflat Group

***Bidens cernua* – *Euthamia occidentalis* – *Ludwigia palustris* Provisional Alliance**

Baccharis douglasii (= *B. glutinosa*) Provisional Association,

Bidens frondosa Provisional Association*

Euthamia occidentalis Provisional Association

4b4. *Heterotheca oregona* dominates or co-dominates along gravel bars in floodplains, riparian terraces and stream banks.

Temperate Pacific Freshwater Wet Mudflat Group

***Heterotheca* (*oregona*, *sessiliflora*) Alliance**

Heterotheca oregona Association

5. Herbaceous stands dominated or characterized by *Centromadia pungens*, *Cressa truxillensis*, *Eleocharis macrostachya*, *E. acicularis*, *Eryngium aristulatum*, *Lasthenia glaberrima*, *L. fremontii*, *Limnanthes douglasii*, *Navarretia leucocephala*, *Pleuropogon californicus* or *Trifolium variegatum*. In the *Manual of California Vegetation* (Sawyer et al. 2009), these stands are recognized in a macrogroup associated with vernal pools, even though they do not always occur in vernal pool settings. Future versions of the hierarchy will likely split vernal pool and non-vernal pool stands into different alliances, groups, and macrogroups based on ecological and environmental differences. Few true vernal pool types occur in Santa Clara and Santa Cruz Counties.

Western North American Vernal Pool Macrogroup

Californian Vernal Pool / Swale Bottomland Group

5a. *Eryngium aristulatum* or *Hemizonia congesta* is co-dominant in the herbaceous layer with other swale and vernal pool species.

Eryngium aristulatum* Alliance

Hemizonia congesta Association*

5b. *Pleuropogon californicus* and/or *Lasthenia glaberrima* are present, sometimes with high cover in the herbaceous layer along with *Limnanthes douglasii*,

Navarretia leucocephala, *Eryngium aristulatum*, and/or *Isoetes howellii*. If *Eleocharis macrostachya* or *E. palustris* is present and co-dominant, key to this alliance instead of *Eleocharis*. Stands typically occur in vernal pools or vernaly influenced marshes.

Lasthenia glaberrima* Alliance

Lasthenia glaberrima – *Pleuropogon californicus* Association*

5c. *Eleocharis macrostachya* dominates in the herbaceous layer along lakeshores, streambeds, swales, pastures, ditches, and ponds. *Juncus phaeocephalus* and *J. patens* may also be present. If *Lasthenia glaberrima* or *Pleuropogon californicus* have high cover, key to the *L. glaberrima* Alliance above.

***Eleocharis (acicularis, macrostachya)* Alliance**

Eleocharis macrostachya Association

5d. *Malvella leprosa* characteristically present with *Eleocharis acicularis* and with salt tolerant species such as *Heliotropium curassavicum* and *Phyla nodiflora* in the herbaceous layer. Not sampled but may occur in Santa Clara and Santa Cruz Counties.

***Eleocharis (acicularis, macrostachya)* Alliance**

5e. *Trifolium variegatum* dominates or co-dominates in the herbaceous layer with a variety of other native and non-native herbs such as *Bromus* spp., *Juncus bufonius*, *Lotus* spp., *Plagiobothrys* spp., *Trifolium fucatum*, and others. Stands occur in vernaly wet, shallow swales.

***Trifolium variegatum* Alliance**

Trifolium variegatum Association

5f. *Centromadia pungens* co-dominates with *Hordeum marinum* or other herbs. Stands occur in alkaline vernaly wet areas such as at Soda Lake in Santa Cruz Co.

***Centromadia (pungens)* Alliance**

5g. Halophytes such as *Cressa truxillensis*, *Distichlis spicata*, *Hordeum depressum*, and *Malvella leprosa* characterize the herbaceous layer away from the immediate coast with a variety of other native and non-native herbs such as *Hordeum marinum* and *Frankenia salina*. Stands occur in alkaline vernaly wet pools/playa areas such as at Soda Lake in Santa Cruz Co.

