National Park Service
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Natural Resource Stewardship and Science

Vegetation Classification and Mapping Project Report, Pinnacles National Monument

Natural Resource Report NPS/SFAN/NRR—2012/574



ON THE COVER
Upper Left: Pinnacles Rock outcrop. Upper Right Blue Oak Woodland
Lower Left: Riparian Forest. Lower Right: Spikemoss community)
Photographs by: Park Crews

Vegetation Classification and Mapping Project Report, Pinnacles National Monument

Natural Resource Report NPS/SFAN/NRR—2012/574

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Abstract

Between 2003 – 2008, the vegetation within a study area of 18,210 hectares (44,997 acres) that encompasses the Pinnacles National Monument (PINN), a quarter-mile buffer and several additional parcels of interest adjacent to the Park was mapped. The map was produced from photo interpretation of 2003 and 2005 natural color and 2002 color infrared digital 1 meter NAIP imagery orthophotos. In 2003 and 2004 Park staff collected vegetation and environmental data from 591 relevés to support the map and classification. Assessment of map accuracy entailed sampling of 766 additional data points in 2008.

Multivariate analysis of the 2003-2004 plot data revealed 67 National Vegetation Classification (NVC) plant associations, alliances or Park special vegetation types within the Monument and environs. Of these, 45 are described at the plant association level; seven others are described at the alliance level. The remaining 22 are described as 'Park specials' because they occur only in small stands and appear to be unique to the Monument. The vegetation of the mapping project area is relatively diverse, including 50 NVC alliances. Chaparral, oak woodlands and dry herbaceous areas dominate the vegetation, accounting for ~35 associations.

A total of 6,141 map polygons representing 34 vegetation map classes (including tree and shrub cover attributes), fourteen land use map classes and 7 miscellaneous classes were developed for the PINN vegetation mapping project. Of the 6,141 mapped polygons, 115 were assigned both a land use class and a vegetation class. The average polygon size across all map classes is 3 ha (7.3 acres). Natural and semi-natural vegetation classes cover 17,953 ha (44,362 acres), or 98.6% of the project area. Land use polygons, including ranch developments, agriculture and Park facilities cover 250 ha (617 acres), or 1.4 % of the project area. Final overall map Producer accuracy is 84.4% (Kappa correction = 83.1%). Final overall map User accuracy is 78.0% (Kappa correction = 75.6%).

Summary

The San Francisco Bay Area Inventory and Monitoring Network of the National Park Service worked with the support of the National Vegetation Inventory Program (NVIP) to describe and map vegetation at Pinnacles National Monument (PINN). This collaborative effort involved Aerial Information Systems, the California Native Plant Society, the Western Region office of NatureServe and Park service staff and their cooperators.

The mapping area is 18,210 hectares (44,997 acres), encompassing the entire Monument and a quarter-mile buffer 13,606 ha (33,621 acres), with several additional parcels of interest adjacent to the Park and buffer area known as the "expanded area" adding an additional 4,604 ha (11,376 acres). Ecologists and photo interpreters worked together to identify plant associations for PINN and determine how best to map them using 2003 and 2005 natural color and 2002 color infrared digital 1 meter National Agriculture Imagery Program (NAIP) imagery orthophotos. Ancillary data used included topography, fire history, prescribed burns, past vegetation maps, current features (pig fence, trails, roads) and geological maps. Data input (digitizing the linework) of the mapping was completed using a 1:2000 scale. The field team collected vegetation and environmental data from 591 vegetation classification plots (relevés). Assessment of map accuracy entailed sampling of another 766 data points. Fieldwork and mapping were completed between 2003 and 2008.

Analysis of the 2003-2004 plot data revealed 67 National Vegetation Classification plant associations, alliances or Park special vegetation types within the Monument and environs.

Photo interpretation was conducted through an on-screen heads-up digitizing method using ArcMap. The study area was divided into several modules. The individual modules were interpreted using the primary and supplemental imagery, reconnaissance and relevé data, and other ancillary data, including elevation contours and fire history. Each polygon was assigned the appropriate attribute code string (mapping classification types, conifer, hardwood and shrub percent cover, and land use).

A total of 6,141 map polygons representing 34 vegetation map classes (including tree and shrub cover), 14 land use map classes and 7 miscellaneous classes were developed for the PINN vegetation mapping project. Of the 6,141 mapped polygons 115 were assigned to both a land use class and a vegetation class. Average polygon size across all map classes is 3 ha (7.3 acres). Natural and semi-natural vegetation classes cover 17,953 ha (44,362 acres), or 98.6% of the project area. Land use polygons including ranch developments, agriculture and Park facilities cover 250 ha (617 acres), or 1.4 % of the project area.

Final overall map Producer accuracy is 84.4% (Kappa correction = 83.1%). Final overall map User accuracy is 78.0% (Kappa correction = 75.6%). Eleven map classes did not meet the 80% standard. However, in every case but three, the 90% confidence interval includes 80%, so Monument staff deemed the results to be acceptable. Map classes 3300, 3330, and 3360 (California Coastal Scrub Shrubland Macrogroup, California Wild Buckwheat Shrubland Alliance and Black Sage Shrubland Alliance, respectively) were <80% in User accuracy, and

were retained because they were all >90% in Producer accuracy. These are described in detail in the Accuracy Assessment section of this report, along with the justification for retaining them.

Products resulting from the PINN vegetation mapping project in hard copy and on CD:

- project summary of methods and results
- dichotomous field key to the vegetation associations and alliances
- hierarchical key to map classes
- illustrated guide to the vegetation map classes
- detailed descriptions of vegetation associations
- samples of field forms
- geodatabase containing map polygon attribute
- ground photography of vegetation plots and accuracy assessment points in digital formats
- all field data (plot/relevé and accuracy assessment points) stored in a Microsoft Access database
- hard copy vegetation maps
- metadata for all digital products

Vegetation Classification and Mapping Project, Pinnacles National Monument

The National Park Service (NPS), in partnership with the U.S. Geological Survey (USGS), has implemented a program to "develop a uniform hierarchical vegetation methodology" at a national level. The program will also create a geographic information system (GIS) database for the Parks under its management. The purpose of the data is to document the state of vegetation within the NPS service area, thereby providing a baseline study for further analysis at the Regional or Service-wide level.

Several parks, representing different regions, environmental conditions and vegetation types, were chosen to be part of the prototype phase of the program. The initial goal of the prototype phase is to "develop, test, refine, and finalize the standards and protocols" to be used during the production phase of the project. This includes the development of a standardized vegetation classification system for each park and the establishment of photo interpretation, field and accuracy assessment procedures.

Pinnacles National Monument (referred to as the Park or PINN) is one of the post-prototype parks in the NPS Western Region selected for mapping. The Park is located in the Gabilan Range of west-central California east of Monterey (Figure 1). It is a rugged to rolling mountain environment with many canyons and several stream valleys with varied geology from volcanic (including ash, breccia, rhyolite) to granitic and alluvial surfaces. The vegetation types include riparian woodlands, oak woodlands, wetlands, grasslands, cryptogams, chaparral and coastal sage scrub. Rural development occurs on the fringes of the Park.

Aerial Information Systems (AIS) was contracted by the National Park Service (NPS) to create a map of the Park vegetation resource through photo-interpretation (PI), automation and accuracy assessment. NPS contracted with NatureServe and the California Native Plant Society (CNPS) for the development of the National Vegetation Classification System (NVCS) classification for the Park. The Park staff conducted the 2003-2004 field sampling effort to support the development of the vegetation classification. CNPS was also contracted to collect AA field data.

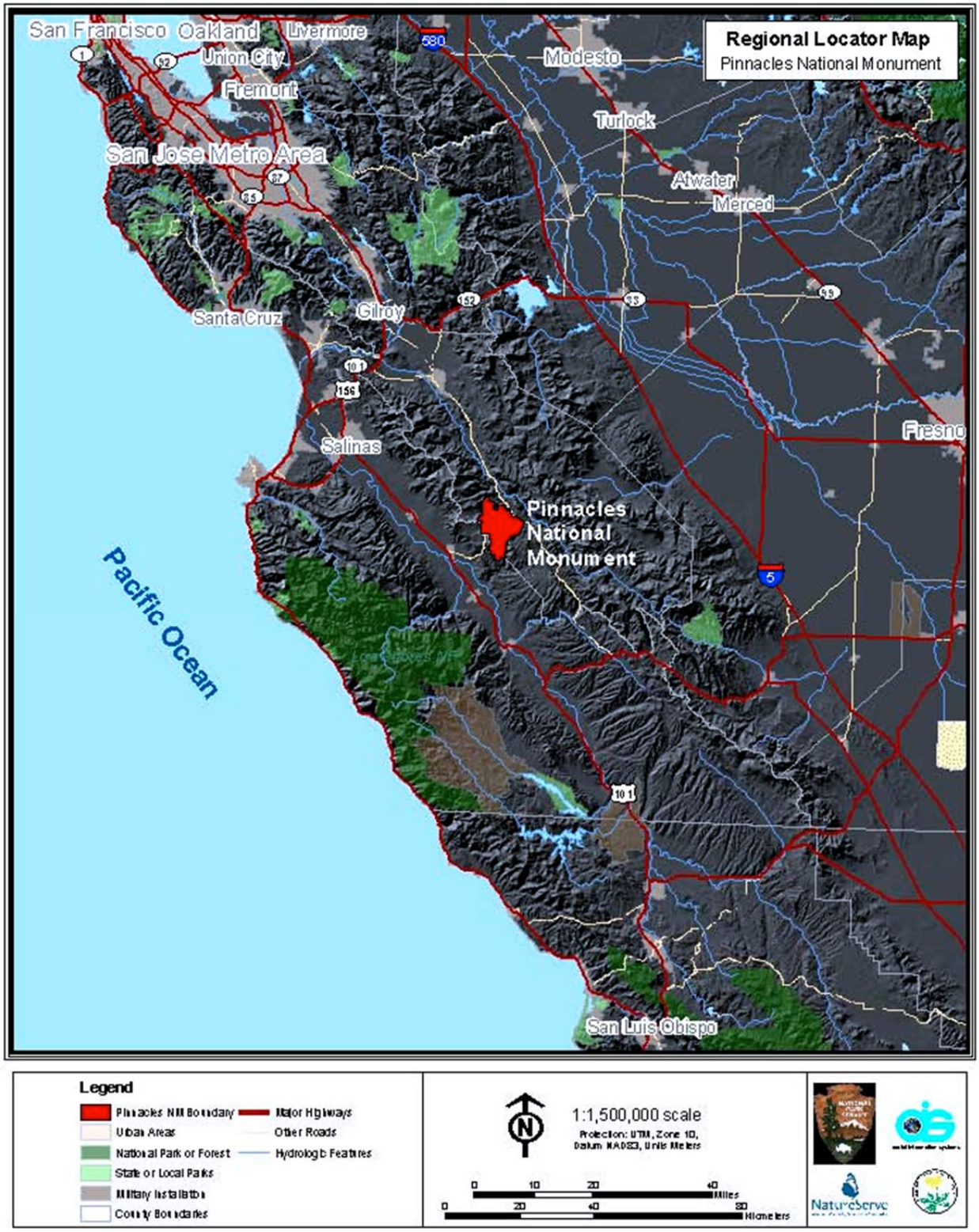


Figure 1. Location of Pinnacles National Monument in Central California.

The purpose of this project was to describe and map existing vegetation on 18,210 hectares (44,997 acres), within PINN and its environs, and to provide this information in written, tabular, digital and spatial formats useful to Monument resource managers, the California Native Plant Society, Department of Fish and Game and others. The basic project components consist of a classification and description of the Monument's vegetation and a spatial database encompassing an interpretation of the vegetation from aerial imagery.

Project methods, results and products are documented in this report. This introductory section describes the National Vegetation Inventory Program, as well as the PINN mapping project area. Later sections document the methods and results for each of the major steps in the project: scoping, vegetation classification and description, vegetation mapping, and map accuracy assessment.

The National Vegetation Inventory Program

The National Vegetation Mapping Program (NVIP)is a cooperative effort between the National Park Service (NPS) and the United States Geological Survey (USGS) to inventory, classify, describe and map vegetation in more than 270 national park units within the United States. Consistent vegetation classification, mapping and accuracy assessment protocols and standards are applied across projects supported by this program which was formerly known as the USGS-NPS Vegetation Mapping Program. The NVIP's mission is to produce high-quality plant community classification, standardized maps and associated data sets of the vegetation occurring within park boundaries. NVIP products are important for park management and have a variety of natural resource applications including plant species and community conservation, monitoring for insects and disease effects, wildlife habitat relationships, and the effects of wildland fires. Vegetation classification and mapping products produced by this program are served by both the USGS (http://www.usgs.gov/core_science_systems/csas/vip/index.html) and the NPS (http://science.nature.nps.gov/im/inventory/veg/products.cfm).

San Francisco Bay Area Network Inventory and Monitoring Program

The National Park Service developed an inventory and long-term monitoring program for park natural resources over the last two decades of the twentieth century. This effort was enhanced by the NPS Natural Resource Challenge (NPS 1999). The San Francisco Bay Area Network (SFAN) encompasses eight park units, five of which contain natural resources: Golden Gate National Recreation Area, John Muir National Historic Site, Muir Woods National Monument, Pinnacles National Monument and Point Reyes National Seashore. In addition there are three Historic Parks: Eugene O'Neil National Historic Site, Fort Point and Presidio of San Francisco.

The goals of Inventory and Monitoring networks are inventory the natural resources under NPS stewardship to determine their nature and status; monitor park ecosystems to better understand their dynamic nature and condition and to provide reference points for comparisons with other, altered environments; establish natural resource inventory and monitoring as a standard practice throughout the National Park system that transcends traditional program, activity, and funding boundaries; integrate natural resource inventory and monitoring information into NPS planning, management, and decision making; share NPS accomplishments and information with other natural resource organizations and form partnerships for attaining common goals and objectives.

Plant Communities

Numerous biotic and abiotic factors have altered and continue to threaten plant communities within SFAN. As plant communities continue to recover from past resource extraction, over grazing, the cessation of Native American activities and suppression of wildfires, there is a need to understand how current activities are effecting this recovery. It is also important to monitor and evaluate changes to the composition of plant communities and type changes occurring on the landscape. The monitoring program proposed assimilates multiple vital signs including invasive plant species, threatened and endangered plant species, wetlands, grassland plant communities, oak woodlands and plant species at the edge of their range. There are also significant ties between plant community change and almost all of the faunal indicators being monitored such as land birds, Northern spotted owls, endangered butterflies, etc.

Monitoring Objectives

Park objectives for monitoring include: 1) Develop and maintain a list of priority plant communities based on their rarity and degree of protection, 2) Detect long-term trends in native and non-native abundance and distribution within selected plant communities and 3) Detect changes in overall vegetation cover, vegetation type and species composition of selected SFAN plant communities.

A goal of the NPS I&M Program is to complete baseline inventories of biological and geophysical resources for each park unit. These inventories cover 12 basic data sets needed by park staff to guide resource management. Vegetation classification and mapping constitute one of these data sets. Early in the development of its I&M program, in addition to assisting park management, vegetation maps and classification information were seen as contributing significantly to long-term monitoring efforts.

Vegetation Inventory Program Standards

The NPS I&M Program established guidance and standards for all vegetation mapping projects in a series of documents. Listed below are the protocols and standards that were current at the time of this project.

Protocols

- National Vegetation Classification System (TNC and ESRI 1994a, NatureServe 2003a)
- Field methods and mapping procedures (TNC and ESRI 1994b, CNPS 2003)
- Statistically rigorous accuracy assessment procedures (ESRI and TNC 1994)
- Guidelines for using existing vegetation data (TNC 1996)

Standards

- National Vegetation Classification Standard (FGDC 2008)
- Spatial Data Transfer Standard (FGDC 1998b)
- Content Standard for Digital Geospatial Metadata (FGDC 1998a)

- United States National Map Accuracy Standards (USGS 1999)
- Integrated Taxonomic Information System
- Program-defined standards for map attribute accuracy and minimum mapping unit

These documents are available on the USGS-NPS Vegetation Program Web site (http://www.usgs.gov/core_science_systems/csas/vip/index.html). Since this project was initiated, many of the protocols and standards have been updated to incorporate "lessons learned". For the most current list of protocols and standards, see http://science.nature.nps.gov/im/inventory/veg/Guidance.cfm

National Vegetation Classification Standard

The National Vegetation Classification (NVC) is the system used in SFAN vegetation mapping projects (TNC and ESRI 1994a), and is based on the National Vegetation Classification Standard adopted by the Federal Geographic Data Committee (FGDC 2008). The NVC evolved from work conducted primarily by The Nature Conservancy (TNC), NatureServe and the Natural Heritage Program network over more than two decades (Grossman et al. 1998). The structure of the NVC is based in part on an earlier international vegetation classification developed by the United Nations Educational, Cultural and Scientific Organization (UNESCO 1973, Driscoll et al. 1984). Use of a standardized classification system helps to ensure data compatibility throughout the National Park Service and other agencies. The FGDC Vegetation Subcommittee works to keep this standard current and relevant. In fact the use of Macrogroup and Group for mapping hierarchy is from the newly adopted NVC standard (FGDC 2008).

Vegetation classification systems attempt to recognize and describe repeating assemblages of plants in similar habitats. The NVC is a hierarchical system that incorporates physiognomic, climatic and other abiotic characters and floristic data to define eight levels of terrestrial vegetation classification. The six upper levels (class, subclass, formation, division, macrogroup and group are based on physiognomic features. The two lower levels (alliance and association) are distinguished by differences in floristic composition. The physiognomic units have a broad geographic perspective and the floristic units have utility in local and site-specific applications (Grossman et al. 1998, FGDC 2008). The physiognomic levels of the NVC are based on physical, structural and environmental characteristics identifiable from satellite imagery, aerial photography or ground observations (Table 1). Specific criteria defining these physiognomic units are based on ecologic characteristics that vary among major vegetation groups (FGDC 2008).

The alliance and association levels form the base of the NVC hierarchy and are determined by the most abundant or diagnostic species comprising the various layers of a homogenous vegetation community. An association is here defined as a plant community type with a consistent species composition, uniform physiognomy and similar habitat conditions (Flahault and Schroter 1910). Species composition differentiates associations (TNC and ERSI 1994a). An alliance is "a physiognomically uniform group of plant associations sharing one or more dominant or diagnostic species which, as a rule, are found in the uppermost strata of the vegetation." (Reid and Comer 1998). NatureServe coordinates plant association data for the

NCPN vegetation mapping projects. Associations are added to the NVC and older concepts are refined as new data become available.

Other Standards

In addition to vegetation classification, the FGDC sets standards for map spatial accuracy and for metadata employed in NPS vegetation mapping projects. Standards for map products stipulate map scales of 1:24,000 or finer, and minimum polygon size of 0.5 ha (1.24 acres). Positional accuracy for vegetation maps must meet National Map Accuracy Standards, which specify horizontal errors of less than 10.2 m (33.5 ft.) on the ground for 1:12,000-scale maps.

All digital vegetation products resulting from this project are accompanied by FGDC-compliant metadata. Metadata are "data about the data" and describe the content, quality, condition and other characteristics of the spatial dataset. Metadata are critical elements that expedite the interpretation and exchange of information among users.

This project also employed the CNPS Rapid Assessment Vegetation Sampling Protocol, as seen through the following link: http://www.cnps.org/programs/vegetation/protocol.htm. This technique was selected in addition to the standard accuracy assessment sampling protocol and the relevé sampling protocol used regularly by the National Park vegetation program because of its ability to represent large numbers of vegetation stands quickly, thus increasing the sample size and range of sampling locations for all types of vegetation. The rapid assessment protocol was expected to be an efficient way to assess many dense and difficult to penetrate stands of chaparral and coastal scrub, where the species indicative of particular ecological settings are primarily in the shrub layer and not in the understory herb and grass layer. It was used extensively in virtually all types of vegetation in this project except for the species-rich riparian, oak, and other hardwood woodlands; coastal sage scrub; and grasslands in which relevés were used to augment the samples. The diversity of species and the more significant variation of understory species in these situations require a full sample of all species present to more accurately classify and understand the variations in these types of vegetation. For a thorough explanation of the protocol see appendix A.

Table 1. National Vegetation Classification Hierarchy (FGDC 2008).