***Cressa truxillensis* – *Distichlis spicata* Alliance**

Section II. Vegetation dominated or characterized by herbaceous species that occupy dry, seasonally moist, and usually well-drained sites that range from interior dry ridges and cliffs to ocean bluffs, dunes, and terraces with cooling summer fog and salty breezes. Stands are not wet or inundated as in Section I above. This group includes native and non-native annual and perennial grasslands, seral herbaceous stands, dry cliff and canyon vegetation, and coastal dune/ bluff vegetation. Dominant, co-dominant, and characteristic taxa include:

Abronia, *Agrostis gigantea*, *A. stolonifera*, *Allium falcifolium*, *Ambrosia*, *Ammophila*, *Anthoxanthum*, *Avena*, *Brachypodium*, *Brassica*, *Briza*, *Bromus*, *Calamagrostis*, *Carpobrotus*, *Centaurea*, *Cynosurus*, *Danthonia*, *Deschampsia*, *Dudleya*, *Elymus elymoides*, *E. glaucus*, *E. multisetus*, *E. luteolum*, *E. nudum*, *Erodium*, *Eryngium armatum*, *Eschscholzia*, *Festuca arundinacea*, *F. californica*, *F. idahoensis*, *Hesperolinon*, *Heterotheca*, *Holcus*, *Hordeum*, *Lasthenia californica*, *Leymus mollis*, *Lolium*, *Melica*, *Mesembryanthemum*, *Nassella*, *Phalaris*, *Plagiobothrys nothofulvus*, *Plantago erecta*, *Pteridium*, *Raphanus*, *Sedum*, and/or *Vulpia*.

6. *Allium falcifolium*, *Dudleya* spp., *E. luteolum*, *E. nudum*, *Polypodium californicum*, *Sedum spathulifolium*, *Selaginella bigelovii*, *Streptanthus glandulosus*, and/or moss and lichen characterize or dominate stands on exposed rock.

Western North American Cliff, Scree & Rock Vegetation Macrogroup

Californian Cliff, Scree & Rock Vegetation Group

6a. Sparsely vegetated herbaceous stands (generally less than 2% absolute cover though may be higher in cover depending on rainfall) characterized by *Allium falcifolium*, *Claytonia exigua*, *Dudleya* spp., *Eriogonum luteolum*, *E. nudum*, *Hesperolinon* spp., *Plantago erecta*, and/or other native herbs growing on steep serpentine barrens with exposed gravel and bedrock.

***Allium* spp. – *Streptanthus* spp. – *Hesperolinon* spp. serpentinite Alliance**

Allium falcifolium – *Eriogonum luteolum* – *Streptanthus* (*batrachopus*, *morrisonii*)
Provisional Association

Streptanthus glandulosus – *Dudleya abramsii* / Lichen – Moss Association

6b. *Sedum spathulifolium* and/or *Polypodium* spp. dominate or co-dominate in small stands on steep north-facing rock outcrops and vertical cliff faces. Moss and lichen species often have high cover.

Sedum spathulifolium* Provisional Alliance

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

6c. The native *Dudleya farinosa* or other *Dudleya* spp. is characteristic, dominant, or co-dominant with herbs such as *Eriogonum latifolium*, *Vulpia bromoides*, and others. Lichen is characteristic and often dominant -- with *Dudleya* sometimes lacking. Often on rocky coastal bluffs, cliffs, headlands, and bedrock outcrops.

Dudleya cymosa* – *Dudleya lanceolata* / Lichen – Moss Alliance

Dudleya farinosa / Lichen – Moss Provisional Association*

6d. *Selaginella bigelovii* dominates or characterizes small stands on rock outcrops, cliff faces, or skeletal soils over gently to steeply sloping, impervious substrates. Moss and lichen species often intermix. Emergent shrubs may be present.

***Selaginella* (*bigelovii*, *wallacei*)**

Selaginella bigelovii / *Eriogonum fasciculatum* Association

7. Perennial forbs such as *Calyptridium monospermum*, *Corethrogyne filaginifolia*, *Eriogonum nudum*, *Erysimum teretifolium*, *Heterotheca sessiliflora*, *Pteridium aquilinum*, *Sidalcea malviflora* or *Viola pedunculata* dominate or co-dominate with other herbs including non-natives, OR two or more of these species are characteristically present in stands, sometimes with high cover of non-native annuals. Habitats include the dry to mesic, sandhills of Santa Cruz Co. and sites recent or seasonal disturbance in both counties. If *Heterotheca sessiliflora* characterizes the stand with mesic herbs such as *Danthonia californica* (which can be at trace cover) and/or non-natives such as *Aira caryophylla*, *Briza maxima*, and *Vulpia bromoides*, **see step 9b**.