Hierarchy Level	Criteria	Example
Upper: Physiognomy plays a predominant role.		
L1 – Class	Broad combinations of general dominant growth forms adapted to basic temperature (energy budget), moisture, and/or substrate or aquatic conditions.	1.Forest and Woodland
L2 - Subclass	Combinations of general dominant and diagnostic growth forms that reflect global macroclimatic factors driven primarily by latitude and continental position, or that reflect overriding substrate or aquatic conditions.	1.C .Temperate Forest
L3 – Formation	Combinations of dominant and diagnostic growth forms that reflect global macroclimatic factors as modified by altitude, seasonality of precipitation, substrates and hydrologic conditions.	1.C.1. Warm Temperate Forest
Middle: Both floristics and physiognomy play a significant role.		
L4 – Division	Combinations of dominant and diagnostic growth forms and a broad set of diagnostic plant taxa that reflect biogeographic differences in composition and continental differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.	1.C.1.c. Madrean Forest
L5 – Macrogroup	Combinations of moderate sets of diagnostic plant species and diagnostic growth forms that reflect biogeographic differences in composition and subcontinental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes.	California Forest and Woodland **MacroGroup**
L6 – Group	Combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes	California Coastal Closed-Cone Conifer Forest and Woodland **Group**
Lower: Floristics plays a predominant role**.**		
L7 – Alliance	Diagnostic species, including some from the dominant growth form or layer, and moderately similar composition that reflect regional to subregional climate substrates, hydrology, moisture/nutrient factors and disturbance regimes.	Foothills Pine Woodland **Alliance**
L8 – Association	Diagnostic species, usually from multiple growth forms or layers, and more narrowly similar composition that reflect topo-edaphic climate, substrates, hydrology and disturbance regimes.	*Pinus sabiniana / Eriogonum fasciculatum* Alluvial Woodland

Project Study Area – General Description

Pinnacles National Monument was created by the National Park Service on January 16, 1908. The Park occupies about 26,000 acres of land in the Gabilan Range of central California. Over 16,000 acres of the Park is set aside as designated wilderness. The Park functions as a regional recreation area. Visitors to the Park may hike on trails, climb rock walls, explore the talus caves or use the campground and picnic facilities.

The study area for the project consists of 44,997 acres and consists of two tiers. The first tier (Park and buffer area) includes lands within the Park boundary as well as a quarter-mile buffer around the Park. The second tier (expanded study area) includes several areas of interest, of varying sizes, adjacent to the Park and buffer (Figure 2).

The outermost study area boundary varies in shape and distance from the Park boundary. The north end of the study area mainly follows Sandy Creek in Bickmore Canyon. The northeast side varies from a quarter-mile to a half-mile east of State Highway 25. The southeast and south portions of the study area follow the quarter-mile Park boundary buffer. The southwest contains the largest part of the expanded study area, which straddles State Highway 146. It extends irregularly outside the Park and buffer as far as the edge of the Salinas River floodplain, up to four miles east of the Park boundary. The northwest edge of the study area varies up to a half-mile outside the Park boundary, with a westward extension into and as far as the western end of Gloria Valley.

The Pinnacles National Monument project study area contains three main ecologic or geomorphologic areas:

- Region 1 - The West
- Region 2 - The Northeast
- Region 3 – The South

The following is a brief and general description of the major regions and their associated vegetation types:

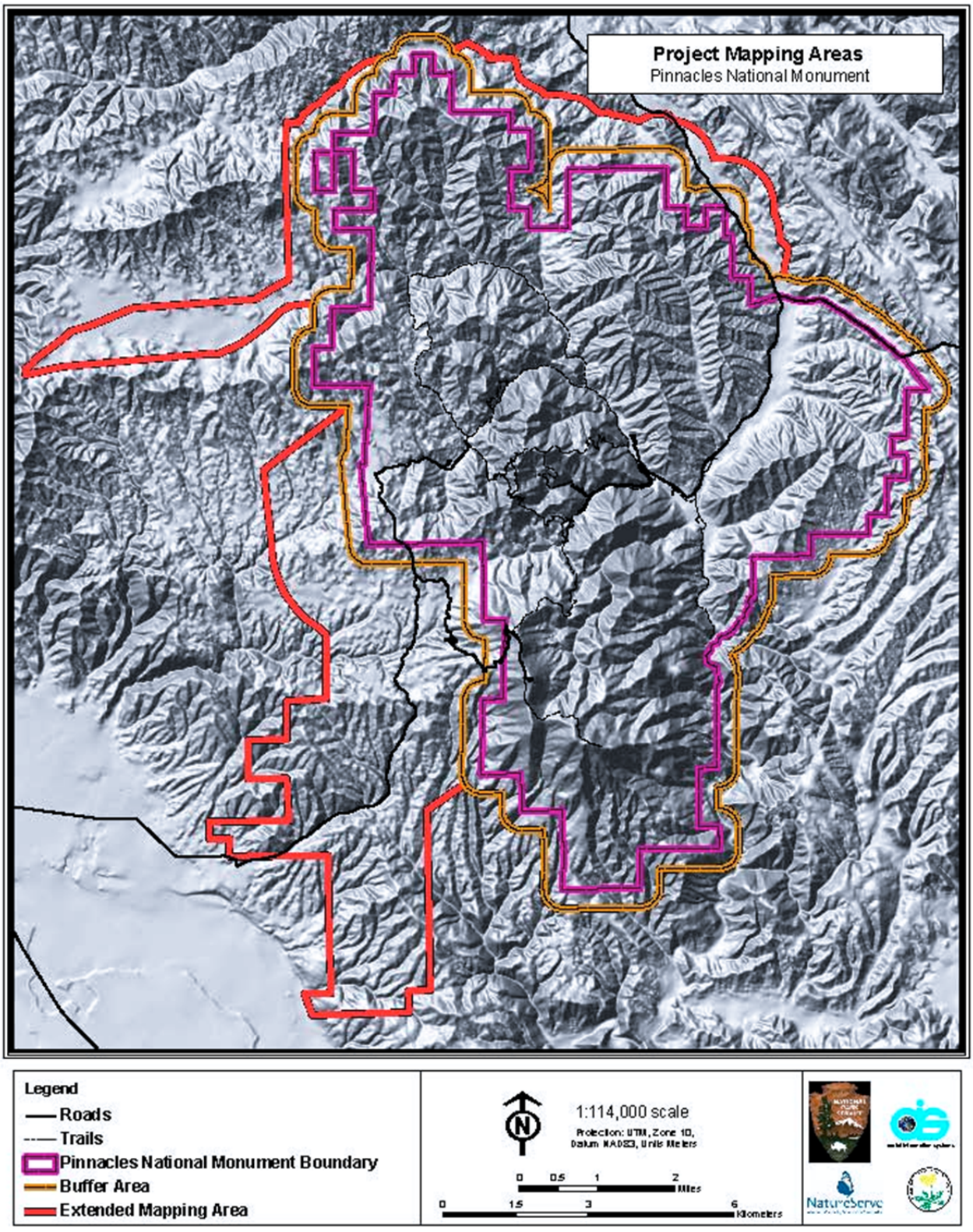


Figure 2. Mapping Project Boundaries.

Region 1 – The West

The West region is bounded on the east by the backbone, or major north-south ridgeline, of the Park formed by the Pinnacle Rocks and North and South Chalone Peaks. The southern part of the ridgeline divides the Miners Gulch watershed from the Chalone Creek watershed. The northern ridgeline continues past the Pinnacles to Chalone Creek, then up to the Sandy Creek-Chalone Creek watershed ridgeline, then westward along the ridge. The boundary continues westward to the edge of the study area. Of the three regions, the West is most affected by the fog that moves in from the west. The fog may be low and linger against the western hills, or it may move upward and over the pinnacle and peak divide, or along stream valleys that cut through the divide.

The West can be divided into four sub-areas: the Pinnacle Rocks, the West slope of the Chalone Peaks/Pinnacle Rocks, Gloria Valley and the Southwest Hills of the Expanded Area.

The Pinnacle Rocks are a series of very large jagged irregular volcanic rock outcrops, towers and pinnacles running in a general northeast to southwest trend. The rock faces have little to no vascular vegetation. The shallow to deep concavities between the pinnacles can be densely to sparsely vegetated. The rock faces and convexities contain xeric environments where bare rock is exposed to the light and heat of the sun. The mesic environments are in the shady concavities, north-facing slopes and bottoms where the water from seeps, runoff and streams gather. The vegetation of the Pinnacles consists of forests, woodlands, chaparral and coastal sage scrub. Mesic trees include coast live oak, interior live oak, blue oak, California buckeye and California juniper. Foothill pine is present in both mesic and xeric environments. Mesic shrubs include hollyleaf cherry, birchleaf mountain-mahogany, toyon, California ash, California scrub oak, pointleaf manzanita and Pacific poison-oak. Xeric shrubs include chamise, buckbrush, bigberry manzanita, California wild buckwheat and silver lupine. Bushy spikemoss may also be present in drier environments.

The West slope of Chalone Peaks/Pinnacle Rocks is the steep, generally west-facing slope from the Chalone Peaks and Pinnacles down to the edge of the lower more gently sloping and rolling hills. This area is steep and fairly rugged, with a number of short steep canyons and draws. The vegetation consists mainly of blue oak woodland, coastal sage scrub, and chaparral. Trees present include blue oak, foothill pine and California juniper. Chaparral shrubs include chamise, buckbrush, hollyleaf cherry, toyon and birchleaf mountain-mahogany. Coastal sage scrub shrubs include California wild buckwheat, coastal sagebrush and black sage. Bushy spikemoss may also be present in drier, rockier environments.

Gloria Valley is a westward narrow extension of the study area along Chalone Creek. It is a wide east-west trending valley centered on the creek. It is relatively flat with low rolling hills to the south. There are several small dammed ponds or reservoirs along the creek. The valley is mainly dry grassland, with wet meadows near the creek. Some of the water bodies contain inundated vegetation. Riparian trees and shrubs consisting of red willow, arroyo willow and mule's-fat occur along the creek. The trees are mainly valley oak and coast live oak, with some blue oak. Recent disturbance has resulted in regenerating chaparral shrubs and coastal sage scrub in the low hills of this region.

The Southwest Hills sub-area is a series of low hills and canyons between the Salinas Valley floodplain and the Park. The vegetation consists mainly of chaparral and coastal sage scrub, with some blue oak woodland and grassland on the uplands and coast live oak woodland, shrub riparian, and grassland on the lowlands. Blue oak, coast live oak, foothill pine and California juniper are present in the woodlands. Chaparral shrubs include chamise, buckbrush, hollyleaf cherry, birchleaf mountain-mahogany and toyon. The coastal sage scrub consists of combinations of coastal sagebrush, California wild buckwheat and black sage. Riparian shrubs include arroyo willow, mule's-fat and California wildrose. The herbs Douglas' sagewort and dragon wormwood may also be present in the flat terraces adjacent to the creeks.

Region 2 - The Northeast

The Northeast region is bound by the Pinnacle Rock areas on the west and the Bear Gulch/Bear Valley lowlands on the south. The north and east boundaries go out to the edge of the study area. The Northeast can be divided into six sub-areas: Bickmore Canyon, the Northeast Dry Chaparral, the Highway 25 Corridor, Old Pinnacles Mixed Chaparral, North Chalone Creek and Bear Gulch-Bear Valley.

Bickmore Canyon is an east-west trending canyon at the north end of the study area. It is centered on Sandy Creek, which flows eastward. The study area covers only the north-facing southern side of the canyon. The vegetation is composed of coast live oak woodland, shrub riparian, blue oak woodland, pine woodland, chaparral and some coastal sage scrub. Trees present include coast live oak, valley oak, and foothill pine on the valley bottom, and blue oak and foothill pine on the slopes. The riparian shrubs consist of arroyo willow and mule's-fat. Chaparral shrubs include chamise, buckbrush, hollyleaf cherry, birchleaf mountain-mahogany and California scrub oak. Coastal sage scrub consists primarily of California wild buckwheat and woolly yerba santa on the flat valley bottom.

The Northeast Dry Chaparral sub-area occupies one of the largest portions of the study area. It features a series of alternating ridges and canyons along the north and east side of Chalone Creek. It is composed mainly of chaparral and coastal sage scrub containing chamise, buckbrush, bigberry manzanita, pointleaf manzanita, black sage, California wild buckwheat and bushy spikemoss. Small isolated stands of mesic shrubs, consisting of hollyleaf cherry, birchleaf mountain-mahogany and toyon, are present. Some mesic canyon bottoms contain coast live oak, blue oak and foothill pine.

The Highway 25 Corridor is mainly composed of two parts. East of the highway the terrain is fairly gentle to flat, with residences, farm buildings, and fenced grassy rangeland. West of the highway are residences, farm buildings, woodlands and chaparral. The east side rangeland contains grasslands as well as blue oak woodlands and riparian trees and shrubs. The easternmost hills of the study area contain blue oak woodlands, coastal sage scrub and chaparral. On the west side of the highway are a series of spur ridges and canyons or draws. The spurs are primarily composed of chaparral with coastal sage on southern exposures. The canyon bottoms and north slopes contain oak woodlands. Sandy alluvial washes run down the bottom of the canyons and fan out at the mouth of the canyons. The trees in this region include coast live oak, blue oak and foothill pine in the canyons. The riparian trees include polished willow, Fremont cottonwood and valley oak. The flat valley bottom contains valley oak, coast live oak and blue oak. Chaparral shrubs include chamise, buckbrush, bigberry manzanita and pointleaf manzanita. Riparian shrubs

present are mule's-fat, arroyo willow and California wildrose. Coastal sage scrub in this area is primarily composed of California wild buckwheat and black sage on hillsides, with silver lupine and California wild buckwheat on alluvial washes and fans.

The Old Pinnacles Mixed Chaparral sub-area lies south and west of Chalone Creek, north of Bear Gulch, and east of the Pinnacle Rocks. It is composed of minor canyons and ridges. The vegetation is a diverse mixture and mosaic composed of woodlands, mesic chaparral and xeric chaparral. The woodlands contain coast live oak, blue oak, interior live oak, California buckeye, California juniper and foothill pine. Mesic chaparral shrubs present include hollyleaf cherry, California scrub oak, toyon, California ash, birchleaf mountain-mahogany and hollyleaf redberry. Xeric chaparral shrubs include chamise, buckbrush, bigberry manzanita and pointleaf manzanita. California wild buckwheat, black sage and bushy spikemoss are also present within the chaparral.

The North Chalone Creek riparian corridor runs from west of Black Canyon eastward and southward to Bear Gulch-Bear Valley. The trees consist of blue oak along the toeslopes and side canyons, coast live oak within the floodplain and side canyons, and foothill pine within the floodplain, side canyons and toeslopes. Mesic shrubs, including hollyleaf redberry, Pacific poison-oak, and birchleaf mountain-mahogany, occupy shaded toeslopes. Riparian trees, including red willow and Fremont cottonwood, occupy the wetter areas along the stream channel. Riparian shrubs consisting of mule's-fat, arroyo willow, sandbar willow and California wildrose occur within the floodplain, especially along the stream channel. Other short shrubs and herbs, including California wild buckwheat, silver lupine, Douglas' sagewort, dragon wormwood, California poppy and common deerweed, also occur on the floodplain terraces.

The Bear Gulch-Bear Valley area is divided into two parts, Bear Gulch and Bear Valley. Bear Gulch is a narrow northeast-southwest trending canyon to the west of Chalone Creek and east of the Pinnacle Rocks. It has rather steep sideslopes. The valley bottom supports riparian trees and shrubs consisting of coast live oak, California sycamore, red willow, California buckeye, arroyo willow and Pacific poison-oak. The north-facing slopes contain blue oak, California buckeye, hollyleaf cherry, hollyleaf redberry, California ash, toyon and buckbrush. The south-facing slopes contain blue oak, chamise, buckbrush, California wild buckwheat, coastal sagebrush and black sage. Bear Valley is a wide valley containing a campground and several abandoned residences and farm buildings. The valley bottom is composed of grasslands, with valley oak, coast live oak and blue oak occurring in sparse stands or clusters. The riparian corridor contains red willow, Fremont cottonwood, California sycamore, valley oak, arroyo willow, mule's-fat, coyote brush, California wildrose and Pacific poison-oak. Sparsely vegetated floodplain terraces contain foothill pine, California wild buckwheat, silver lupine, ragworts, dragon wormwood, Douglas' sagewort and California poppy. The north-facing slopes contain side canyons of coast live oak, blue oak and foothill pine, with adjacent chaparral and coastal sage scrub composed of chamise, buckbrush and California wild buckwheat. The south-facing slopes contain primarily chaparral composed of chamise and buckbrush, with side canyons of coast live oak, blue oak, foothill pine, silver lupine and California wild buckwheat. McCabe Canyon also contains unique stands of valley oak, coast live oak and deergrass.

Region 3 - The South

The South region is bounded on the north by Bear Gulch-Bear Valley; Highway 25, Rosas Canyon, Horse Valley, and Chalone Creek on the east; and the Miners Gulch watershed and the North and South Chalone Peaks ridgeline on the south and west. The South is divided into four sub-areas: the Mount Defiance-Frog Creek area, the Far South, South Chalone Creek and the Eastern Extension.

The Mount Defiance-Frog Creek sub-area is very rugged with steep canyons and ridges that form the bulk of the South Region. Its vegetation is composed primarily of chaparral, with blue oak woodland on lower eastern slopes, pine woodlands scattered on lower and upper slopes, and coastal sage scrub on steep south-facing slopes. A riparian corridor runs along Frog Creek. Trees include blue oak, foothill pine, interior live oak and California juniper. Chaparral consists of chamise, buckbrush, hollyleaf cherry, California ash, toyon, birchleaf mountain-mahogany, bigberry manzanita and pointleaf manzanita. Coastal sage scrub shrubs include California wild buckwheat and black sage. Riparian corridors include coast live oak, California sycamore and foothill pine. Rocky outcrops occur in many parts of the area, including steep cliffs along Frog Creek and on ridgetops.

Large areas of this part of the Park burned within the last ten years. The post-fire vegetation consists of open to very sparse stands of regenerating shrubs with some grasses, and/or herbaceous vegetation. Shrub species include common deerweed, woolly yerba santa, the unusual Gray bushmallow, tree poppy, black sage and California Wild Buckwheat.

The Far South is composed primarily of low hills and canyons. Chaparral, coastal sage scrub and grasslands are the main vegetation, with woodlands in the canyon bottoms. Chaparral consists of chamise and buckbrush. Coastal sage scrub is composed of black sage, California wild buckwheat and coastal sagebrush. The woodlands are composed of coast live oak, blue oak and foothill pine.

The South Chalone Creek riparian corridor runs along a north-south trend on the east side of the region. Unique to the north end of the corridor are valley oak, coyote brush and sandbar willow. The entire corridor contains a mixture of Fremont cottonwood, red willow, California sycamore, coast live oak and foothill pine. Shrubs include arroyo willow, mule's-fat and California wild buckwheat.

The Eastern Extension is a series of rolling hills and valleys wedged between Bear Valley on the north and Chalone Creek on the west. Agriculture, including residences, farm buildings, vineyards and grassy rangeland, are located along the eastern side of Highway 25. Blue oak woodlands also occur on the hills opposite Highway 25 from the main body of the Park. The vegetation in the main part of the area is composed primarily of chaparral, with woodlands on the north and east side. The shrubs are composed of chamise, buckbrush, California scrub oak, hollyleaf cherry, black sage and California wild buckwheat. The woodlands are composed of coast live oak, blue oak and foothill pine.

Previous Vegetation Studies

In 1983 the National Park Service Denver Regional Office interpreted 1:12,000 color infrared aerial photography (flown in August 1983) to the 1976 Park Boundary. Vegetation cover types were coded from aerial photographs (Figure 3).