Californian Annual & Perennial Grassland Macrogroup

Californian Perennial Grassland Group

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

Chorizanthe pungens – *Eriogonum nudum* var. *decurrens* – *Heterotheca sessiliflora*
Association

Eriogonum nudum Association

Viola pedunculata – (*Eschscholzia californica* – *Nassella pulchra*) Provisional
Association

8. Native and non-native annual forb/grass vegetation AND native perennial grasslands growing within the California Mediterranean climate. Stands are generally found in relatively drier sites than those in the Vancouverian Macrogroups which are more common near the coast (**see step 9**). Includes vegetation characterized by, but not limited to *Amsinckia*, *Avena*, *Brassica*, *Bromus*, *Centaurea*, *Cynosurus*, *Elymus glaucus*, *Eschscholzia*, *Lasthenia californica*, *Lolium*, *Lupinus*, *Melica*, *Nassella*, *Plagiobothrys nothofulvus*, *Plantago erecta*, *Pteridium aquilinum*, and *Vulpia microstachys*.

Californian Annual & Perennial Grassland Macrogroup

8a. Herbaceous vegetation dominated, co-dominated or characterized by native annual forbs and grasses such as *Amsinckia*, *Chorizanthe pungens*, *Eschscholzia*, *Lasthenia californica*, *Holocarpha*, *Lupinus*, *Monardella sinuata*, *Plagiobothrys*, *Plantago erecta*, *Stylocline gnaphaloides*, and *Vulpia microstachys*. Commonly occurring taxa include *Avena*, *Bromus*, *Cryptantha*, *Geranium*, *Dichelostemma*, *Lolium*, and *Vulpia*. Stands are found on upland slopes, flats, and ridges.

8a1. Annual forbs characteristic of sandhills including *Chorizanthe pungens*, *Monardella sinuata*, and *Stylocline gnaphaloides* dominate or co-dominate with a variety of perennials such as *Calyptridium monospermum*, *Erysimum teretifolium*, *Pteridium aquilinum*, OR at least two of the species listed or in the association name are characteristically present. Non-native annuals such *Hypochaeris glabra* and *Vulpia myuros* may be present at high cover.

Californian Perennial Grassland Group

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

Chorizanthe pungens – *Eriogonum nudum* var. *decurrens* – *Heterotheca sessiliflora*
Association

Californian Annual Grassland & Forb Meadow Group

8a1. *Eschscholzia californica*, *Lupinus bicolor*, and/or *L. nanus* dominate or co-dominate with a variety of native and non-native forbs and grasses, sometimes on thin soils with buried rocks.

Eschscholzia (californica) – Lupinus (nanus) Alliance
Bromus hordeaceus – *Lupinus nanus* – *Trifolium* spp. Association
Eschscholzia californica Association
Lupinus bicolor Provisional Association

8a2. *Plagiobothrys nothofulvus* dominates or characterizes the stand and intermixes with a variety of native and non-native forbs and grasses.

Plagiobothrys nothofulvus Alliance
Plagiobothrys nothofulvus – *Castilleja exserta* – *Lupinus nanus* Provisional Association

8a3. *Lasthenia californica*, *Calycadenia* spp., *Hemizonia congesta*, *Hesperervax sparsiflora*, *Lomatium*, *Lotus humistratus*, *Micropus californicus*, *Plantago erecta*, and/or *Vulpia microstachys* dominate individually or in combination as characteristic plants in the herbaceous layer. *Lasthenia californica*, *Plantago erecta*, and/or *Vulpia microstachys* are often present, sometimes with sparse cover.

Lasthenia californica – Plantago erecta – Vulpia microstachys Alliance
Erigeron glaucus – *Lasthenia californica* Association*
Hemizonia congesta – *Lolium perenne* Association
Lasthenia (californica, gracilis) Association
Lasthenia californica – *Plantago erecta* – *Hesperervax sparsiflora* Association
Lotus humistratus – *Plantago erecta* – *Lomatium* spp. Provisional Association*
Micropus californicus Provisional Association*
Plantago erecta – *Lolium perenne* lichen-rocky Association
Vulpia microstachys – *Plantago erecta* Association
Vulpia microstachys – *Plantago erecta* – *Calycadenia (truncata, multiglandulosa)* Association

8a4. *Amsinckia* spp. and/or *Phacelia* spp. dominate or characterize stands with a variety of native and non-native forbs and grasses.

Amsinckia (menziesii, tessellata) – Phacelia spp. Alliance
Amsinckia (intermedia, menziesii) Association

8a5. *Holocarpha heermannii* or *Holocarpha virgata* characteristically present to co-dominant in the herbaceous layer; native herbs typically > 10% relative cover.

Holocarpha (heermannii, virgata) Alliance
Holocarpha heermannii Association*
Holocarpha virgata Association

8b. *Elymus elymoides*, *E. multisetus*, *Melica* spp., and/or *Nassella* spp., all native perennial grasses, are dominant or characteristic in stands, sometimes with equal or greater cover of non-native herbs.

Californian Perennial Grassland Group

8b1. *Elymus elymoides* or *E. multisetus* dominates or co-dominates in stands on serpentine soils, often on southerly exposures. Stands of *Elymus multisetus* with *Eschscholzia californica* and/or *Plantago erecta* were encountered most often in the sites visited for this project; *Dichelostemma capitatum*, *Eriogonum nudum*, *Lotus humistratus*, and *Minuartia douglasii* were also commonly present.

Nassella spp. – Melica spp. Alliance

Elymus multisetus – (*Eschscholzia californica* – *Plantago erecta*) Association

8b2. *Melica californica*, *M. torreyana*, and/or *Nassella* spp. are dominant, co-dominant or characteristic in stands. *Avena*, *Bromus*, *Hemizonia congesta*, *Lolium perenne*, *Plantago erecta* P. *Lanceolata*, and/or *Trifolium* spp. intermix as dominant, co-dominant or characteristic taxa in associations of this alliance. If *Danthonia californica* or *Festuca idahoensis* is co-dominant or characteristic with *Nassella pulchra*, then key to the *Festuca idahoensis* – *Danthonia* alliance.

Nassella spp. – Melica spp. Alliance

Melica californica Association

Melica torreyana Association

Nassella lepida Provisional Association

Nassella pulchra Association

Nassella pulchra – *Avena* spp. – *Bromus* spp. Association

Nassella pulchra – *Corethrogyne filaginifolia* Association

Nassella pulchra – *Hemizonia congesta* Association

Nassella pulchra – *Lolium perenne* – (*Trifolium* spp.) Association

Nassella pulchra – *Lolium perenne* – *Plantago erecta* Serpentine Association

Nassella pulchra – *Melica californica* – annual grass Association

8c. Herbaceous vegetation strongly dominated (typically >85% relative cover) by non-native grasses and forbs such as *Aegilops*, *Avena*, *Brachypodium*, *Brassica*, *Briza*, *Bromus*, *Carduus pycnocephalus*, *Centaurea*, *Cynosurus*, *Danthonia pilosa* (*Rytidosperma penicillatum*), *Erodium*, *Lolium*, *Nassella manicata*, *Pennisetum*, and *Raphanus*. Native herbaceous species have insignificant cover in these stands, especially during the active growing season. Stands are found in foothills, rangelands, fallow fields, woodland openings, riparian areas, and disturbed settings.

Californian Ruderal Grassland, Meadow & Scrub Group

8c1. *Avena*, *Brachypodium*, *Briza*, *Bromus*, *Erodium* and/or *Hypochaeris* dominate individually or in combination. If *Elymus caput-medusae* is co-dominant with *Avena* and/or *Bromus* spp., those stands can also key here. If *Lolium perenne* is co-dominant key to that alliance.

Avena spp. – Bromus spp. Semi-Natural Alliance

Avena barbata – *Avena fatua* Semi-Natural Association

Avena barbata – *Bromus hordeaceus* Semi-Natural Association

Brachypodium distachyon Semi-Natural Association

Briza maxima Provisional Semi-Natural Association*

Bromus diandrus Semi-Natural Association

Bromus diandrus – *Avena* spp. Semi-Natural Association
Bromus hordeaceus – *Erodium botrys* Semi-Natural Association

8c2. *Brassica nigra*, *Raphanus sativus*, *Carduus pycnocephalus*, *Carthamus lanatus*, *Centaurea solstitialis*, *Silybum marianum*, or another non-native forb dominates in the herbaceous layer, often in old or active agriculture lands.