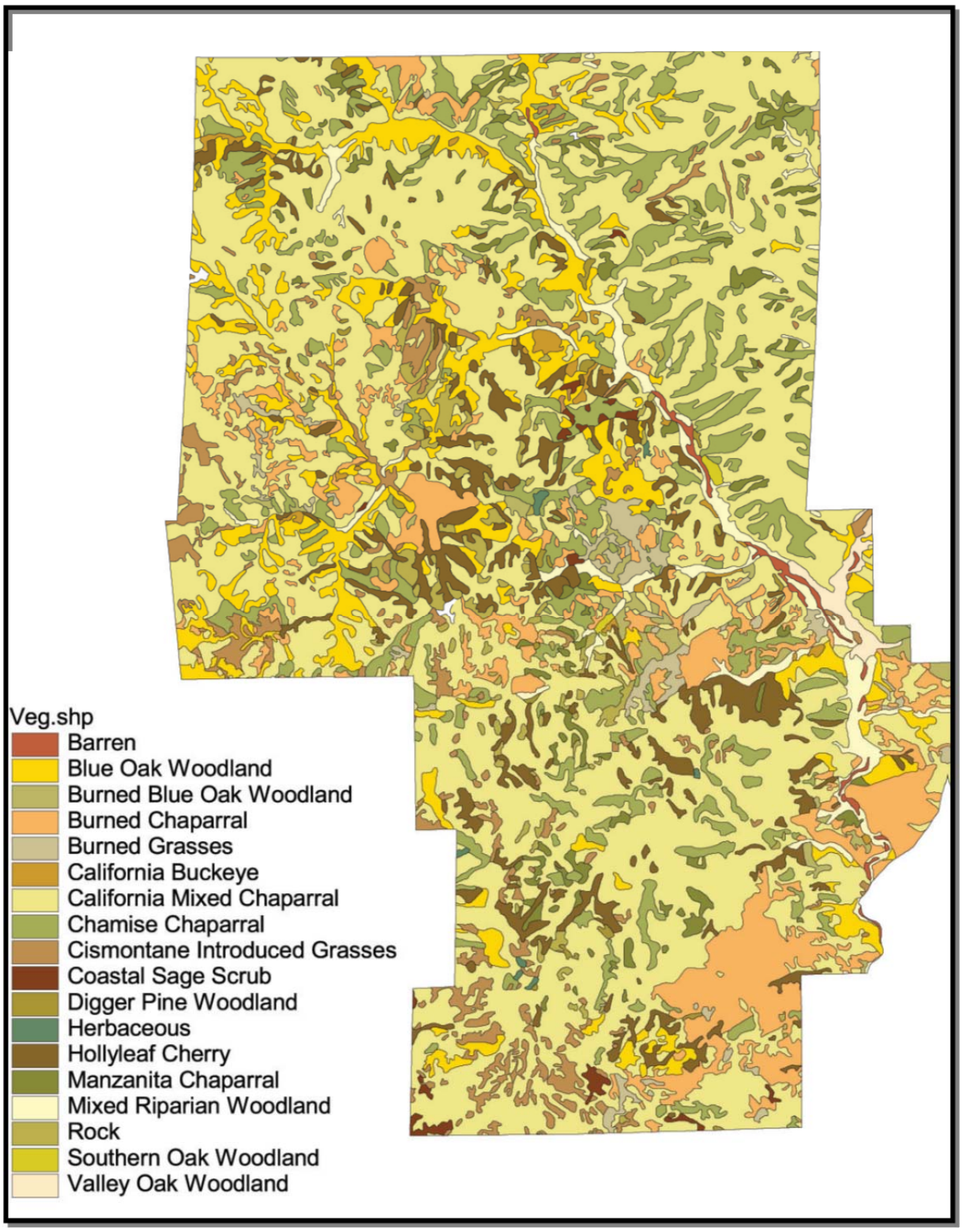


Figure 3. 1983 Vegetation Map.

General Approach and Timeline

The following section is a short outline, listed in chronological order, of the vegetation mapping effort at Pinnacles National Monument (PINN).

2003 -- Following NPS and California Native Plant Society protocols, in 2003, 256 relevé plots were collected to throughout the Monument's total 24,600 acres.
2004 -- In 2004, an additional 335 relevés were collected on portions of the 2,000 acres of land that previously comprised the Kingman Ranch and is now held by The Nature Conservancy for NPS purchase. Additional relevé data were collected to capture vegetation types not sampled in 2003. University of Montana conducted mapping with Landsat imagery.
2005 -- University of Montana, Wildlife Spatial Analysis Lab completed a vegetation map with 11 classes
2006 -- Park acquires more funding to complete vegetation association classification and a more detailed map. California Native Plant Society (CNPS) and NatureServe are contracted conduct vegetation classification and plant association descriptions. AIS is contracted to produce a more detailed map of the current vegetation. Fall 2006 to winter 2007 Vegetation analysis and classification gets under way.
2007 -- ***March*** Initial Meeting and Park Tour, Preliminary photo interpretation mapping classification compiled.
May First photo interpretation field reconnaissance
June Second photo interpretation field reconnaissance
August Begin photo interpretation, mapping and quality control of vegetation delineations and attribution.
October First field verification
November Second field verification. Field meeting with AIS, CNPS and NatureServe, key to association's field tested.
2008 -- ***January-June*** Final mapping classification for photo interpretation. Completion of photo interpretation, mapping and quality control of vegetation delineations and attribution.
July – Sept Field crew training by CNPS, NatureServe and AIS, and field work conducted to collect AA points.
Sept. – Dec AA data entered into database.
2009-- ***January – Feb*** AA data analyzed, map validation, AA statistics generated and final map production.
March- June Final report
2012—*September* Report formatted, edited with programmatic updates, and published

Vegetation Classification and Description

Pre-Field Methods

Preliminary Classification List

Park staff with the assistance of California Native Plant Society compiled a list of alliances expected to be found in the Park. Previous botanic surveys and floristic information for PINN, the Monument's plant species list, and expert local knowledge were used to refine the list. This process resulted in a preliminary list of alliances for the vegetation mapping project area. This alliance list was a useful gauge for estimating and planning field work and for assigning provisional alliance names to vegetation plots (relevés).

Legacy Data Review

Prior vegetation work at Pinnacles was not available for primary review for this project. Knowledge of habitats from rare plant surveys was the basis for the preliminary alliance list. The vegetation classification presented in this report was derived from new field data collected specifically for the PINN vegetation mapping project.

Field Methods

The primary purpose of gathering relevé data was to document the composition and structure of PINN vegetation and associated environmental conditions. These data became the basis for classifying the vegetation at the Park. Field methods used in this project followed California Native Plant Society Relevé Protocol (2002). Data gathered during this project contributed to understanding vegetation relationships across broader landscapes beyond the boundaries of the Park. Plot forms and individual data field descriptions appear in Appendix A & B. Throughout this report the terms ‘relevé’ and ‘plot’ are used interchangeably.

Field Sampling Approach

The sampling area included the entire Monument as well as newly acquired lands in the environs. Private lands in the environs as well as private in-holdings within the Monument were not visited. Because the project area is large, complex, and access can be logistically complex, the areas to be sampled were selected to capture the dominant vegetation types in 2003. At the end of the season, a list of alliances yet to be visited provided the basis for sampling in 2004, and to ensure that all major environmental settings were visited and a good spatial dispersion of sample plots was achieved.

Field crews used their knowledge of the Parks phytogeography. Some of the crew members were very familiar with the flora; two had spent the 2002 field season searching the Park for plant species not listed in the Park’s inventory. The crew visited known representative stands of the dominant alliances. As the season progressed, and the crew became more familiar with the Park, more stands were selected based on field observation. Stands were chosen as likely sampling candidates when they met the criteria of compositional integrity and structural homogeneity. In 2003-2004, an effort was made to sample all known alliances several times. Relevés were placed to best represent the vegetation by summarizing the species composition, cover and structure of the entire stand. Some common associations were sampled more often and some rare types were

sampled less often. An effort was made to achieve good spatial distribution of relevés across the landscape and to capture the full range of variation of each association.

Relevé Data Collection

Field crews located relevés subjectively within stands or map segments in order to best represent the alliance being sampled. Ecotones (areas where two or more plant communities intermix) were avoided. Highly disturbed areas were also avoided unless they covered several hectares. Relevés were generally located in stands exceeding the minimum mapping unit (MMU) of 0.5 hectares. A few areas sampled were smaller patches of distinctive vegetation or communities of rare species, such as scree slopes and riparian terraces. Plot size and shape requirements were consistent with California Native Plant Society Relevé Protocol (CNPS 2002). Plot size was determined by the physiognomy of the community being sampled (Table 2). PINN plot shape was adjusted as needed to sample linear bands of vegetation in drainage bottoms. Plot size and shape were recorded for all relevés.

Table 2. Relevé sizes used for vegetation classification sampling at PINN.

Vegetation Class	Area (m^2)	Radius (m) (for circular plots)
Forest and Woodland	1000	17.6
Shrubland	400	11.3
Grasslands	400	11.3
Herbaceous	100	5.6
Sparse Rock	100	5.6

Within each relevé, field staff estimated and recorded an array of vegetation and environmental data using the field forms in Appendix B and data definitions in Appendix A. Four categories of data were collected for vegetation plots (Table 3):

- location and plot identifiers
- environmental description
- vegetation description
- other information

Location and Plot Identifiers

PINN staff requested that the vegetation plot locations not be permanently marked. The bounds of each plot were marked temporarily using measuring tapes. The Universal Transverse Mercator (UTM) coordinates at the center of each plot were recorded (Zone 10N, NAD83) on Trimble or Garmin hand-held GPS receivers. Other data fields documenting the location of each plot are listed in Table 3 and are described in detail in Appendix C. Locations were recorded on topographic maps during each field trip to avoid duplication of effort and ensure that the Monument was adequately sampled.

Table 3. General plot data categories and specific data components collected at each vegetation classification plot.

Plot Data Category	Data Components
Location and Plot Identifiers	Plot code, Park name, site name, quad name, GPS unit, GPS file ID, UTM coordinates, 3D differential, survey date, surveyor names, directions to plot, site location notes, photograph documentation
Environmental Description	Slope, aspect, topographic position, landform, geology, Cowardin wetland type, ground cover, soil texture, soil drainage, evidence of disturbance and animal use, and their intensity
Vegetation Description	Height and cover of all strata, cover by species, physiognomic type, provisional association name, certainty of provisional name id
Other Information	Narrative description of the setting of the plot; describes adjacent communities, note unusual ecological processes, continue descriptions from other narrative fields, vegetative trend, phenology, sensitive species

Environmental Description

The physical characteristics of each plot were documented in both categorical and narrative fields (Table 3; Appendix A). These included topographic site features (elevation, slope, aspect, topography), hydrology, geology, and soils. Characterization of the ground surface was made by estimating the cover of rocks, sand, litter, bare soil and biological soil crust. A narrative field was provided for a general description of the plot setting and the influence of physical factors on the vegetation.

Vegetation Description

Every vascular plant species in each plot was assigned to one of 3 height classes (low, medium and tall) (Appendix A & B). Moss, lichen and *Selaginella bigelovii* were also included in the species abundance tally. Consistent and repeatable cover estimates were obtained by relating the area occupied by an individual species to the area of the entire plot. When it was not possible to identify a species in the field, plant material was collected and pressed for later identification. Provisional alliance names were assigned to each plot using the preliminary alliance list and professional judgment.

Other Information

Field crews were encouraged to record general observations on how well the plot represented the stand, the relationship of site conditions to vegetative patterns, characteristics of adjacent vegetation, and site disturbance history. The overall character of the vegetation and features of each plot were recorded in four color digital photographs taken in the four cardinal directions.

Data Processing and Analysis

Five hundred ninety-one vegetation plots (relevés) were collected within the mapping project area during the 2003 and 2004 field seasons (Figure 4). Plot data were manually entered into a FileMaker database developed by Park staff. The 2,360 digital images were stored in a photograph database.

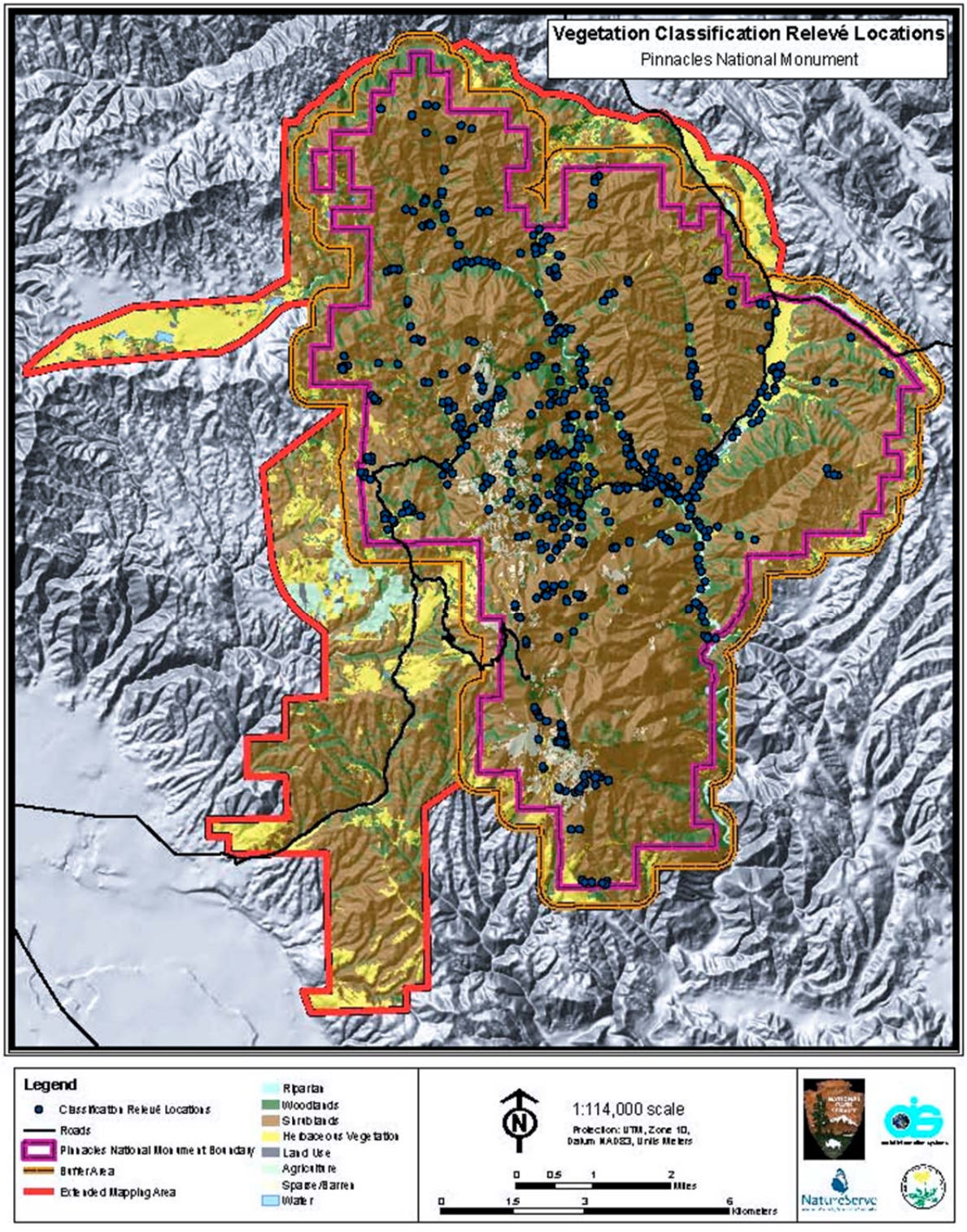


Figure 4. Location of the relevé sample points used to classify the vegetation.

Classification Data Analysis

Data Preparation

Data were exported from FileMaker format and imported into an MS Access database. Staff combined canopy cover for non-tree species that were recorded in more than one height category within a single plot. This eliminated "pseudo-species" and represented the species' total abundance within a plot. Eleven tree species remained in the data set as pseudo-species: low (seedlings), medium (sapling) and tall (mature) by taxa (see Appendix E]). Other data preparation included standardization of moss and lichen naming conventions. Some crews could identify moss genera or species, other crews could not. To make the data consistent, all moss and liverwort species were combined and coded as 'Bryophyte' and all lichens as 'Lichen'. These values where combined within the plot regardless if they were at a low height (on the ground or rocks) or medium height (on woody vegetation). The spikemoss, *Selaginella bigelovii,* was kept as a valid taxon in the database. One relevé data sheet was lost, so that data point was removed.

Multivariate Analysis

Vegetation classification was accomplished through a multivariate analysis of vegetation plot data. Canopy cover classes were used in all data analysis procedures. Species cover data were exported in list format from the Access database, then imported into PC-Ord (McCune and Mefford, 1999). Exploratory multivariate statistical analyses (summary statistics, outlier analysis, Bray-Curtis ordination, cluster analysis and Indicator Species Analysis (ISA)) were used with the objectives of summarizing the compositional and structural characteristics of the plant communities and assessing possible spatial patterns related to environmental gradients.

The data set consisted of 590 plots and 614 taxa. To reduce noise and detect ecological patterns, 363 species that never occur with more than 1% cover in the entire dataset were removed. This left 251 taxa for additional analyses. The plot data were then evaluated for outliers, which potentially distort the matrix. Outlier analysis revealed 28 plots in the PINN data set with an average distance greater than two standard deviations. As is often the case in heterogeneous ecological datasets, these outliers represent uncommon and therefore under sampled vegetation types. The outliers were retained in subsequent analyses. An initial cluster analysis (McCune and Mefford 1999) suggested about 30 potential groups, using the "25% information remaining" point as an arbitrary cut point. To explore whether these 30 groups represented real ecological units, an Indicator Species Analysis (Dufrêne and Legendre 1997) was conducted on the dataset and divided it into 2 to 50 groups as sorted by the cluster analysis. The object of ISA is to find the number of groups that maximizes the number of significant indicators while minimizing the p value. Figure 5 shows two points that met these criteria: 7 groups and 13 groups.

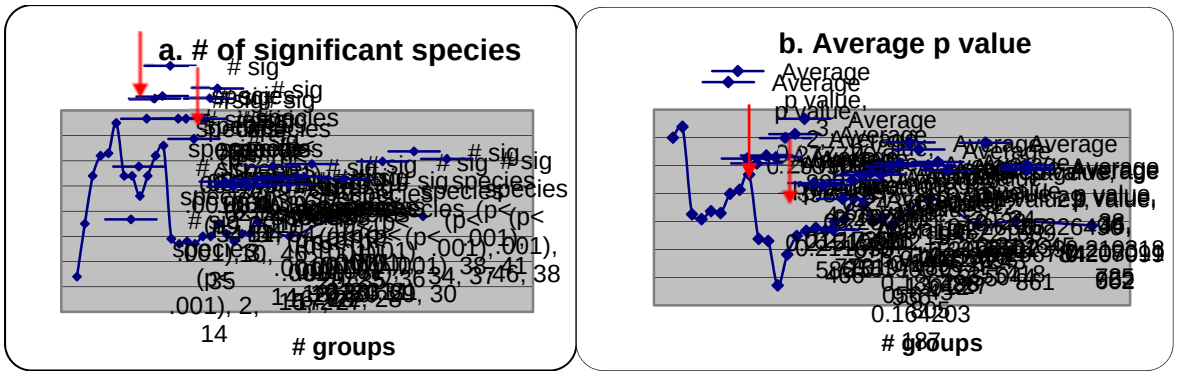


Figure 5. Indicator Species Analysis on 590 plots. (a) number of significant species per group and (b) average p value per group. Both seven and 13 groups had the highest number of significant species per group, and the lowest average p value.

Because about 13 groups appeared to be potentially significant in both the initial cluster analysis and the ISA, we re-ran the indicator species analysis for 13 groups and inspected the results. Thirteen groups appeared to represent twelve ecologically meaningful groups, such as Blue oak woodlands and chamise chaparral shrublands however, one group was large, with 243 plots, and no significant indicator species. We ran a second ISA with 15 groups, but had the same result, that is, one large group with no indicator species. We ran a second indicator species analysis on this group. For this second set, with 20 groups, we had the greatest number of indicator species, and the lowest average p values (running the same analysis as shown in figure 5, but not illustrated here). This gave us ecologically meaningful groups such as cottonwood woodlands and *Cerocarpus* chaparral shrublands. However, again there was one large group of 130 plots with no indicator species. We ran a third ISA on this last group, and teased out an additional 14 ecological meaningful groups. Table 4 shows these three ISA results, with their indicator species and number of plots per group.