***Brassica nigra* – *Centaurea (solstitialis, melitensis)* Semi-Natural Alliance**

Brassica nigra Semi-Natural Association*

Carduus pycnocephalus – *Silybum marianum* Provisional Semi-Natural Association

Carthamus lanatus Provisional Semi-Natural Association*

Centaurea solstitialis Semi-Natural Association

Raphanus sativus Semi-Natural Association

8c3. *Cynosurus echinatus*, *Danthonia pilosa* (*Rytidosperma penicillatum*), and/or *Nassella manicata* dominate or co-dominate in the herbaceous layer. *Anagallis*, *Avena*, *Lolium*, *Plantago lanceolata*, *Rumex*, and *Vulpia bromoides* are often present.

Cynosurus echinatus* – *Arrhenatherum elatius* Semi-Natural Alliance

Cynosurus echinatus – (*Danthonia pilosa* – *Nassella manicata*) Provisional Semi-Natural Association*

8c4. *Lolium perenne* dominates or co-dominates with *Avena* spp., *Bromus* spp., *Hordeum marinum*, *H. murinum*, *Medicago*, *Trifolium subterraneum*, *Elymus caput-medusa*, and other non-natives in the herbaceous layer. Native species are typically less than 10% relative cover. These invaded stands are often found on moist or poorly drained sites, on or off serpentine.

***Lolium perenne* Semi-Natural Alliance**

Lolium perenne Semi-Natural Association

Lolium perenne – *Bromus hordeaceus* Semi-Natural Association

Lolium perenne – *Hordeum marinum* – *Ranunculus californicus* Semi-Natural Association*

Lolium perenne – *Lotus corniculatus* Semi-Natural Association*

8c5. *Aegilops triuncialis* dominates or co-dominates with *Avena barbata*, *Bromus hordeaceus*, *Lolium perenne*, and other non-natives in herbaceous stands. Often found on dry grasslands with serpentinite parent material.

***Lolium perenne* Semi-Natural Alliance**

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

9. Herbaceous vegetation dominated, co-dominated, or characterized by native or non-native perennial grasses. Stands are generally found in moister settings than those in the California Annual and Perennial Grassland Macrogroup (**see step 8**) and are often coastal. The grasses included are: *Agrostis gigantea*, *A. stolonifera*, *Anthoxanthum*, *Calamagrostis nutkaensis*, *Cortaderia*, *Danthonia californica*, *Deschampsia cespitosa*, *Elymus elymoides*, *E. multisetus*, *Festuca arundinacea*, *F. idahoensis*, *Holcus*, *Hordeum brachyantherum* and/or *Phalaris aquatica*. Note: stands dominated by *Lolium perenne* key out in step 8 above.

9a. *Agrostis*, *Anthoxanthum*, *Cortaderia* spp., *Festuca arundinacea*, *Holcus*, and/or *Phalaris* are dominant, co-dominant, or characteristic in herbaceous stands.

9a1. Non-native, mesic to wet, disturbed pasturelands dominated or co-dominated by the following perennial grasses: *Agrostis gigantea*, *A. stolonifera*, *Festuca arundinacea*, and/or *Phalaris*. If native species are present and co-dominant, key to an alliance dominated or characterized by natives. Found in wet settings, including brackish marshes, meadows, stream terraces, wet pastures, agricultural wetlands, or tidal zones.

Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup

Western North American Ruderal Marsh, Wet Meadow & Shrubland Group

9a1a. *Agrostis gigantea*, *A. stolonifera*, and/or *Festuca arundinacea* dominate or co-dominate in the herbaceous layer. The stands encountered for this project were dominated by *F. arundinacea*, though stands dominated by *Agrostis* may be present in Santa Clara and Santa Cruz Counties.

***Poa pratensis* – *Agrostis gigantea* – *Agrostis stolonifera* Semi-Natural Alliance**

Festuca arundinacea Provisional Semi-Natural Association

9a1b. *Phalaris aquatica* dominates in naturalized or planted stands. Other non-native herbs, such as *Avena barbata* and *Hypochaeris glabra* may be present with low cover.

***Phalaris aquatica* – *Phalaris arundinacea* Semi-Natural Alliance**

Phalaris aquatica Provisional Semi-Natural Association

9a2. Non-native, slightly mesic, disturbed herblands dominated or co-dominated by the following perennial grasses: *Anthoxanthum*, *Cortaderia*, and/or *Holcus*, and/or the following forbs: *Ageratina adenophora*, *Conium maculatum*, *Dipsacus fullonum*, *Dipsacus sativus*, *Echium candicans*, or *Foeniculum vulgare*. If native species are present and co-dominant, key to an alliance dominated or characterized by natives. Found in meadows, moist pastures, agricultural areas, coastal terraces, or coastal bluffs.

Western North American Ruderal Grassland & Shrubland Macrogroup

Southern Vancouverian Lowland Ruderal Grassland & Shrubland Group

9a2a. *Holcus lanatus* and/or *Anthoxanthum odoratum* dominate individually or in combination. Other co-dominants may include *Briza maxima*, *Lolium perenne*, *Plantago lanceolata*, *Rumex acetosella*, and *Vulpia bromoides*.

***Holcus lanatus* – *Anthoxanthum odoratum* Semi-Natural Alliance**

Holcus lanatus Semi-Natural Association

Holcus lanatus – *Anthoxanthum odoratum* Semi-Natural Association*

9a2b. *Conium maculatum*, *Ageratina adenophora*, *Dipsacus fullonum*, *D. sativus*, or *Foeniculum vulgare* dominates herbaceous stands, though various other taxa are likely present.

***Conium maculatum* – *Foeniculum vulgare* Semi-Natural Alliance**

Conium maculatum Semi-Natural Association

Foeniculum vulgare Semi-Natural Association*

Dipsacus (fullonum, sativus) Provisional Semi-Natural Association

9a2c. *Cortaderia jubata* or *Cortaderia selloana* dominates in naturalized stands, sometimes in dense clumps; or other non-native herbs such as *Echium candicans* dominant or co-dominant with *Cortaderia jubata*. Likely to occur in Santa Cruz Co.

Cortaderia (jubata, selloana)* Semi-Natural Alliance

Cortaderia (jubata, selloana) Provisional Semi-Natural Association*

Echium candicans Semi-Natural Association*

9b. Native, mesic to moist, primarily coastal grasslands dominated, co-dominated, or characterized by *Bromus carinatus*, *Calamagrostis nutkaensis*, *Deschampsia cespitosa*, *Danthonia californica*, *Elymus glaucus*, *Eryngium armatum*, *Festuca californica*, *F. idahoensis*, *Heterotheca sessiliflora*, *Hordeum brachyantherum*, and/or *Pteridium aquilinum*. Other species such as *Baccharis pilularis*, *Briza maxima*, *Holcus lanatus*, *Nassella pulchra*, and/or *Vulpia bromoides* commonly intermix in stands. Found in a variety of settings, including dunes, bluffs, meadows, valley bottoms, alluvial slopes, terraces, meadows, and seasonally flooded areas with moderate salinity.

9b1. *Deschampsia cespitosa*, *Danthonia californica*, *Iris douglasiana*, and/or *Eryngium armatum* dominate or co-dominate individually or in combination (if *Holcus lanatus* has the highest cover, but these three species have at least 10% combined cover, key to *Deschampsia*). Settings range from coastal dunes and bluffs to inland plains (e.g., Santa Rosa Plain) to montane meadows.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Freshwater Wet Meadow & Marsh Group

***Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica* Alliance**

Deschampsia cespitosa – *Danthonia californica* Association

Deschampsia cespitosa – *Eryngium armatum* Association*

Deschampsia cespitosa – *Iris douglasiana* Association*

Deschampsia (cespitosa, holciformis) Association*

9b2. *Hordeum brachyantherum* dominates or co-dominates with *Achillea millefolium*, *Distichlis spicata*, *Holcus lanatus*, *Hordeum marinum*, *Lolium perenne*, and/or *Lotus corniculatus* in moist meadows, along stream terraces and coastal bluffs, and near seeps and springs.