Table 4. Indicator Species Analysis on 1) the full dataset of 590 plots, 2) the group of remaining 242 plots with no indicator species from first ISA, 3) the group of 130 plots with no indicator species from second ISA.

ISA #1	**(590 plots)**	**ISA #2**	**(243 plots)**	**ISA #3**	**(130 plots)**
# plots	**Significant Indicator Species (p = 0.001)**	**# plots**	**Significant Indicator Species (p = 0.001)**	**# plots**	**Significant Indicator Species (p = 0.001)**
72	*Adenostoma fasciculatum*	5	*Artemisia dracunculus*	5	*Avena fatua*
12	*Aesculus californica*	3	*Baccharis pilularis*	16	*Baccharis salicifolia*
24	*Ceanothus cuneatus* var. *cuneatus*	12	*Cercocarpus betuloides* var. *betuloides*	3	*Eriogonum elongatum*
45	*Eriogonum fasciculatum* var. *foliolosum*	10	*Datisca glomerata*	2	*Eschscholzia californica*
18	Lichens	7	*Erodium brachycarpum*	71	Herbaceous and Scree
18	*Prunus ilicifolia* ssp. *ilicifolia*	15	*Fraxinus dipetala-Ceanothus cuneatus-Prunus ilicifolia*	6	*Juncus balticus*
39	*Quercus agrifolia* var. *agrifolia*	11	*Juniperus californica*	10	Lichens - with many non-native herbs
22	*Quercus douglasii*	8	*Mimulus aurantiacus*	9	*Lupinus albifrons* var. *albifrons*
8	*Rosa californica*	11	*Pinus sabiniana*	11	*Pinus sabiniana*

ISA #1	(590 plots)	ISA #2	(243 plots)	ISA #3	(130 plots)
14	*Salix laevigata*	3	*Polypogon interruptus*	2	*Quercus wislizeni* var. *wislizeni*
23	*Salvia mellifera*	3	*Populus fremontii* ssp. *fremontii*	4	*Rubus ursinus-Populus fremontii-Salix laevigata*
7	*Sedum spathulifolium*	4	*Quercus berberidifolia* - with other chaparral shrubs	6	*Salix lasiolepis*
45	*Selaginella bigelovii*	5	*Quercus berberidifolia* - with several herbaceous species	2	*Vulpia myuros*
243	None	2	*Rhamnus ilicifolia*	7	*Vulpia octoflora**
		4	*Symphoricarpos albus* var. *laevigatus*		*Not significant, but representative
		6	*Vulpia bromoides-Plagiobothrys canescens*		
		130	None		

Each of the resultant groups were subjected to additional cluster analyses, ordinations and tabular analysis (Mueller-Dombois and Ellenberg 1974) to determine whether they could be further subdivided. We repeated these analyses on subsets of each group until the smallest units remaining corresponded approximately to NVC alliances and associations or closely related groups of alliances and associations.
Because the PINN plots are intended to fit into an existing national classification instead of a stand-alone, site specific classification, the analysis techniques described above were used in combination with our ecological experience and the plot environmental data to assign plots to preliminary associations. Some of the more difficult groups, including chaparral shrublands and sparse scree-slope plant communities, were compared with plots from other California Parks. The association assignment for each plot was made on the basis of multiple factors, not merely on its position in a cluster analysis or ordination.

California Native Plant Society and NatureServe ecologists reviewed the preliminary classification, with each plot association assignment, and made adjustments when needed to ensure consistency with NVC concepts. NatureServe was also responsible for deciding whether to add new associations to the NVC or assign unusual types to a “Park Special” category. The final classification was issued by NatureServe in 2007.

Classification Results

The vegetation data collected for the PINN mapping project was classified into 67 community types (Table 5). Of these, 45 are described at the plant association level; seven others are described at the alliance level but lacked sufficient information to justify creating new associations. The remaining 22 are described as ‘Park specials’ because they occur only in small stands and appear to be unique to the Monument. Park special types are not assigned to NVC associations or alliances. The vegetation of the mapping project area is relatively diverse, including 50 NVC alliances. Chaparral, oak woodlands and dry herbaceous areas dominate the vegetation, accounting for ~35 associations.

Each association, alliance, or Park special is represented by at least one and as many as 35 plot samples (Table 5). Types with only one plot may have been rare in the Park, or were simply under sampled as a result of difficult access or limitations of the sampling design. Many of the types that appeared to be rare after the initial sampling were found to be more common during accuracy assessment. Range-wide (Global) and Park specific (Local) descriptions of NVC plant associations, their component alliances and Park special association local descriptions can be found in Appendix C.

Table 5. Vegetation Classification of Alliances, NVC Plant Associations and Park Specials from 590 sample plots at Pinnacles National Monument.

Alliance	NVC CODE	Association Scientific Name	Association Common Name	#Plots
FOREST and WOODLAND				
Aesculus californica Woodland Alliance	CEGL005302	*Aesculus californica / Toxicodendron diversilobum* / Moss Woodland	California Buckeye / Pacific Poison-oak / Moss Woodland	12
Juniperus californica Wooded Shrubland Alliance	Park Special	*Juniperus californica / Prunus ilicifolia* / Moss Woodland	California Juniper / Hollyleaf Cherry / Moss Woodland	7
Pinus sabiniana Woodland Alliance	Park Special	*Pinus sabiniana / Eriogonum fasciculatum* Alluvial Woodland	Foothill Pine / California Wild Buckwheat Alluvial Woodland	5
	Park Special	*Pinus sabiniana / Ceanothus cuneatus - Rhamnus ilicifolia* Woodland	Foothill Pine / Sedgeleaf Buckbrush - Hollyleaf Redberry Woodland	7
Quercus agrifolia Woodland Alliance	Park Special	*Quercus agrifolia - Aesculus californica* Woodland	Coast Live Oak - California Buckeye Woodland	4
	CEGL002861	*Quercus agrifolia* / Annual Grass - Forb Woodland	Coast Live Oak / Annual Grass - Herb Woodland	2
Quercus douglasii Woodland Alliance	CEGL005313	*Quercus douglasii - Pinus sabiniana / Cercocarpus montanus* var. *glaber* Woodland	Blue Oak - Foothill Pine / Birchleaf Mountain-mahogany Woodland	4
	CEGL008647	*Quercus douglasii - Pinus sabiniana* / Grass Woodland	Blue Oak - Foothill Pine / Grass Woodland	8
	Park Special	*Quercus douglasii / Juniperus californica* Woodland	Blue Oak / California Juniper Woodland	5
	CEGL005314	*Quercus douglasii* / Mixed Herbaceous Woodland	Blue Oak / Mixed Herbaceous Woodland	13
Quercus wislizenii Woodland Alliance	Park Special	*Quercus wislizeni - Pinus sabinana* / Mixed Herbaceous Woodland	Interior Live Oak - Foothill Pine / Mixed Herbaceous Woodland	2
SHRUBLAND				
Adenostoma fasciculatum Shrubland Alliance	CEGL003504	*Adenostoma fasciculatum - Arctostaphylos glauca* Shrubland	Chamise - Bigberry Manzanita Shrubland	14
	Park Special	*Adenostoma fasciculatum - Arctostaphylos pungens* Shrubland	Chamise - Mexican Manzanita Shrubland	9
	CEGL003468	*Adenostoma fasciculatum - Ceanothus cuneatus* var. *cuneatus* Shrubland	Chamise - Sedgeleaf Buckbrush Shrubland	30
	CEGL003524	*Adenostoma fasciculatum - Salvia mellifera* Shrubland	Chamise - Black Sage Shrubland	9
	Park Special	*Adenostoma fasciculatum / Selaginella bigelovii* Shrubland	Chamise / Bushy Spike-moss Shrubland	7
	CEGL002924	*Adenostoma fasciculatum* Shrubland	Chamise Shrubland	25
Arctostaphylos glauca Shrubland Alliance	CEGL003008	*Arctostaphylos glauca* Shrubland	Bigberry Manzanita Shrubland	3
Artemisia californica - Eriogonum fasciculatum Shrubland Alliance	CEGL003544	*Artemisia californica - Eriogonum fasciculatum* Shrubland	California Sagebrush - California Wild Buckwheat / Annual Grass - Herb Shrubland	13

Alliance	NVC CODE	Association Scientific Name	Association Common Name	#Plots
Artemisia californica Shrubland Alliance	CEGL003536	*Artemisia californica* Shrubland	California Sagebrush Shrubland	3
Baccharis pilularis Shrubland Alliance	CEGL003183	*Baccharis pilularis* / Annual Grass - Herb Shrubland	Coyotebrush / Annual Grass - Herb Shrubland	3
Ceanothus cuneatus Shrubland Alliance	CEGL003025	*Ceanothus cuneatus* var. *cuneatus* Shrubland	Sedgeleaf Buckbrush Shrubland	7
Cercocarpus montanus var. *glaber* Shrubland Alliance	CEGL003615	*Cercocarpus montanus* var. *glaber* Shrubland	Birchleaf Mountain-mahogany Shrubland	13
Diplacus aurantiacus Shrubland Alliance	CEGL003705	*Diplacus aurantiacus* Shrubland	Orange Bush-monkeyflower Shrubland	11
Eriogonum fasciculatum Shrubland Alliance	CEGL001258	*Eriogonum fasciculatum* Shrubland	California Wild Buckwheat Shrubland	28
Lotus scoparius Shrubland Alliance	CEGL005304	*Lotus scoparius* Shrubland Association	Deerweed Shrubland	1
Lupinus albifrons Shrubland Alliance	Park Special	*Lupinus albifrons - Senecio flaccidus* var. *douglasii* Shrubland	Silver Lupine - Douglas's Ragwort Shrubland	9
Prunus ilicifolia Shrubland Alliance	CEGL005309	*Prunus ilicifolia - Ceanothus cuneatus* Shrubland	Hollyleaf Cherry - Sedgeleaf Buckbrush Shrubland	10
	CEGL005310	*Prunus ilicifolia - Fraxinus dipetala* Shrubland	Hollyleaf Cherry - California Ash Shrubland	15
	CEGL003715	*Prunus ilicifolia - Heteromeles arbutifolia* Shrubland	Hollyleaf Cherry - Toyon Shrubland	4
	CEGL005311	*Prunus ilicifolia* Shrubland	Hollyleaf Cherry Shrubland	1
Quercus berberidifolia Shrubland Alliance	Park Special	*Quercus berberidifolia - Cercocarpus montanus* var. *glaber* Shrubland	California Scrub Oak - Birchleaf Mountain-mahogany Shrubland	3
	CEGL003716	*Quercus berberidifolia* Shrubland	California Scrub Oak Shrubland	8
Rhamnus ilicifolia Shrubland Alliance	Unclassified	*Rhamnus ilicifolia - Clematis lasiantha* Shrubland Unclassified:	Hollyleaf Redberry - Pipestem Virgin's-bower Shrubland	2
Salvia mellifera Shrubland Alliance	CEGL005317	*Salvia mellifera - Eriogonum fasciculatum / Bromus madritensis* Shrubland	Black Sage - California Wild Buckwheat / Foxtail Brome Shrubland	14
	CEGL003727	*Salvia mellifera* Shrubland	Black Sage Shrubland	8
NON-VASCULAR and SPARSE				
Rock-Cobble-Gravel Lichen Sparsely Vegetated Alliance	Park Special	*Collinsia heterophylla* - Lichen Sparse Vegetation	Harlequin Blue-eyed Mary - Lichen Sparse Vegetation	10
	Park Special	*Eriogonum wrightii* - Lichen Sparse Vegetation	Bastard-sage - Lichen Sparse Vegetation	7
	Park Special	Lichen Gravel - Bedrock Nonvascular Sparse Vegetation	Lichen Gravel - Bedrock Nonvascular Sparse Vegetation	30
HERBACEOUS VEGETATION				
Artemisia dracunculus Herbaceous Alliance	Park Special	*(Artemisia dracunculus)* - *Gnaphalium canescens* Herbaceous Vegetation	(Dragon Wormwood) - Wright's Cudweed Herbaceous Vegetation	7
	Park Special	*Artemisia dracunculus* Alluvial Fan Herbaceous Vegetation	Dragon Wormwood Alluvial Fan Herbaceous Vegetation	11
Avena (barbata, fatua) Herbaceous Alliance	Unclassified	*Avena barbata - Melica imperfecta* Herbaceous Vegetation Unclassified:	Barbed Oats - Coast Range Melicgrass Herbaceous Vegetation	3
	Park Special	*Avena fatua - (Nassella pulchra, Plantago erecta)* Herbaceous Vegetation	Barbed Oats - (Purple Needlegrass, Erect Plantain) Herbaceous Vegetation	10
Eriogonum nudum Herbaceous Alliance	Unclassified	*Epilobium canum* Herbaceous Vegetation Unclassified:	Hummingbird-trumpet Herbaceous Vegetation	1
Eriogonum elongatum Herbaceous Alliance	Park Special	*Eriogonum elongatum* Herbaceous Vegetation	Longstem Wild Buckwheat Herbaceous Vegetation	5

Alliance	NVC CODE	Association Scientific Name	Association Common Name	#Plots
Selaginella bigelovii Herbaceous Alliance	CEGL002886	*Eriogonum fasciculatum / Selaginella bigelovii* Herbaceous Vegetation	California Wild Buckwheat / Bushy Spike-moss Sparse Herbaceous Vegetation	35
Eriogonum nudum Herbaceous Alliance	Unclassified	*Eriogonum nudum* Herbaceous Vegetation Unclassified:	Naked Wild Buckwheat Herbaceous Vegetation	1
Bromus (diandrus, hordeaceus, madritensis) Herbaceous Alliance	Park Special	*Erodium brachycarpum - Bromus hordeaceus - Bromus madritensis* Herbaceous Vegetation	Short-fruit Stork's-bill - Soft Brome - Compact Brome Herbaceous Vegetation	12
Eschscholzia californica Herbaceous Alliance	Park Special	*Eschscholzia californica* Herbaceous Vegetation	California Poppy Herbaceous Vegetation	7
Heterotheca sessiliflora Herbaceous Allliance	Park Special	*Heterotheca sessiliflora* ssp. *echioides* Herbaceous Vegetation	Sessile-flower False Goldenaster Herbaceous Vegetation	8
Hordeum brachyantherum Temporarily Flooded Herbaceous Alliance	CEGL003430	*Hordeum brachyantherum* Herbaceous Vegetation	Meadow Barley Herbaceous Vegetation	1
Muhlenbergia rigens Herbaceous Alliance	CEGL005306	*Muhlenbergia rigens* Herbaceous Vegetation	Deergrass Herbaceous Vegetation	1
Sedum spathulifolium Herbaceous Alliance	Park Special	*Sedum spathulifolium* - Moss - Bedrock Vegetation	Pacific Stonecrop - Moss - Bedrock Vegetation	7
Vulpia bromoides - Mixed Forb Herbaceous Alliance	Unclassified	*Vulpia bromoides - Deiandra lobbii* Unclassified:	Brown Six-weeks Grass - Deiandra Herbaceous Vegetation	3
	Unclassified	*Vulpia bromoides - Plagiobothrys canescens - Amsinckia menziesii* Herbaceous Vegetation Unclassified:	Brome Six-weeks Grass - Valley Popcorn-flower - Menzies' Fiddleneck Herbaceous Vegetation	2
***RIPARIAN-WETLAND* FOREST and WOODLAND**				
Quercus lobata Woodland Alliance	CEGL002872	*Quercus lobata - Quercus agrifolia* / Annual Grass - Herb Woodland	Valley Oak - Coast Live Oak / Annual Grass - Herb Woodland	8
Platanus racemosa Temporarily Flooded Woodland Alliance	CEGL002858	*Platanus racemosa - Quercus agrifolia* var. *agrifolia* Woodland	California Sycamore - Coast Live Oak Woodland	5
	Unclassified	*Platanus racemosa - Salix laevigata / Rubus ursinus* Woodland Unclassified:	California Sycamore - Red willow / California Blackberry Woodland	1
	CEGL005307	*Platanus racemosa* Temporarily Flooded Woodland	California Sycamore Temporarily Flooded Woodland	1
Populus fremontii Temporarily Flooded Forest Alliance	CEGL005308	*Populus fremontii - Salix laevigata* Woodland	Fremont Cottonwood - Red willow Woodland	10
	CEGL000941	*Populus fremontii / Baccharis salicifolia* Woodland	Fremont Cottonwood / Mule's-fat Woodland	2
Quercus agrifolia Woodland Alliance	CEGL005312	*Quercus agrifolia / Toxicodendron diversilobum* Intermittently Flooded Woodland	Coast Live Oak / Pacific Poison-oak Intermittently Flooded Woodland	18
Salix laevigata Temporarily Flooded Woodland Alliance	CEGL005316	*Salix laevigata / Artemisia douglasiana - Rubus ursinus* Woodland	Red willow / Douglas' Wormwood - California Blackberry Woodland	12
***RIPARIAN-WETLAND* SHRUBLAND**				
Baccharis salicifolia Intermittently Flooded Shrubland Alliance	CEGL003549	*Baccharis salicifolia* Riparian Shrubland	Mule's-fat Riparian Shrubland	17
Rosa californica Shrubland Temporarily Flooded Alliance	CEGL005315	*Rosa californica* Shrubland	California Rose Shrubland	9
Salix (exigua, interior) Temporarily Flooded Shrubland Alliance	CEGL001197	*Salix exigua* Temporarily Flooded Shrubland	Sandbar willow Temporarily Flooded Shrubland	1
Salix lasiolepis Temporarily Flooded Shrubland Alliance	CEGL002875	*Salix lasiolepis* / *Baccharis salicifolia* Shrubland	Arroyo Willow / Mule's-fat Shrubland	10
	Park Special	*Salix lasiolepis / Rosa californica* Shrubland	Arroyo Willow / California Rose Shrubland	1

Alliance	NVC CODE	Association Scientific Name	Association Common Name	#Plots
***RIPARIAN-WETLAND* HERBACEOUS VEGETATION**				
Distichlis spicata Intermittently Flooded Herbaceous Alliance	CEGL001770	*Distichlis spicata* Herbaceous Vegetation	Inland Saltgrass Herbaceous Vegetation	1
Eleocharis macrostachya Herbaceous Alliance PROPOSED	CEGL005303	*Eleocharis macrostachya* Herbaceous Vegetation	Page Spikerush Herbaceous Vegetation	1
Juncus balticus Seasonally Flooded Herbaceous Alliance	CEGL001838	*Juncus balticus* Herbaceous Vegetation	Baltic Rush Herbaceous Vegetation	6
Leymus triticoides Temporarily Flooded Herbaceous Alliance	CEGL001571	*Leymus triticoides* Herbaceous Vegetation	Beardless Wildrye Herbaceous Vegetation	1
Mimulus (*guttatus*) Temporarily Flooded Herbaceous Alliance	CEGL005305	*Mimulus guttatus* - *(Mimulus* spp.*)* Herbaceous Vegetation	Seep Monkeyflower - (Monkeyflower species) Herbaceous Vegetation	5

Plant Community Descriptions

This section provides a summary of PINN vegetation by physiognomic group. Appendix C provides detailed local and global descriptions of the 67 plant associations, alliances and Park special vegetation types found within the Park. Local descriptions are based on plot data from the Park and environs. Global descriptions characterize the association across its range and are based primarily on published and unpublished literature.

Most of the vegetation types at PINN fit into existing NVC association concepts, or were considered significant enough to create new NVC associations for them. Twenty-two associations were considered unique to the Monument; NatureServe designated these as Park Specials. Seven vegetation types fit into alliance concepts but lacked sufficient information to justify creating new associations.

Upland Forest and Woodland Associations

Tree-dominated vegetation types are common and widely distributed within PINN. They occupy nearly every available habitat, from riparian corridors to rock outcrops. All stands are subject to fire. Canopy density is controlled by stand age and the availability of soil moisture. Most examples at PINN do not have the closed tree canopy that usually characterizes forest (as opposed to more open woodland) associations. The upland forest and woodland associations at PINN include:

- *Aesculus californica / Toxicodendron diversilobum* / Moss Woodland
- *Juniperus californica / Prunus ilicifolia* / Moss Woodland
- *Pinus sabiniana / Eriogonum fasciculatum* Alluvial Woodland
- *Pinus sabiniana / Ceanothus cuneatus - Rhamnus ilicifolia* Woodland
- *Quercus agrifolia - Aesculus californica* Woodland
- *Quercus agrifolia* / Annual Grass - Forb Woodland
- *Quercus douglasii - Pinus sabiniana / Cercocarpus montanus* var. *glaber* Woodland
- *Quercus douglasii - Pinus sabiniana* / Grass Woodland
- *Quercus douglasii / Juniperus californica* Woodland
- *Quercus douglasii* / Mixed Herbaceous Woodland
- *Quercus wislizeni - Pinus sabinana /* Mixed Herbaceous Woodland

Blue oak (*Quercus douglasii*) and foothill pine (*Pinus sabiniana*) woodlands occupy slopes and hill tops, while coast ive oak (*Quercus agrifolia*) woodlands occur at the bottom of rock outcrops and cliff faces, on the lower third of hill slopes and the edges of valley bottoms and riparian areas, where soil moisture collects. California buckeye (*Aesculus californica*) stands are less common but striking (especially in the fall) as the only upland summer-deciduous tree in the Park. California juniper (*Juniperus californica*) and interior live oak (*Quercus wislizenii*) are not abundant and are limited to small clumps.

Upland Shrubland Associations

Chaparral shrublands are the characteristic vegetation type of Pinnacles. They are diverse and widespread and cover much of the Park. The upland shrubland associations of PINN include:

- *Adenostoma fasciculatum - Arctostaphylos glauca* Shrubland
- *Adenostoma fasciculatum - Arctostaphylos pungens* Shrubland
- *Adenostoma fasciculatum - Ceanothus cuneatus* var. *cuneatus* Shrubland
- *Adenostoma fasciculatum - Salvia mellifera* Shrubland
- *Adenostoma fasciculatum / Selaginella bigelovii* Shrubland
- *Adenostoma fasciculatum* Shrubland
- *Arctostaphylos glauca* Shrubland
- *Artemisia californica - Eriogonum fasciculatum* Shrubland
- *Artemisia californica* Shrubland
- *Baccharis pilularis* / Annual Grass - Herb Shrubland
- *Ceanothus cuneatus* var. *cuneatus* Shrubland
- *Cercocarpus montanus* var. *glaber* Shrubland
- *Diplacus aurantiacus* Shrubland
- *Eriogonum fasciculatum* Shrubland
- *Lotus scoparius* Shrubland Association
- *Lupinus albifrons - Senecio flaccidus* var. *douglasii* Shrubland
- *Prunus ilicifolia - Ceanothus cuneatus* Shrubland
- *Prunus ilicifolia - Fraxinus dipetala* Shrubland
- *Prunus ilicifolia - Heteromeles arbutifolia* Shrubland
- *Prunus ilicifolia* Shrubland
- *Quercus berberidifolia - Cercocarpus montanus* var. *glaber* Shrubland
- *Quercus berberidifolia* Shrubland
- *Rhamnus ilicifolia - Clematis lasiantha* Shrubland Unclassified:
- *Salvia mellifera - Eriogonum fasciculatum / Bromus madritensis* Shrubland
- *Salvia mellifera* Shrubland

Dry chamise (*Adenostoma fasciculatum*) chaparral associations are the most abundant shrublands within the Park and its surrounding lands. Manzanita (*Arctostaphylos* spp.) shrublands contrast sharply with their larger round leaves, and occur in smaller clumps, generally on rockier soils. Chaparral on the west side experiences a more maritime climate and is dominated by California wild buckwheat (*Eriogonum fasciculatum*) or black sage (*Salvia mellifera*). Only the west side are there locations of California sagebrush (*Artemisia californica*). Moist chaparral, represented by hollyleaf cherry (*Prunus ilicifolia*), hollyleaf redberry (*Rhamnus ilicifolia*), and California ash (*Fraxinus dipetala*) occurs on north facing slopes or lower third of slopes that are more protected and collect moisture. Dry alluvial flats and narrow canyon bottoms have stands of orange bush-monkeyflower (*Diplacus aurantiacus*) and silver lupine - Douglas's ragwort (*Lupinus albifrons - Senecio flaccidus* var. *douglasii*). Deerweed (*Lotus scoparius*) occurs on recently disturbed areas

such as burns. Small pockets of California scrub oak (*Quercus berberidifolia*) can be found on deep soils on north facing upper slopes.

Non-Vascular and Sparse

Vertical cliff faces, large flat and sloping rock formations and loose scree slopes are the domain of non-vascular and sparse vegetation. The non-vascular and sparse plant associations of PINN are:

- *Collinsia heterophylla* - Lichen Sparse Vegetation
- *Eriogonum wrightii* - Lichen Sparse Vegetation
- Lichen Gravel - Bedrock Nonvascular Sparse Vegetation

The first two associations are scree slope types. The last association is a catch-all type that can occur on solid vertical or flat rock faces, on large rocks, or on small gravel surfaces. Unfortunately lichens were not identified beyond their life form. For more information on the biodiversity of lichens in Pinnacles, see Benson (2005) and Tucker et. al (2006).

Upland Herbaceous Associations

Probably the most interesting vegetation type in Pinnacles is Spikemoss (*Selaginella bigelovii*) which dominates some slopes and is illustrated on the cover of this report. This type is known from across central and south coast ranges of Califonria. Two associations represent the presence of Spikemoss (a shrubland with an upper canopy of *Adenostoma*) and the herbaceous association with a scattered upper canopy of *Eriogonum*. Other herbaceous types are dominated by introduced annual grass or native forbs. Grasslands tend to occur where soils are thin and windswept or where fire has removed the competing woody vegetation. Many herbaceous types tend to be weedy. The upland herbaceous associations of PINN include:

- *(Artemisia dracunculus) - Gnaphalium canescens* Herbaceous Vegetation
- *Artemisia dracunculus* Alluvial Fan Herbaceous Vegetation
- *Avena barbata - Melica imperfecta* Herbaceous Vegetation Unclassified
- *Avena fatua - (Nassella pulchra, Plantago erecta)* Herbaceous Vegetation
- *Epilobium canum* Herbaceous Vegetation Unclassified
- *Eriogonum elongatum* Herbaceous Vegetation
- *Eriogonum fasciculatum / Selaginella bigelovii* Herbaceous Vegetation
- *Eriogonum nudum* Herbaceous Vegetation Unclassified
- *Erodium brachycarpum - Bromus hordeaceus - Bromus madritensis* Herbaceous Vegetation
- *Eschscholzia californica* Herbaceous Vegetation
- *Heterotheca sessiliflora* ssp. *echioides* Herbaceous Vegetation
- *Hordeum brachyantherum* Herbaceous Vegetation
- *Muhlenbergia rigens* Herbaceous Vegetation
- *Sedum spathulifolium* - Moss - Bedrock Vegetation
- *Vulpia bromoides - Deiandra lobbii* Herbaceous Vegetation Unclassified
- *Vulpia bromoides - Plagiobothrys canescens - Amsinckia menziesii* Herbaceous Vegetation Unclassified

The herbaceous associations were the most difficult to classify, since many are dominated by non-native species. We were generous in trying to describe native vegetation. If a stand had a decent (~10% relative cover) amount of a native species, we leaned toward naming the type for that native, even though the cumulative cover of component non-natives may far exceeded it. All herbaceous types at Pinnacles occur in small patches, with the exception of *Avena* spp. grasslands, which can be large and grade into oak/grass woodlands.

Riparian and Wetland Forest and Woodland Associations

Riparian woodlands are restricted in their distribution to floodplains, tributary canyons, and ravines. They tend to be dominated by valley oaks, cottonwoods, willows or sycamores, except in narrow, rock-walled canyons, where *Quercus agrifolia* sometimes occurs in the canopy. Riparian forest and woodland associations of PINN include:

- *Quercus lobata - Quercus agrifolia* / Annual Grass - Herb Woodland
- *Platanus racemosa - Quercus agrifolia* var. *agrifolia* Woodland
- *Platanus racemosa - Salix laevigata / Rubus ursinus* Woodland Unclassified:
- *Platanus racemosa* Temporarily Flooded Woodland
- *Populus fremontii - Salix laevigata* Woodland
- *Populus fremontii / Baccharis salicifolia* Woodland
- *Quercus agrifolia / Toxicodendron diversilobum* Intermittently Flooded Woodland
- *Salix laevigata / Artemisia douglasiana - Rubus ursinus* Woodland

The broad, well-developed floodplains of Chalone Creek, McCabe Canyon and Bear Valley have majestic stands of Valley Oak. Along the stream banks and active channels are cottonwoods and willow woodlands and shrublands. In these broad valleys *Quercus agrifolia* can occur at the outer edge of the valley floor. Along the narrow banks of Bear Gulch, tall sycamores tower over oak and cottonwood trees.

Riparian and Wetland Shrubland Associations

Mesic and wetland shrub communities are very limited in their size and distribution within the Park. All are restricted to areas with high water tables, including stream banks, stock pond margins, pour offs, and seeps. Riparian and wetland shrubland associations of PINN include:

- *Baccharis salicifolia* Riparian Shrubland
- *Rosa californica* Shrubland
- *Salix exigua* Temporarily Flooded Shrubland
- *Salix lasiolepis* / *Baccharis salicifolia* Shrubland
- *Salix lasiolepis / Rosa californica* Shrubland

Sandbar willow (*Salix exigua*) and mule's Fat (*Baccharis salicifolia*) shrublands are common throughout the Park along the narrow active streams such as West Fork Chalone Creek, where stream banks, islands or bars are vulnerable to frequent scouring from floods. Wild rose shrublands were seen only in Bear Valley. Tall arroyo willow (*Salix lasiolepis*) occurs throughout the Park in wet, actively flooded channels.

Riparian and Wetland Herbaceous Associations

Like mesic shrub communities, riparian and wetland herbaceous associations are uncommon and limited in their distribution within the mapping area. All are restricted to areas with water at or near the surface for some or all of the growing season. Diversity is high, but most occur in patches smaller than the minimum mapping unit. Riparian and wetland herbaceous associations of PINN include:

- *Distichlis spicata* Herbaceous Vegetation
- *Eleocharis macrostachya* Herbaceous Vegetation
- *Juncus balticus* Herbaceous Vegetation
- *Leymus triticoides* Herbaceous Vegetation
- *Mimulus guttatus - (Mimulus* spp.*)* Herbaceous Vegetation

Baltic rush (*Juncus balticus*) and monkeyflower (*Mimulus* spp.) were sampled 6 and 5 times respectively, while the others were sampled only once. Baltic rush is a common community, often found in overgrazed pastures because cattle find it unpalatable and will eat it only late in the season when little else is left (USDA . Baltic rush is very resistant to grazing because of persistent deep rhizomes as well as extensive fibrous roots (Weixelman et al 1996, Kovalchick et al, 1988). Monkeyflower, on the other hand, is restricted to small seeps and perennially wet creeks, and rarely occurs outside of the "splash zone." Beardless wildrye and inland saltgrass can form larger patches on mesic stream banks and subirrigated meadow areas, both are tolerant of alkaline conditions. Page spike rush (*Eleocharis macrostachya*) is limited to neutral to slightly acidic soils, and must remain wet throughout the growing season, thus it is limited to tiny patches in the Park.

Field Key Preparation

A dichotomous field key to plant associations of the PINN mapping area was developed for this project (Appendix D). The key is designed to assist users in identifying vegetation associations in the field. The key has two levels; the first level is defined by the physiognomy of the vegetation, i.e., forest, woodland, tall shrubland, shrubland, dwarf-shrubland, graminoid, or forb. The second level focuses on the dominant species' canopy cover. Brief environmental descriptions are included with the floristic descriptions to assist in identifying plant associations.

The association field key was constructed from data collected during the classification phase of the mapping project and revised following field testing. Because the key is based on a sample of the vegetation, it likely does not account for all associations occurring within the Park, nor does it explain the full range of variation of all associations as they appear in the Park.

The field key was tested by NatureServe and CNPS in the field prior to its use by accuracy assessment field crews. A NatureServe ecologist made notes and edited areas where the key was confusing or unclear. The field key in Appendix D is the final version containing revisions based on suggestions from this field testing.

University of Montana Vegetation Map (2005)

In 2005 the Wildlife Spatial Analysis Lab at the University of Montana produced a digital map of existing vegetation and land cover from high-resolution Ikonos satellite imagery (Figure 6). Imagery was from May and June of 2000. Initial line work was generated by eCognition. Supervised computerized classification (machine learning software WEKA) based on 4 spectral bands mapped 11 Land Cover Type map classes. The 2003 and 2004 relevé data was used as training data, with a reserve of 10% of the points for accuracy assessment. Map Classes developed were: Woodlands - W1 Oak/Pine, W2 Buckeye, W3 Mixed Riparian; Shrublands - S1 Chamise, S2 Chamise-Ceanothus, S3 Chamise-Manzanita/Mtn. Mahogany, S4 Prunus/Mixed Chaparral, S5 Buckwheat/Cal. Sage, S6 Chamise-Black Sage; and Herbaceous/Other - G Grassland/Herbaceous, N Sparse/Non-veg.

The overall accuracy was 84.95%. Unfortunately, due to funding limitations, this map was produced with little interaction between field crews and mapping staff, and with no interaction

with ecologists from NatureServe, California Native Plant Society or Park staff. See Appendix K for a cross walk of AIS Vegetation Map Classes (n=41) to the University of MT map Classes (n=11) (Remond et al. 2005).

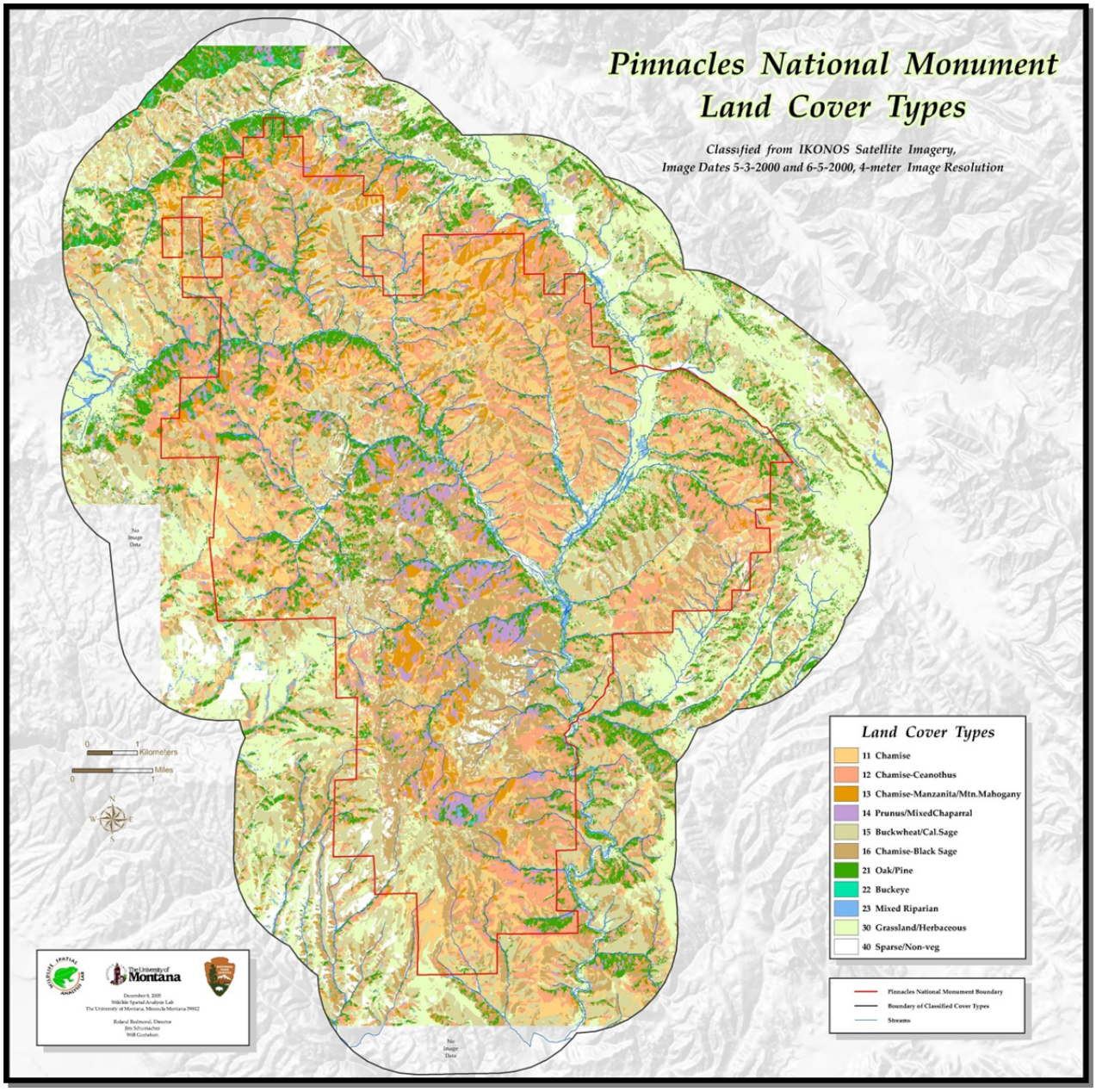


Figure 6. University of Montana 2005 Vegetation Map

Vegetation Mapping At Pinnacles National Monument

One of the most important mandates of the National Vegetation Inventory Program (NVIP), (formerly known as the "USGS-NPS Vegetation Mapping Program"), is the consistent capture and classification of vegetation types through mapping and field sampling methods. Mapping criteria and procedures developed during the prototype phase is still being tested and revised. The first two Parks mapped, Assateague Island National Seashore and Tuzigoot National Monument, used a vegetation layer mapping approach. Layer mapping consists of photo-interpretation of multiple canopies of vegetation that are visible on the aerial photography. Canopies are normally defined by the structure of the vegetation (trees, shrubs or herbaceous growth). Where possible, individual plant species were interpreted for each layer of vegetation. These data layers are then aggregated up into the appropriate alliance or community as defined in the NVCS (National Vegetation Classification System) (NatureServe 2003).

The Program criteria and methodology have since evolved to the methods in use today. Mapping at subsequent parks, including the Scotts Bluff National Monument, Agate Fossil Beds National Monument, Fort Laramie National Historic Site, Rock Creek Park, Isle Royale National Park, Congaree Swamp National Monument and Yosemite National Park, involves the use of an initial photo signature type describing multiple vegetation canopies. These photo signature types are then translated into a NVCS community type or alliance. Density, and in some parks height and pattern, are additionally assigned to each polygon. In some instances photo interpretive mapping units are retained to further describe, at a more detailed level, the attributes visible on the aerial photography for each polygon. In other situations mapping units are used to address more general levels where an alliance or association is not discernable on the aerial photography.

Photo Interpretation Mapping Criteria

From the onset of the NVIP, standardized program-wide mapping criteria have been used. The mapping criteria contain a set of decision rules that are used to ensure accuracy and consistency of vegetation attributes including type, height and cover. These criteria assist the user in understanding the characteristics, definition and context for each vegetation community. While type and density of vegetation were both used, height was not an attribute used in the PINN project.

Minimum Mapping Unit

The minimum mapping unit (mmu) for PINN matches the NVIP standard of 1/2 hectare.

Aggregation

Aggregation of multiple vegetative classes is necessary when vegetation types present within a polygon are below mmu.

- Similar life forms are aggregated together: tree-dominated types are aggregated with other tree-dominated types, shrub types with other shrub types, and herbaceous types with other herbaceous vegetation types.

- If possible, wetland vegetation types generally are not aggregated with upland types, even if they are in the same life form.

- If a unit that is below mmu is completely surrounded by another vegetation type, the unit is aggregated with the surrounding vegetation.

- If a unit that is below mmu is the same life form as two adjacent larger stands, and the adjacent stand types are very dissimilar in environment, the unit may be aggregated with the more similar adjacent type.

Woody Cover

Woody Vegetative Cover is a quantitative estimate of woody plant cover derived from viewing the aerial imagery. Photo interpreters assessed the cover of woody vegetation associated with the life form of the map unit assigned to that polygon. Vegetation not visible in the aerial photograph was not considered part of the woody cover class. For example, in a closed canopy forest the understory grasses and shrubs are not visible; therefore, only the tree overstory is visible and the cover class is based on the total tree cover present. Therefore cover classes coded to polygons in the database may differ from assessments done on the ground by field crews.