Vancouverian Lowland Marsh, Wet Meadow & Shrubland Macrogroup

Vancouverian Freshwater Wet Meadow & Marsh Group

***Deschampsia cespitosa* – *Hordeum brachyantherum* – *Danthonia californica*
Alliance**

Hordeum brachyantherum Lowland Association

9b3. *Calamagrostis nutkaensis* dominates or co-dominates with *Baccharis pilularis*. Other species such as *Carex obnupta*, *Heracleum maximum*, *Holcus lanatus*, *Juncus* spp., *Pteridium aquilinum*, and/or *Rubus ursinus* often intermix in stands.

Southern Vancouverian Lowland Grassland & Shrubland Macrogroup

Southern Vancouverian Shrub & Herbaceous Bald, Bluff & Prairie Group

***Calamagrostis nutkaensis* Alliance**

Calamagrostis nutkaensis Association*

Calamagrostis nutkaensis – *Carex (obnupta)* – *Juncus (patens)* Association

Calamagrostis nutkaensis / *Baccharis pilularis* Association*

9b4. *Festuca idahoensis*, *F. californica*, *F. rubra* and/or *Danthonia californica* dominate or characterize stands. *Nassella pulchra* may be co-dominant. *Bromus carinatus*, *Elymus glaucus*, *Plantago erecta*, and a variety of native and non-native forbs and grasses may intermix as sub-dominants. *Festuca*, *Danthonia* or *Perideridia kelloggii* and other native species share at least 10% relative cover in the herb layer, with other non-native grasses and forbs sometimes having higher cover (e.g., *Briza maxima*, *Cynosurus echinatus*, *Hypochaeris radicata*, *Plantago lanceolata*, and *Vulpia bromoides*). Occasionally, the larger *Festuca californica* may replace *F. idahoensis* in somewhat shadier or less exposed sites, or occasionally *Heterotheca sessiliflora* may be dominant and/or co-dominant with other forbs and grasses including mesic herbs such as *Danthonia californica* (which can be at trace cover) and/or non-natives such as *Aira caryophyllea*, *Briza maxima*, and *Vulpia bromoides*.

***Festuca idahoensis* – *Danthonia californica* Alliance**

Danthonia californica – *Nassella pulchra* Association

Perideridia kelloggii – *Danthonia californica* Provisional Association

Danthonia californica Coastal Association

Festuca californica Association*

Festuca idahoensis – (*Danthonia californica* – *Koeleria macrantha*) Association

Festuca idahoensis – *Nassella pulchra* Provisional Association*

Festuca idahoensis Ultramafic Provisional Association*

Festuca rubra Association*

Heterotheca sessiliflora – *Danthonia californica* Provisional Association*

9b5. *Bromus carinatus*, *Elymus glaucus*, *Pteridium aquilinum* and/or *Thermopsis californica* dominate or co-dominate near meadows, in forested openings, and on elevated flats. *Achillea millefolium*, *Bromus hordeaceus*, *Geranium dissectum*, *Rumex acetosella*, and *Vulpia bromoides* are often present.

***Bromus carinatus* – *Elymus glaucus* Alliance**

Bromus carinatus Association

Elymus glaucus Association

Pteridium aquilinum – Grass Association

Thermopsis californica – *Bromus carinatus* – Annual Brome Association*

10. Coastal dune, bluff, meadow, cliffs, rock outcrops, and other vegetation dominated by herbaceous species such as *Abronia*, *Ambrosia*, *Ammophila*, *Armeria maritima*, *Artemisia pycnocephala*, *Carpobrotus*, *Dudleya*, *Erigeron glaucus*, *Eriogonum latifolium*, *Eriophyllum staechadifolium*, *Fragaria chiloensis*, *Leymus mollis*, and *Mesembryanthemum*.

10a. Native species, including *Abronia latifolia*, *Ambrosia chamissonis*, *Artemisia pycnocephala*, *Leymus mollis*, *Lathyrus littoralis*, and/or other herbs, are characteristic to dominant on dunes or coastal bluffs. Plants are adapted to salt spray, wind and shifting sands and are thus capable of colonizing relatively unstable and sterile substrates.

Pacific Coastal Beach & Dune Macrogroup

10a1. *Leymus mollis* dominates or is characteristically present in the herbaceous layer. *Abronia*, *Ambrosia chamissonis*, *Artemisia pycnocephala*, *Cakile*, and other herbaceous species may be present as sub-dominants.