The percent cover was assessed for conifer, hardwood tree and shrubs. For example, a polygon with all three types of woody vegetation visible in the imagery will have three values of cover class.

The following criteria are used for making decisions about assigning cover classes to vegetation polygons:

- The coverage pattern of the life form is considered before assigning a density code to the polygon. Estimating densities is more straightforward when plants occupying the same strata are evenly distributed throughout the mapping unit. When polygons contain populations of plants that are clumped or occur only in a portion of the polygon, the photo interpreter considers the area that is not occupied by plant cover when determining coverage density. To ensure consistency, plants are estimated in polygons with clumped and unevenly distributed vegetation and then are compared to similar-sized polygons with an even distribution of plant cover.

- The date of the imagery influences the densities assigned to vegetation types, especially for deciduous vegetation. Subsequent field verification and accuracy assessments must take into consideration the following factors that can cause apparent discrepancies between the densities evident on the photo and those visible in the field:

    - Seasonality - Photos of forest or woodland areas with leaf-on conditions obscure the understory. Photos of leaf-off conditions would allow photo interpretation of the understory, but make it difficult to identify the overstory species since there is no foliage present.

    - Annual variability - the environmental conditions at the time of the

photography (wet vs. drought years, flooding, etc.) may affect the densities seen during the on-site field visits.

Alliance/Association

The assignment of vegetation polygons to an alliance and plant association is based on NVCS criteria. A final vegetation classification and key, along with vegetation descriptions for each alliance and association, was developed for PINN using the plot data collected by the PINN field sampling crews.

PINN Specific Mapping Protocols and Criteria

Study Area

The Park set up a two-tiered study area for photo interpretation and mapping. The first tier, or main body of the study area, consisted of areas within the Park boundary as well as a quarter-mile buffer around the Park. This tier is mapped at the suballiance level and to the association level where possible. The second tier is composed of areas outside the Park, designated by the Park as areas of interest. The Park requested that this area be mapped at a general life form level. Therefore, this area is mapped at or above alliance level.

Woody Cover

PINN differs from the previously mapped parks by assigning conifer, hardwood and shrub cover for each polygon, rather than cover of the life form of the alliance. All cover values followed the same classification.

Chaparral and Coastal Sage Scrub

Due to the limitations of the imagery and the inconsistent signature response of the chaparral and coastal sage scrub from place to place, photo interpretation of those types to the alliance and association level were very limited. Chaparral was therefore mapped to two main mapping classes as Californian Xeric Chaparral Shrubland Group and Californian Chaparral Shrubland Macrogroup. Coastal sage scrub was mapped as California Coastal Scrub Shrubland Macrogroup. At locations where reconnaissance and relevé site data was available, an attempt was made to map to the alliance level where possible and to extrapolate to nearby areas.

Land Use

Land Use was mapped as a separate layer from Vegetation. A polygon coded with a forest or woodland vegetation type and tree cover can also be coded with a land use. Land Use was mapped from imagery photo interpretation and field reconnaissance. Park facilities were identified separately from non-park uses.

Project Materials

The following materials were used for the PINN mapping project.

Digital Orthophoto Base

Natural color digital orthophotos available from NAIP served as the base for the data rectification task. The imagery is dated 2005 and depicts leaf-on conditions.

Supplemental Imagery

Two other sets of digital imagery were provided by the Park. They include:

- Natural color digital orthophotos dated 2003 (leaf-on). This set of imagery corresponds to the date of the Park's vegetation sampling sites
- Color infrared digital orthophotos dated 2002 (leaf-on)

Ancillary Data

PINN provided AIS with a number of hardcopy and digital files to assist in the photo interpretations.

- PINN Field Data 2003-2004
  - 590 Relevé Plots
- Historic Vegetation
  - Technical Report No. 34, Vegetation and Floristics of Pinnacles National Monument, dated 1987. Corresponding hardcopy map was produced in 1983 from color infrared aerial photos dated August 16, 1983.
- Other Hardcopy Data
  - Geologic Map of Pinnacles Volcanic Formation, by Vincent Matthews, 1:24000 scale, date unknown.
- Digital GIS Data
  - Fire History
  - Stonewall Fire
  - Prescribed Burns
  - Geology
  - Contours
  - Springs
  - Pig Fence
  - Drainages
  - Roads
  - Trails

Photo Interpretation Mapping Procedures

Four major tasks are associated with the photo interpretation phase of a NPS vegetation mapping project:

- Field Reconnaissance
- Photo Interpretation and Digitization of Vegetation
- Field Verification
- Quality Control

Field Reconnaissance

The field reconnaissance visit serves two major functions. First, the photo interpreter keys the signature on the aerial photos to the vegetation on the ground at each signature site. Second, the photo interpreter becomes familiar with the flora, vegetation assemblages and local ecology that occur in the study area. Park and/or field biologists who are familiar with the local vegetation and ecology of the Park are present to help the photo interpreter understand these elements and their relationship with the geography of the Park.

Prior to the field reconnaissance, AIS staff performed several in-house preparations to facilitate a more organized trip. Field routes were planned to accommodate a variety of factors including: maximizing the number of vegetation types and regional zones visited, responding to recommendations of Park staff, addressing time constraint considerations and accessibility. Hardcopy outputs of the base imagery were plotted for navigation in the field.

The imagery was reviewed for representative signatures of different vegetation types, density and abiotic factors such as percent slope, aspect, shape of the slope, elevation, etc. Field check sites and associated notations were noted on the field overlays. Multiple sites were chosen to provide alternatives if one or more sites proved inaccessible.

Field site locations visited were recorded on a GPS unit. A field notebook was used to record pertinent information for each site visited. Later, these records were input into computer files for easy reference. Color ground photos were taken at selected locations and later compared to the imagery and the field site notes. Additional field sites included areas encountered in transit between initially selected sites, areas of noteworthy or unusual significance, and other vegetation types the photo interpreter or ecologist deemed important. Two photo interpretation field reconnaissance trips were conducted by the staff from AIS and the Park.

Photo Interpretation and Digitization of Vegetation

Photo interpretation is the process of identifying map units based on their photo signature. All land cover features have a photo signature. These signatures are defined by the color, texture, tone and pattern exhibited on the aerial photography. By observing the context and extent of the photo signatures associated with specific vegetation types, the photo interpreter is able to identify and delineate the boundaries between plant communities or signature units. Environmental factors such as elevation, slope and aspect also play an important part in the photo interpretation decision-making process. For the PINN project, the photo interpreters also gleaned information from the field reconnaissance notes and a Relevé plots Access database. The PINN staff attempted to answer photo interpretation questions in the field as the mapping progressed.

Photo interpretation was conducted through an on-screen heads-up digitizing method using ArcMap. The study area was divided into several modules. The individual modules were interpreted using the primary and supplemental imagery, reconnaissance and relevé data, and other ancillary data, including elevation contours and fire history. The polygon delineations were based on a number of signature characteristics including color, tone, texture, relative height and density. Each polygon was assigned the appropriate attribute code string (mapping classification types, conifer, hardwood and shrub percent cover, and land use). The modules were subsequently edge-matched and were checked for invalid codes and errors in topology.

A separate quality control step was performed for each module upon completion of the photo interpretation. A senior photo interpreter reviewed each module for map unit delineation and the accuracy of the codes assigned to every polygon. Each module was checked for completeness, consistency and adherence to the mapping criteria and guidelines.

Field Verification

The mapping was followed by two field verification trips by AIS and Park staff designed to confirm that the vegetation units were mapped consistently. Any outstanding photo interpretation related questions were also addressed during the verification visits. Changes based on field verification observations were applied to polygons in the database for which the results were pertinent.

Final Quality Control

The individual modules were then joined into a single seamless vegetation file for the Park. The final vegetation database was examined by a senior photo interpreter for registration of linework to the base imagery. Final checks were conducted for invalid codes and code field correlations. Topological errors were checked, as were any edge-match problems.

Accuracy Assessment

Introduction

Accuracy assessment (AA) is a statistical test of how well polygon map class attributes represent vegetation on the ground. The AA compares field observations with the map class assignment of the sampled polygon. Errors occur when mapped polygon labels differ from field observations. Results of the AA allow users to evaluate the utility of the vegetation mapping data for particular applications. Accuracy assessment results come in two forms: "producer's accuracy" (the probability that an AA point was mapped correctly, also referred to as "errors of omission"), and "user's accuracy" (the probability that the map represents what was found on the ground, also referred to as "errors of commission"). High producer's accuracy combined with low user's accuracy indicates that the map unit is under-mapped. Conversely, low producer's accuracy combined with high user's accuracy indicates that a type is over-mapped. Ideally, a map has both high user's and producer's accuracy.

The accuracy assessment was applied to both the association level classification version of the map and the alliance level version.

Methods

Sampling Design

A stratified random sampling approach was used to determine AA sampling locations. The AA included most vegetation map classes and was limited to lands within the PINN boundary and buffer zone; private and federal land in the Expanded Area (outside of the Monument buffer) were not included in the accuracy evaluation. Sample sizes for each evaluated map class were selected using the USGS-NPS Vegetation Characterization Program guidelines (TNC et al. 1994):

Scenario A: The class is abundant. It covers more than 50 ha (124 acres) and consists of at least 30 polygons. The recommended sample size is 30.

Scenario B: The class is relatively abundant. It covers more than 50 ha, but consists of fewer than 30 polygons. The recommended sample size is 20. The rationale for reducing the sample size for this type of class is that sample sites are more difficult to find because of the lower frequency of the class.

Scenario C: The class is relatively rare. It covers less than 50 ha but consists of more than 30 polygons. The recommended sample size is 20. The rationale for reducing the sample size is that the class occupies a small area. At the same time, however, the class consists of a considerable number of distinct polygons that are possibly widely distributed. The number of samples therefore remains relatively high because of the high frequency of the class.

Scenario D: The class is rare. It has more than five but fewer than 30 polygons and covers less than 50 ha. The recommended number of samples is five. The rationale for reducing the sample size is that the class consists of small polygons and the frequency of the polygons is low.

Specifying more than five sample sites will likely result in multiple samples within the same (small) polygon. Collecting five samples will allow accuracy to be estimated, although the estimate will not be very precise.

Scenario E: The class is very rare. It has fewer than five polygons and occupies less than 50 ha. In this case, it is recommended that the existence of the class be confirmed by a visit to each polygon. The rationale for the recommendation is that with fewer than five sample sites (assuming one site per polygon), no estimate of level of confidence can be established for the sample and the accuracy of the class can only be confirmed through a field census.

Of the 39 alliance level map classes and 58 association level map classes that were originally mapped within the Park and buffer, 7 of the map classes were excluded from the accuracy assessment:

Vegetated Map Classes
3103 – Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit
3104 – Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit
9700 – Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Regeneration Mapping Unit
Non-natural Map Classes
9100 – Built-up Mapping Unit
9200 – Agriculture Mapping Unit
9500 – Water Mapping Unit
9600 – Planted Trees and Shrubs Mapping Unit

The 3 vegetated map classes (3103, 3104 and 9700) were excluded from the AA because the vegetation had likely changed since time of the imagery exposure. The other 4 classes were excluded because they are non-natural map classes.

Accuracy assessment sampling points were selected for each of the 32 remaining alliance level map classes and the 51 remaining association level map classes using guidelines A–E. The primary set of selected AA evaluation sites included 750 points. Secondary and tertiary sets of points were generated in case some of the points in the primary set could not be accessed safely. After all sets of points were selected, field crews sampled as many accessible polygons as possible given the restricted timing of the field season. Location (UTM) coordinates for all selected AA polygons were downloaded to GPS units for field sampling. Only the AA points and vegetation polygon boundaries (no vegetation map attributes) were printed on paper maps with an orthophotograph and elevation contour background to help guide the field crews. The field crew is therefore "blind" to the map classes assigned to the vegetation polygons.

AA Field Data Collection

Accuracy assessment point data were collected at PINN during the summer/fall of 2008. Field crews used GPS units, digital orthophotographs and topographic maps to navigate precisely to each pre-selected AA polygon. The crews evaluated the selected AA location using the protocol defined in Appendix F. The field form used is provided in Appendix G. Environmental data

collected in the field included elevation and descriptive comments of site history and stand age. Vegetation data included canopy cover for each stratum as well as for the dominant species and phenology of the dominant vegetation. A vegetation field key and mapping key were used to identify the vegetation type that best described the AA site location (Appendices D and I, respectively). In most cases, only one plant association name or map class was recorded. When vegetation relationships were less clear, a secondary or tertiary plant association name or map class was also recorded. Adjacent plant associations or map classes were recorded with a notation of the direction of adjacency to sampled polygon. Two or more digital photographs were taken at each AA point to provide visual documentation of the site.

The field team collected data at 766 AA points (Figure 7). AA point data were downloaded from GPS units into an Access plots database. All vegetation and species data were manually entered into this same database and a thorough quality assessment/quality check (QA/QC) was performed on the data prior to analysis. Nomenclature standards and other data management procedures were the same as for the classification plot data (see Vegetation Classification and Description section). Digital photographs were archived into folders which are labeled by date.

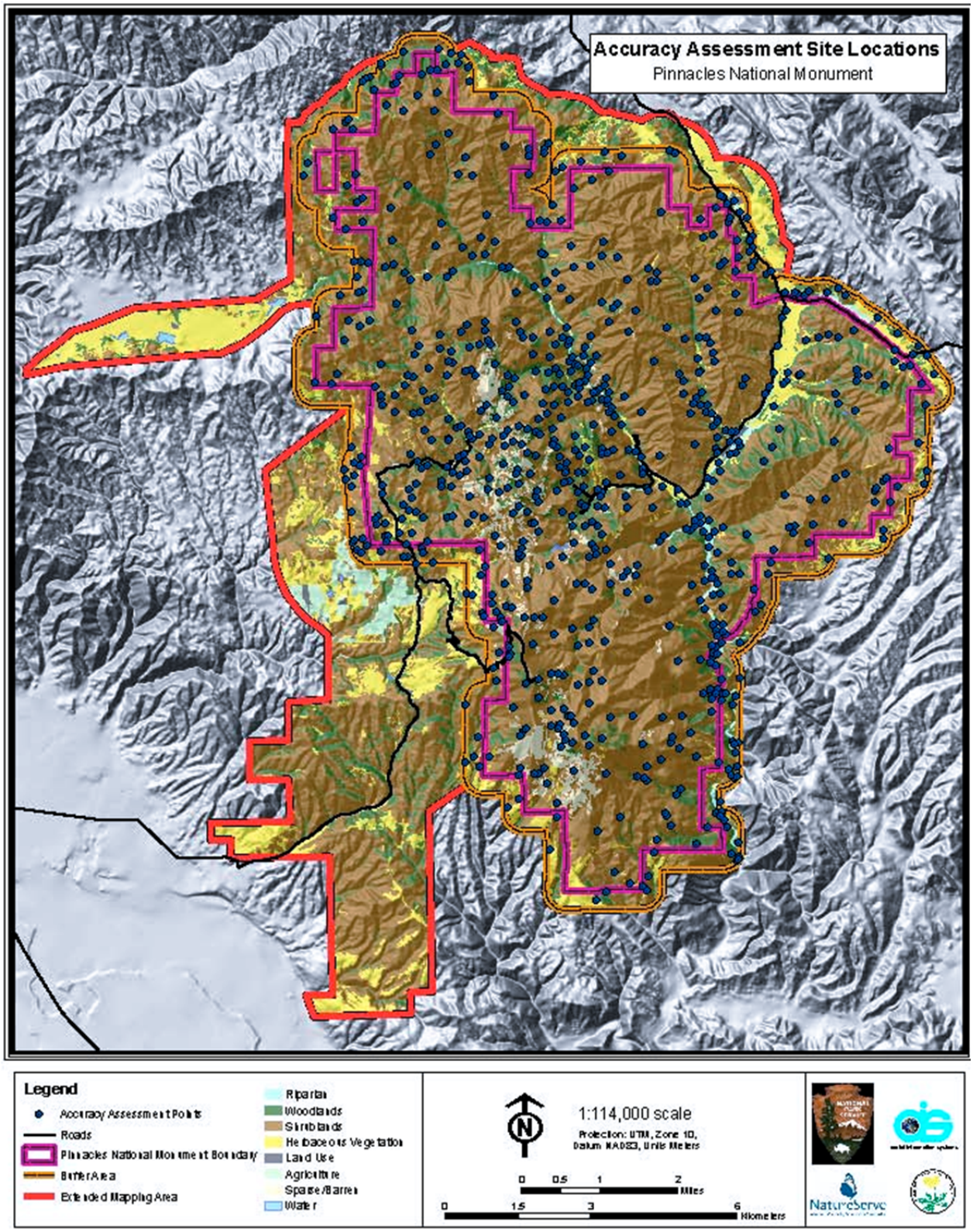


Figure 7. Location of Accuracy Assessment (AA) points.

Data Analysis

Accuracy assessment (AA) is a statistical test of how well polygon map class attributes represent vegetation on the ground. The AA compares field observations with the map class assignment of the sampled polygon. Errors occur when mapped polygon labels differ from field observations. Results of the AA allow users to evaluate the utility of the vegetation mapping data for particular applications. Accuracy assessment results come in two forms (Hop et al. 2005): "producer's accuracy" (the probability that an AA point was mapped correctly, also referred to as "errors of omission"), and "user's accuracy" (the probability that the map represents what was found on the ground, also referred to as "errors of commission"). High producer's accuracy combined with low user's accuracy indicates that the map class is under-mapped. Conversely, low producer's accuracy combined with high user's accuracy indicates that a type is over-mapped. Ideally, a map has both high user's and producer's accuracy.

The lead AIS photo interpreters and CNPS project ecologists reviewed the AA data for the 766 visited sites. The field points were converted into a spatial data layer with coordinates and attributes. AA point data was intersected with the map polygon data. Review consisted of evaluating calls for match or mismatch to the corresponding vegetation map polygon attribute. The primary, secondary and tertiary plant association, alliance or other map class assigned to each AA point (in the field) were compared to the map class code for that polygon. Per protocol, if any of the three calls agreed with the labeled map class for a given polygon, the point was considered correct.

Each AA point mismatch (disagreement between field call and polygon label) was evaluated for the type of error (true or false). Sources of "false" error include GPS or positional errors, questionable field determinations, edge error, and inclusions (small patches of vegetation within larger map polygons). Mismatches were reviewed when a false error was identified and were either determined to be a match, mismatch, or were discarded. All other mismatches were deemed true errors.

Patterns of error were analyzed for classes falling below the accuracy threshold and possible solutions for raising map class accuracy formulated, i.e., lumping the class into a higher class in the vegetation hierarchy.

In May 2009, a series of conference calls were held among the Park staff and project cooperators to discuss the results of the AA process. Participants discussed the alternative solutions developed during the analysis, and decided on the best solution for the purposes of natural resource management. In some cases, meeting participants recommended combining certain map classes to achieve higher levels of accuracy and more meaningful vegetation map classes. In other cases, the group recommended retaining map classes with lower accuracy, as discussed below. A final contingency table was produced by project cartographers (Table 6), representing mapping to the finest level possible (macrogroup, group, alliance or plant association). The spatial database was revised to reflect the final map classes.

The results of this analysis were arrayed in a preliminary contingency table and "producer's" and "user's" accuracy were calculated for each map class. **Producer's** accuracy is computed by

dividing correct-call samples by the total number of samples taken in polygons called that class. **User's** accuracy divides the correct-call samples by the total field samples called that map class (regardless of what the polygon was labeled). Note that in the hierarchical classification, lower level codes that nest within the higher level codes were considered a match. For example, an association nests into a corresponding alliance; a suballiance mapping unit will nest into its corresponding alliance; an alliance will nest into its corresponding group, and group into macrogroup.

Results and Discussion

Of the 766 AA samples collected in 2008, 738 were used in the analysis. Post accuracy assessment resulted in 3 macrogroup, 3 group, 14 alliance, 3 plant association, 5 ad hoc unit level map classes representing the natural resource and an additional 4 classes representing human footprint and open water. The map classes shown in the following tables and figures represent the final map classes as a result of the accuracy assessment. Final map classes are listed in Appendix H, and an illustrated guide with map class descriptions appears in Appendix J. The final vegetation map can be seen in Figure 8, page 52. To appreciate the fine-scale details and nuances the map is best viewed on a computer or on the poster-sized hard copy.