North Pacific Maritime Dune & Coastal Beach Group

***Leymus mollis* Alliance**

Leymus mollis – *Abronia latifolia* – (*Cakile* spp.) Association

10a2. *Abronia latifolia*, *Ambrosia chamissonis*, *Calystegia soldanella*, and/or *Lathyrus littoralis* are characteristically present to dominant, sometimes with *Armeria maritima*, *Camissonia cheiranthifolia*, *Cardionema ramosissimum*, *Poa douglasii*, or *Polygonum paronychia* occurring as associated species. Non-native species such as *Cakile maritima*, *Carpobrotus* spp., and *Ammophila arenaria* may also be present.

Californian Coastal Beach & Dune Group

***Abronia latifolia* – *Ambrosia chamissonis* Alliance**

Ambrosia chamissonis Association

Ambrosia chamissonis – *Abronia umbellata* Association

Abronia latifolia – *Calystegia soldanella* – *Lathyrus littoralis* Association

10a3. *Armeria maritima*, *Artemisia pycnocephala*, *Erigeron glaucus*, *Eriophyllum staechadifolium*, *Eriogonum latifolium*, and/or *Fragaria chiloensis* dominate or characterize stabilized dunes, sea bluffs and exposed coastal terraces. Shrubs such as *Baccharis pilularis*, *Lupinus arboreus*, *L. versicolor*, and *Rubus ursinus* may be present at low cover. Other native forbs and grasses may be present including *Achillea millefolium*, *Angelica hendersonii*, *Bromus carinatus*, *Daucus pusillus* and/or *Dudleya* spp.

Californian Coastal Beach & Dune Group

***Eriophyllum staechadifolium* – *Erigeron glaucus* – *Eriogonum latifolium* Alliance**

Armeria maritima – *Plantago (maritima)* Provisional Association*

Artemisia pycnocephala Association

Erigeron glaucus – *Fragaria chiloensis* Association

Eriogonum parvifolium Association*
Eriophyllum staechadifolium – *Eriogonum latifolium* Association

10a4. *Ericameria ericoides*, *Lupinus chamissonis*, and/or other coastal bluff scrub are dominant or subdominant in the shrub layer, while psammophytic herbs as noted in 10a above are also often present.

***Lupinus chamissonis* – *Ericameria ericoides* Alliance**
Lupinus chamissonis Association
Lupinus chamissonis – *Ericameria ericoides* Association

10b. Open rocky coastal bluffs and cliffs where native *Dudleya farinosa* or other *Dudleya* spp. and/or lichen or moss characteristic, dominant or co-dominant with herbs such as *Eriogonum latifolium*, *Vulpia bromoides*, and others.

Western North American Cliff, Scree & Rock Vegetation Macrogroup

Californian Cliff, Scree & Rock Vegetation Group

Dudleya cymosa* – *Dudleya lanceolata* / Lichen – Moss Alliance
Dudleya farinosa / Lichen – Moss Provisional Association*

10c. Non-natives, including *Ammophila*, *Cakile*, *Carpobrotus*, and/or *Mesembryanthemum* strongly dominate at >80% relative cover on dunes, bluffs, or disturbed lands. Emergent shrubs such as *Baccharis pilularis* or *Lupinus arboreus* may be present.

North Pacific Coastal Ruderal Grassland & Shrubland Macrogroup

North Pacific Maritime Coastal Ruderal Dune Group

10c1. *Ammophila arenaria* is strongly dominant in the herbaceous layer.

***Ammophila arenaria* Semi-Natural Alliance**
Ammophila arenaria Semi-Natural Association
Baccharis pilularis / *Ammophila arenaria* Semi-Natural Association*

10c2. *Carpobrotus* and/or *Mesembryanthemum* dominate on bluffs, dunes, or disturbed lands, often forming impenetrable mats that prevent natives from establishing.

***Mesembryanthemum* spp. – *Carpobrotus* spp. Semi-Natural Alliance**
Carpobrotus (edulis) Semi-Natural Association

10c3. *Cakile edentula* and/or *C. maritima* are strongly dominant along active beaches at the debris line.

***Cakile (edentula, maritima)* Provisional Semi-Natural Alliance**
Cakile (edentula, maritima) Provisional Semi-Natural Association