Final overall map "Producer's" accuracy is 84.4% (Kappa correction = 82.9%). Final overall map "User" accuracy is 76.0% (Kappa correction = 73.6%). Individual map class producer's and user's accuracy values are given with their 90% confidence intervals. The width of each confidence interval is affected by sample size. Individual map class Producer accuracy ranges from 62.5% to 100% (Table 11 and Table 12). Individual map class User accuracy ranges from 33.3% to 100%.

Table 7 shows the nine map classes that met the 80% program standard. Table 8 contains the thirteen map classes that did not meet the 80% program standard. However, in every case but three, the User Accuracy 90% confidence interval includes 80%, so Park staff deemed the results to be acceptable. Map classes 3300, 3330, and 3360 had <80% in User accuracy, but were retained because they were all >90% in Producer accuracy.

Two map classes did not achieve the 80% standard for either user's or producer's accuracy (Table 9). In both cases the Producer's and User's accuracy 90% confidence interval is above 80%. Again, Park staff decided these results were acceptable, and wished to retain the map classes. A discussion of these two problematic map classes is provided below.

Association Contingency table (error matrix)

Sample Data (Polygon Map Data) \ Reference Data (Accuracy Assessment Field Data)	1210	1220	1300	1311	2110	2210	2212	2220	2230	2231	3100	3101	3150	3160	3210	3300	3330	3360	3370	3400	3510	4004	4300	4510	9420	Samples	Correct	Producer Error %	90% Confidence Interval -	90% Confidence Interval +
1210	40				3	6					1	3					3									56	40	71.4%	61%	82%
1220		5											1													6	5	83.3%	50%	100%
1300			19		1				1											5						26	19	73.1%	57%	89%
1311				4	1																					5	4	80.0%	41%	100%
2110	2				72	4	2	2		1				1												84	72	85.7%	79%	93%
2210	4	1			2	85	9	2			1	2	1	1												108	94	87.0%	81%	93%
2212						3	23																			26	23	88.5%	76%	100%
2220					1	2		13																		16	13	81.3%	62%	100%
2230									5	1																6	6	100.0%	92%	100%
2231										2																2	2	100.0%	75%	100%
3100	1	1				1					8	6	8			1	2								1	29	22	75.9%	61%	91%
3101	2				1	1						116				3	7	5							1	136	116	85.3%	80%	91%
3150					2						2		22													26	22	84.6%	71%	98%
3160						2								8												10	8	80.0%	54%	100%
3210															2											2	2	100.0%	75%	100%
3300	1					1						1				8	31	3	4							49	46	93.9%	87%	100%
3330	1																24									25	24	96.0%	88%	100%
3360																		4								4	4	100.0%	88%	100%
3370																			5							5	5	100.0%	90%	100%
3400			1																	16		2				19	16	84.2%	68%	100%
3510																					1					1	1	100.0%	50%	100%
4004																1				2		5				8	5	62.5%	28%	97%
4300							1									4	3						29			37	29	78.4%	66%	91%
4510																								1		1	1	100.0%	50%	100%
9420												5				1							1		44	51	44	86.3%	77%	95%
Samples	51	7	20	4	83	105	35	17	6	4	12	133	32	10	2	18	70	12	9	23	1	7	30	1	46					
Correct	40	5	19	4	72	88	23	13	5	2	10	116	22	8	2	8	24	4	5	16	1	5	29	1	44					
User Error %	78.4%	71.4%	95.0%	100.0%	86.7%	83.8%	65.7%	76.5%	83.3%	50.0%	83.3%	87.2%	68.8%	80.0%	100.0%	44.4%	34.3%	33.3%	55.6%	69.6%	100.0%	71.4%	96.7%	100.0%	95.7%					
90% Confidence -	68%	36%	84%	88%	80%	77%	51%	57%	50%	0%	61%	82%	54%	54%	75%	22%	24%	7%	23%	52%	50%	36%	90%	50%	90%					
90% Confidence +	89%	100%	100%	100%	93%	90%	80%	96%	100%	100%	100%	92%	84%	100%	100%	66%	44%	60%	88%	88%	100%	100%	100%	100%	100%					

Total Producer Correct = 623
Total User Correct = 561
Total Samples = 738

Overall Producer Accuracy = 84.4%, w/Kappa Index = 82.9% | Overall User Accurary = 76.0%, w/Kappa Index = 73.6%

Table 6. Final contingency table for 25 map classes whose accuracy was assessed. Shaded boxes indicate the number of AA points that agree with the assigned map class. To read the table, columns represent the map class observed in the field, while the rows represent the map class assigned by the photo interpreter. Overall producer accuracy is 84.4% with kappa index of 82.9%. Overall user accuracy is 76.0% with kappa index of 73.6%. User's and producer's accuracy values for each map class appear in tables 7 and 8. Note that map unit 3510 is an error and should be Map unit 3410.

Table 7. Final PINN map classes with >80% program standard for both User's and Producer's accuracy.

Map Class Code	Map Class Name	Producer's Accuracy (±90% CI)	User's Accuracy (±90% CI)
1311	California Sycamore-Coast Live Oak Woodland Association	80%±39%	100%±12%
2110	Coast Live Oak Woodland Alliance	86%±7%	87%±6%
2210	Blue Oak Woodland Alliance	87%±6%	84%±6%
2230	Valley Oak Woodland Alliance	100%±8%	83%±33%
3160	California Scrub Oak Shrubland Alliance	80%±26%	80%±26
3210	Coyote Brush Shrubland Alliance	100%±25 %	100%±25%
3510	California Rose Shrubland Alliance	100%±50 %	100%±50%
4510	Deergrass Herbaceous Vegetation Alliance	100%±50 %	100%±50%
9420	Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit	86%±9%	96%±6%

Table 8. Final PINN map classes with $\leq$ 80% program standard for both User's or Producer's accuracy.

Map Class Code	Map Class Name	Producer's Accuracy (±90% CI)	User's Accuracy (±90% CI)
1220	California Juniper Woodland Alliance	83%±33%	71%±35%
1300	Southwestern North American Riparian Evergreen and Deciduous Forest Group	73%±16%	95%±11%
2212	Blue Oak/Mixed Herbaceous Woodland Association	89%±13%	66%±14%
2220	California Buckeye Woodland Alliance	81%±19%	77%±20%
2231	Valley Oak-Coast Live Oak/ Grass Woodland Association	100%±25%	50%±50%
3100	Californian Chaparral Shrubland Macrogroup	76%±15	83%±22
3150	Hollyleaf Cherry Shrubland Alliance	85%±14%	69%±15%
3300	California Coastal Scrub Shrubland Macrogroup	94%±7%	44%±22%
3330	California Wild Buckwheat Shrubland Alliance	96%±8%	34%±10%
3360	Black Sage Shrubland Alliance	100%±12%	33%±27%
3370	California Sagebrush-California Wild Buckwheat Shrubland Alliance	100%±10%	56%±33%
3400	Southwestern North American Riparian/Wash Scrub Shrubland Group	84%±16%	70%±18%
4300	Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Macrogroup	78%±13%	97%±7%

Table 9. Final PINN vegetation map classes where neither the User's or Producer's accuracy met the 80% program standard.

Map Class Code	Map Class Name	Producer's Accuracy (±90% CI)	User's Accuracy (±90% CI)
1210	Foothill Pine Woodland Alliance	71%±11%	78%±11%
4004	Alluvial Herb and Shrub Vegetation Mapping Unit	63%±35%	71%±35%

***Map Class Code 1210 – Foothill Pine Woodland Alliance*:** This map class was problematic for two reasons. The first is that in very sparse stands with about 5 to 12% tree cover, there was a discrepancy between the photointerpreters judgment of the tree density versus the AA field crew's estimate. Therefore field crews tended to call the point a shrub type rather than a tree type. It is reasonable for any field personnel to call sparse cover of foothill pine over shrubland either an open woodland or a shrubland, so the AA point was valid, even though it did not match the mapper's assessment. A second reason for error was due to confusion between the photo signature of Foothill Pine and Blue Oak at some locations. The error between these signatures is more localized in the Park rather than pervasive. Since the Producer's and User's accuracy 90% confidence interval is above 80%, the Park decided to keep this class in the final database.

Map Class 4004 – Alluvial Herb and Shrub Vegetation Mapping Unit: One of the most difficult areas to map were the bare alluvial wash on valley floors. These areas are, for the most part, barren but can have narrow stringers of thick riparian vegetation. Mapped polygons generally represented very sparsely vegetated gravel, cobble or sand bars and stream channels. However some portions of the polygon are vegetated with riparian shrubs along very narrow channels that in many cases may be inclusive. Field crews tended to describe the stringer vegetation, rather than the whole polygon, contrasting with the mapper's call of a mainly the open, bright, reflective bare alluvial substrate, with inclusions of narrow riparian vegetation. In addition, these areas can change with time and flooding events. Since the Producer's and User's accuracy 90% confidence interval is above 80%, the Park decided to keep this class in the final database.

Conclusion

Mapping the vegetation resource at Pinnacles National Monument required a variety of scales of map classes. Twenty-eight map classes representing 67 plant associations, alliances or Park special types were mapped. Twenty five classes were within the 80% accuracy standard (90% confidence interval). Three map units were not assessed for accuracy. Map classes ranged from the broad inclusive scale (macrogroups) to individual plant associations.

Quantitative analysis of plot data collected by Park staff resulted in a classification of 67 plant associations, alliances or Park special vegetation types within the Monument and environs. This classification represents 47 Alliances and 73 plant associations. Fifty-one associations are recognized by the National Vegetation Classification, 22 are described as 'Park specials' because they are known only from the Monument. The vegetation of the mapping project area is relatively diverse. Chaparral, oak woodlands and dry herbaceous areas dominate the vegetation, accounting for ~35 associations.

A total of 6,141 map polygons representing 24 vegetation map classes (including tree and shrub cover attributes), fourteen land use map classes and 7 miscellaneous classes were developed for the PINN vegetation mapping project. Of the 6,141 mapped polygons, 115 were assigned both a land use class and a vegetation class. The average polygon size across all map classes is 3 ha (7.3 acres). Natural and semi-natural vegetation classes cover 17,953 ha (44,362 acres), or 98.6% of the project area. Land use polygons, including ranch developments, agriculture and Park facilities cover 250 ha (617 acres), or 1.4 % of the project area. Final overall map Producer accuracy is 84.4% (Kappa correction = 83.1%). Final overall map User accuracy is 78.0% (Kappa correction = 75.6%).

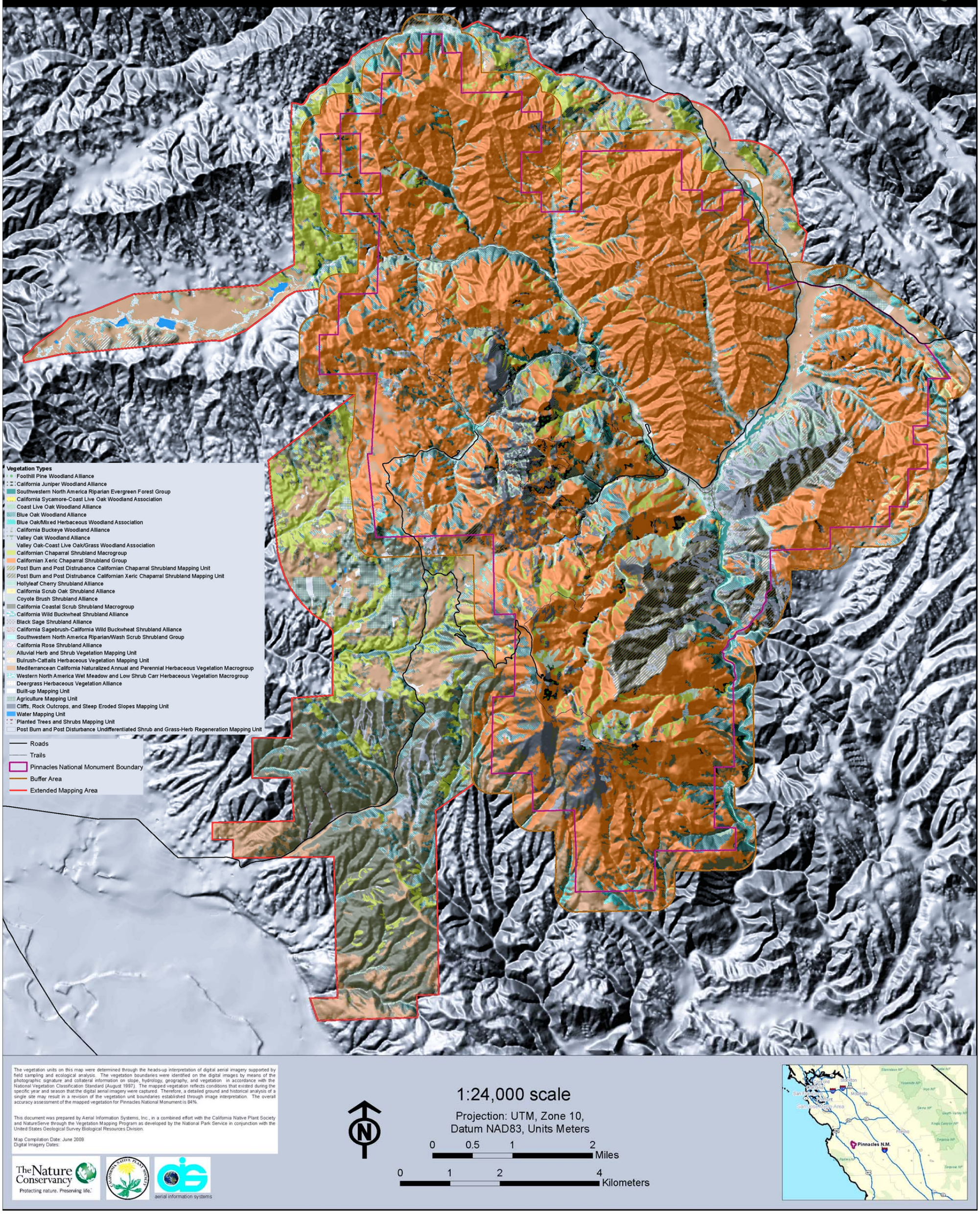


Figure 8. Final Vegetation Map for Pinnacles National Monument 2009. Thirty-four classes represent vegetated and non-vegetated surfaces within the Park and surrounding environs. Full map class table can be found in Appendix H, and an illustrated guided with map class descriptions in Appendix J.

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NPS 114/116963, September 2012

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

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Appendix A

California Native Plant Society Relevé Protocol

Natural Resource Report NPS/SFAN/NRR—2012/574

California Native Plant Society
2707 K Street, Suite 1
Sacramento, CA 95816-5113

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

Pinnacles National Monument staff used an earlier version of the California Native Plant Society (CNPS) Relevé Protocol (revised 2002). The basic method hasn't changed. In addition, the park made slight modification for the park needs, which are outlined in the methods section in the body of this report. The CNPS protocol (revised 2007) is provided here.

Appendix B

Vegetation Relevé Field Form

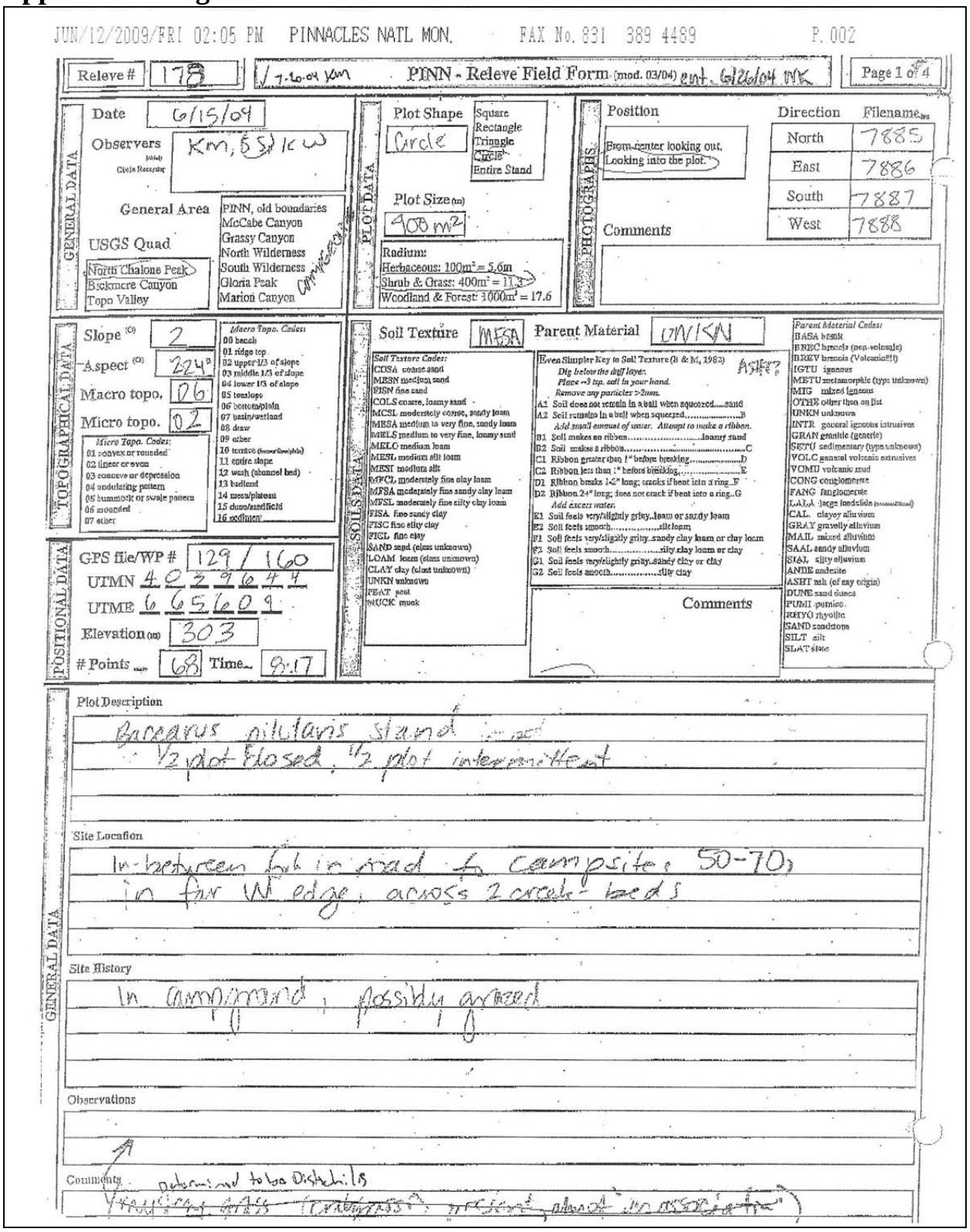
Natural Resource Report NPS/SFAN/NRR—2012/574

Pinnacles National Monument
5000 Hwy 146
Paicines, CA 95043-9770

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

Appendix B. Vegetation Relevé Field Form



JUN/12/2009/FRI 02:05 PM PINNACLES NATL MON. FAX No. 831 389 4489 P. 002

Releve # 178 — 7-20-04 KM — PINN - Releve Field Form (mod. 03/04) ent. 6/26/04 MK — Page 1 of 4

GENERAL DATA
Date: 6/15/09
Observers: Km, ES, ICW
General Area: PINN, old boundaries
USGS Quad: North Chalone Peak; Bickmore Canyon; Topo Valley
PINN, old boundaries; McCabe Canyon; Grassy Canyon; North Wilderness; South Wilderness; Gloria Peak; Marion Canyon

PLOT DATA
Plot Shape: Circle (Square; Rectangle; Triangle; Circle; Entire Stand)
Plot Size (m): 400 m²
Radius: Herbaceous: 100m² = 5.6m; Shrub & Grass: 400m² = 11.3; Woodland & Forest: 1000m² = 17.6

PHOTOGRAPHS
Position: From center looking out. Looking into the plot.
Comments:

Direction	Filename
North	7885
East	7886
South	7887
West	7888

TOPOGRAPHICAL DATA
Slope (°): 2
Aspect (°): 224°
Macro topo.: 06
Micro topo.: 02

Micro Topo. Codes: 01 convex or rounded; 02 linear or even; 03 concave or depression; 04 undulating pattern; 05 hummock or swale pattern; 06 mounded; 07 other

Macro Topo. Codes: 00 bench; 01 ridge top; 02 upper 1/3 of slope; 03 middle 1/3 of slope; 04 lower 1/3 of slope; 05 toeslope; 06 bottom/plain; 07 basin/wetland; 08 draw; 09 other; 10 terrace (former floodplain); 11 entire slope; 12 wash (channel bed); 13 badland; 14 mesa/plateau; 15 dune/sandfield; 16 sediment

SOILS DATA
Soil Texture: MESA
Parent Material: UNKN

Soil Texture Codes: COSA coarse sand; MESN medium sand; FISN fine sand; COLS coarse, loamy sand; MCSL moderately coarse, sandy loam; MESA medium to very fine, sandy loam; MELS medium to very fine, loamy sand; MELO medium loam; MESL medium silt loam; MEST medium silt; MFCL moderately fine clay loam; MFSA moderately fine sandy clay loam; MFSL moderately fine silty clay loam; FISA fine sandy clay; FISC fine silty clay; FIGL fine clay; SAND sand (class unknown); LOAM loam (class unknown); CLAY clay (class unknown); UNKN unknown; PEAT peat; MUCK muck

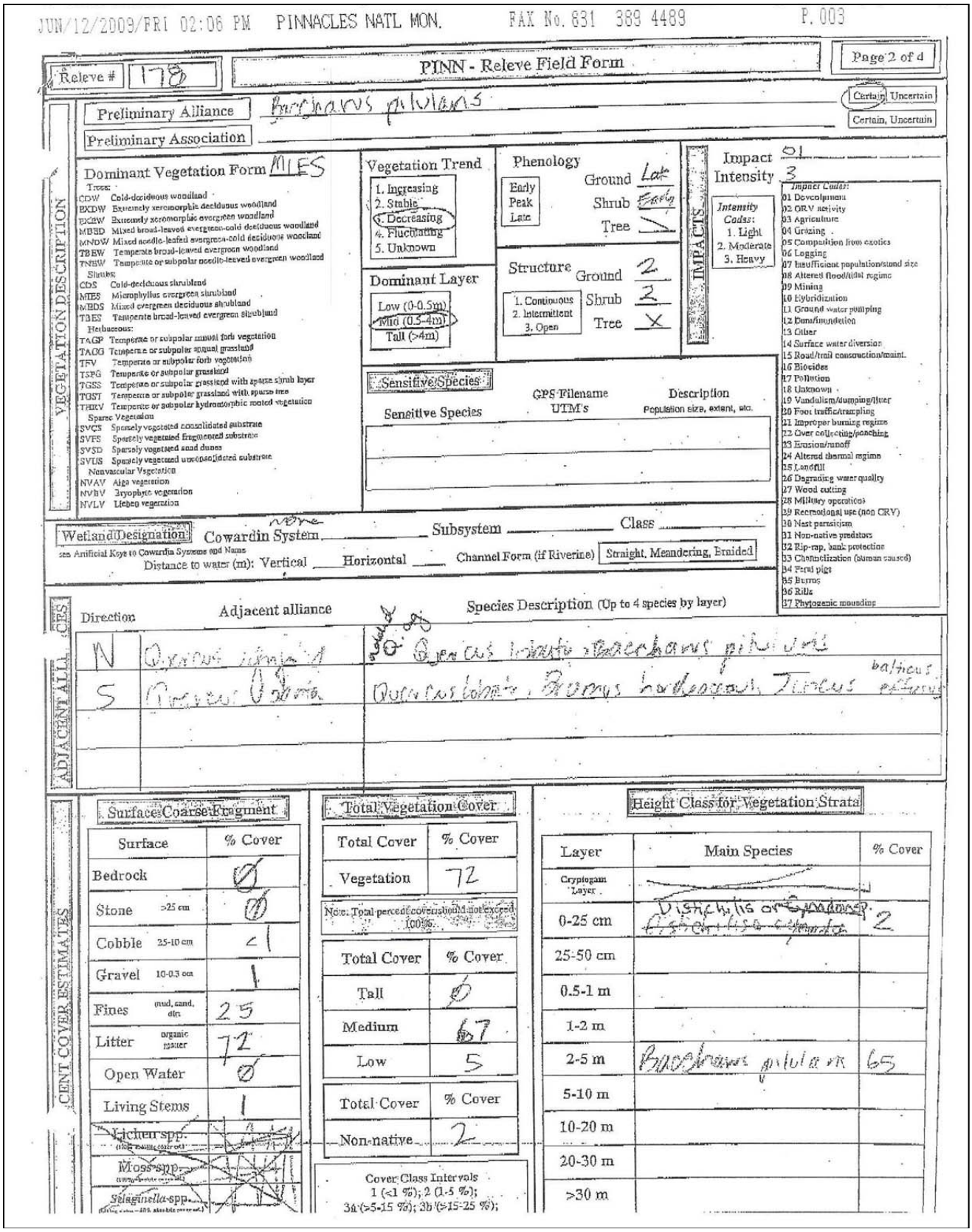
Even Simpler Key to Soil Texture (B & M, 1982) ASHY?
Dig below the duff layer.
Place ~3 tsp. soil in your hand.
Remove any particles >2mm.
A1 Soil does not remain in a ball when squeezed.....sand
A2 Soil remains in a ball when squeezed.....B
Add small amount of water. Attempt to make a ribbon.
B1 Soil makes no ribbon.....loamy sand
B2 Soil makes a ribbon.....C
C1 Ribbon greater than 1" before breaking.....D
C2 Ribbon less than 1" before breaking.....E
D1 Ribbon breaks 1-2" long; cracks if bent into a ring..F
D2 Ribbon 2+" long; does not crack if bent into a ring..G
Add excess water.
E1 Soil feels very/slightly gritty..loam or sandy loam
E2 Soil feels smooth.....silt loam
F1 Soil feels very/slightly gritty..sandy clay loam or clay loam
F2 Soil feels smooth.....silty clay loam or clay
G1 Soil feels very/slightly gritty..sandy clay or clay
G2 Soil feels smooth.....silty clay

Comments:

Parent Material Codes: BASA basalt; BREC breccia (non-volcanic); BREV breccia (Volcanic?!); IGTU igneous; METU metamorphic (type unknown); MIG mixed igneous; OTHE other than on list; UNKN unknown; INTR general igneous intrusives; GRAN granite (generic); SETU sedimentary (type unknown); VOLC general volcanic extrusives; VOMU volcanic mud; CONG conglomerate; FANG fanglomerate; LALA large landslide (recognizable); CAL clayey alluvium; GRAY gravelly alluvium; MAIL mixed alluvium; SAAL sandy alluvium; SIAL silty alluvium; ANDE andesite; ASHT ash (of any origin); DUNE sand dune; PUMI pumice; RHYO rhyolite; SAND sandstone; SILT silt; SLAT slate

POSITIONAL DATA
GPS file/WP #: 129 / 160
UTMN: 4 0 2 9 6 4 4
UTME: 6 6 5 6 0 9
Elevation (m): 303
Points: 68 Time: 9:17

GENERAL DATA
Plot Description: Baccharis pilularis stand — ½ plot closed, ½ plot intermittent
Site Location: In between fork in road & campsite, 50-70 in for W edge, across 2 creek-beds
Site History: In command, possibly grazed
Observations:
Comments: Determined to be Distichlis



JUN/12/2009/FRI 02:06 PM PINNACLES NATL MON. FAX No. 831 389 4489 P. 003

Releve # 178 — PINN - Releve Field Form — Page 2 of 4

Preliminary Alliance: Baccharis pilularis (Certain, Uncertain)

Preliminary Association: (Certain, Uncertain)

VEGETATION DESCRIPTION

Dominant Vegetation Form: MIES

Trees:
CDW Cold-deciduous woodland
EXDW Extremely xeromorphic deciduous woodland
EXEW Extremely xeromorphic evergreen woodland
MBED Mixed broad-leaved evergreen-cold deciduous woodland
MNDW Mixed needle-leafed evergreen-cold deciduous woodland
TBEW Temperate broad-leaved evergreen woodland
TNEW Temperate or subpolar needle-leaved evergreen woodland
Shrubs:
CDS Cold-deciduous shrubland
MIES Microphyllus evergreen shrubland
MBDS Mixed evergreen deciduous shrubland
TBES Temperate broad-leaved evergreen shrubland
Herbaceous:
TAGP Temperate or subpolar annual forb vegetation
TAGG Temperate or subpolar annual grassland
TFV Temperate or subpolar forb vegetation
TSPG Temperate or subpolar grassland
TGSS Temperate or subpolar grassland with sparse shrub layer
TGST Temperate or subpolar grassland with sparse tree
THRV Temperate or subpolar hydromorphic rooted vegetation
Sparse Vegetation
SVCS Sparsely vegetated consolidated substrate
SVFS Sparsely vegetated fragmented substrate
SVSD Sparsely vegetated sand dunes
SVUS Sparsely vegetated unconsolidated substrate
Nonvascular Vegetation
NVAV Alga vegetation
NVBV Bryophyte vegetation
NVLV Lichen vegetation

Vegetation Trend: 1. Increasing; 2. Stable; (3. Decreasing); 4. Fluctuating; 5. Unknown

Phenology: Early / Peak / Late — Ground: Late; Shrub: Early; Tree: —

Dominant Layer: Low (0-0.5m); (Mid (0.5-4m)); Tall (>4m)

Structure: 1. Continuous; 2. Intermittent; 3. Open — Ground: 2; Shrub: 2; Tree: X

IMPACTS

Impact: 01
Impact Intensity: 3
Intensity Codes: 1. Light; 2. Moderate; 3. Heavy

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

Sensitive Species

Sensitive Species	GPS Filename UTM's	Description Population size, extent, etc.

Wetland Designation: Cowardin System: none — Subsystem: — Class: —
see Artificial Keys to Cowardin Systems and Names
Distance to water (m): Vertical — Horizontal — Channel Form (if Riverine): Straight, Meandering, Braided

ADJACENT ALLIANCES

Direction	Adjacent alliance	Species Description (Up to 4 species by layer)
N	Quercus agrifolia	Quercus agrifolia, Baccharis pilularis, Avena barbata, Bromus hordeaceus, Juncus balticus, Festuca californica
S	Grassland	Avena barbata, Bromus hordeaceus, Juncus balticus, Festuca californica

PERCENT COVER ESTIMATES

Surface Coarse Fragment

Surface	% Cover
Bedrock	0
Stone >25 cm	0
Cobble 25-10 cm	<1
Gravel 10-0.3 cm	1
Fines (mud, sand, dirt)	25
Litter (organic matter)	72
Open Water	0
Living Stems	1
Lichen spp.	
Moss spp.	
Selaginella spp.	

Total Vegetation Cover

Total Cover	% Cover
Vegetation	72

Note: Total percent cover should not exceed 100%.

Total Cover	% Cover
Tall	0
Medium	67
Low	5

Total Cover	% Cover
Non-native	2

Cover Class Intervals
1 (<1 %); 2 (1-5 %);
3a (>5-15 %); 3b (>15-25 %);

Height Class for Vegetation Strata

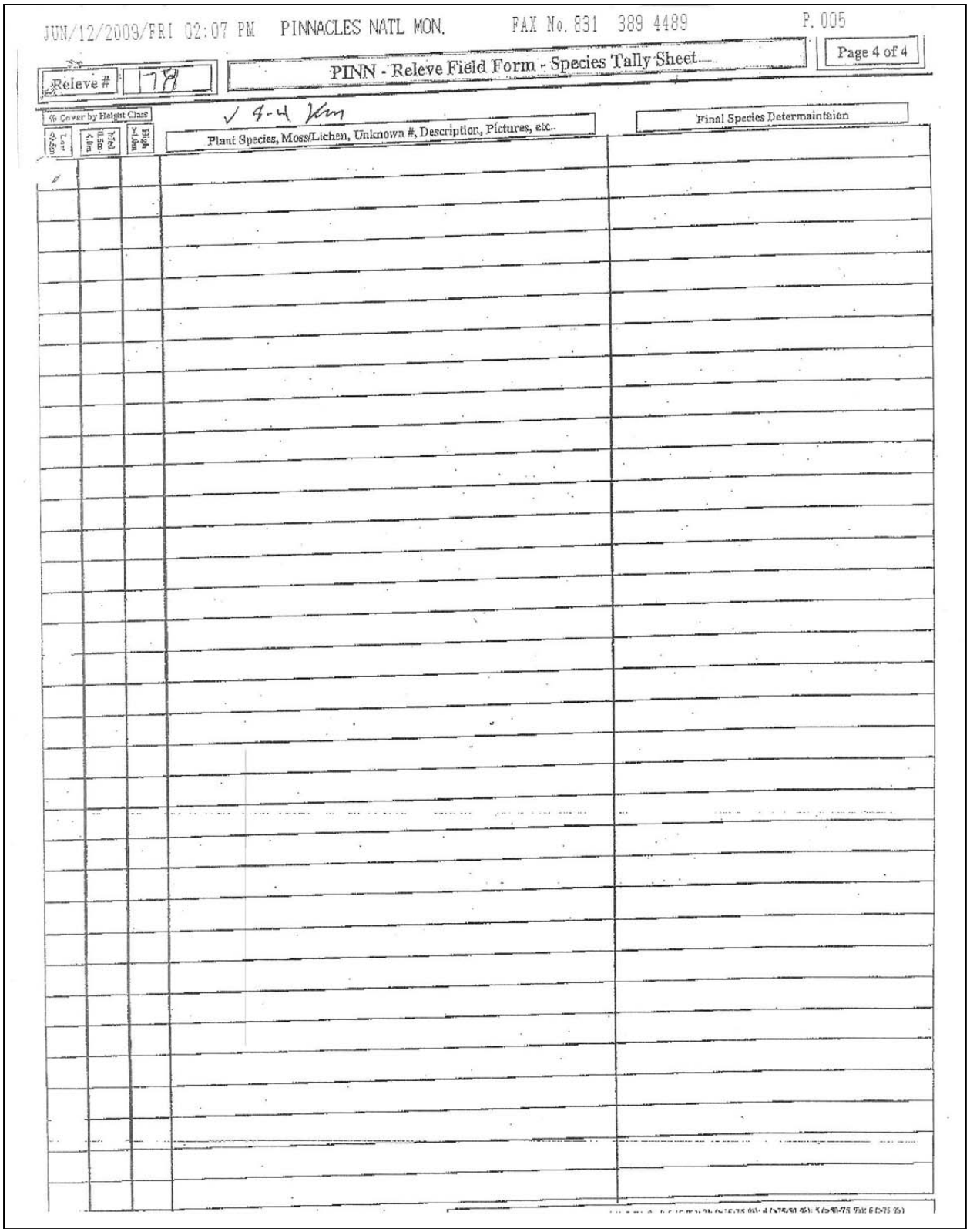
Layer	Main Species	% Cover
Cryptogam Layer		
0-25 cm	Distichlis or Spartina sp.	2
25-50 cm		
0.5-1 m		
1-2 m		
2-5 m	Baccharis pilularis	65
5-10 m		
10-20 m		
20-30 m		
>30 m		

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Releve # 178 — PINN - Releve Field Form - Species Tally Sheet — Page 3 of 4

% Cover by Height Class

Low <0.5m	Med 0.5-5m	High >5m	Plant Species, Moss/Lichen, Unknown #, Description, Pictures, etc..	Final Species Determination
<1	65		Baccharis pilularis	
	1		Lasthenia californica	
2			Distichlis spicata	
<1	<1		Quercus lobata	
<1	1		Quercus agrifolia	
1			Bromus hordeaceus	
<1	<1		Artemisia dracunculus	
<1	<1		Avena fatua	
<1			Pinus sabiniana	
<1			Rumex crispus	
			~~Anthemis cotula~~	
<1			Gnaphalium canescens	
<1			Lotus persianus	
<1			Artemesia douglasii	
<1			Rosa californica	
<1			Cirsium macilatum	
<1			~~Erythranthe~~ Lactuca serriola	
<1			moss sp	
<1			Gnaphalium californica	
<1			Malvella leprosa	



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Page 4 of 4

Releve # 178

PINN - Releve Field Form - Species Tally Sheet

% Cover by Height Class

Tree >5m	Shrub 1-5m	Herb <1m	Plant Species, Moss/Lichen, Unknown #, Description, Pictures, etc.	Final Species Determaintaion
			✓ 9-4 Kim	

Appendix C

Alliance and Association Descriptions of Pinnacles National Monument

Natural Resource Report NPS/SFAN/NRR—2012/574

NatureServe
4001 Discovery Drive, Suite 2110
Boulder, CO 80302

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

NATIONAL VEGETATION CLASSIFICATION

Vegetation Associations of Pinnacles National Monument

12 June 2009

by

NatureServe

1101 Wilson Blvd., 15th floor
Arlington, VA 22209

4001 Discovery, Suite 270
Boulder, CO 80303

This subset of the International Ecological Classification Standard covers vegetation associations attributed to Pinnacles National Monument. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications. Comments and suggestions regarding the contents of this subset should be directed to Mary J. Russo, Central Ecology Data Manager, Durham, NC mary_russo@natureserve.org, and/or Gwen Kittel, Regional Vegetation Ecologist, Boulder, CO <gwen_kittel@natureserve.org>.



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Citations:

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NatureServe[1]. 2009. International Ecological Classification Standard: Terrestrial Ecological Classifications. Vegetation Associations of Pinnacles National Monument. NatureServe Central Databases. Arlington, VA. Data current as of 12 June 2009.

[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

United States
Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque , NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

Canada
Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre. Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean
Centro de Datos para la Conservacion de Bolivia, La Paz , Bolivia; Centro de Datos para la Conservacion de Colombia, Cali,Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala , Guatemala; Centro de Datos para la Conservacion de Panama, Querry Heights , Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo , Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora , Mexico; Netherlands Antilles Natural Heritage Program, Curacao , Netherlands Antilles; Puerto Rico-Departmento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

NatureServe also has partnered with many International and United States Federal and State organizations, which have also contributed significantly to the development of the International Classification. Partners include the following The Nature Conservancy; Provincial Forest Ecosystem Classification Groups in Canada; Canadian Forest Service; Parks Canada; United States Forest Service; National GAP Analysis Program; United States National Park Service; United States Fish and Wildlife Service; United States Geological Survey; United States Department of Defense; Ecological Society of America; Environmental Protection Agency; Natural Resource Conservation Services; United States Department of Energy; and the Tennessee Valley Authority. Many individual state organizations and people from academic institutions have also contributed to the development of this classification.

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Quercus agrifolia / Annual Grass - Herb Woodland
Coast Live Oak / Annual Grass - Herb Woodland

CODE	CEGL002861
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Extremely xeromorphic evergreen woodland (II.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural extremely xeromorphic evergreen woodland (II.A.5.N.)
FORMATION	Sclerophyllous extremely xeromorphic evergreen woodland (II.A.5.N.a.)
ALLIANCE	*QUERCUS AGRIFOLIA* WOODLAND ALLIANCE (A.589) Coast Live Oak Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY
Globally
This association is known from much of central and southern coastal California, from Solano to San Diego counties. This woodland association occurs on flat to steep slopes that are often facing northwest at low elevations between 45 and 700 m. It is dominated by *Quercus agrifolia* in the tree layer and *Bromus diandrus* and other herbs in the herbaceous layer.

DISTRIBUTION
Pinnacles National Monument
This association was sampled in the McCabe Canyon (1) and Old Boundaries (1) areas of Pinnacles National Monument.

Globally
This association is known from much of central and southern coastal California. It is known from the Coast Ranges, from Marin and Solano counties north of the San Francisco Bay area south to San Diego County.

ENVIRONMENTAL DESCRIPTION
Pinnacles National Monument
This woodland/forest association occurs on somewhat steep, north- and northeast-facing slopes at elevations below 600 m. The association is dominated by *Quercus agrifolia var. agrifolia* in the overstory tree layer. The understory shrub layer includes *Ceanothus cuneatus var. cuneatus*, and the herbaceous layer may include *Amsinckia menziesii var. intermedia, Bowlesia incana, Clarkia* sp., *Claytonia perfoliata ssp. perfoliata, Collinsia heterophylla, Delphinium parryi ssp. parryi, Erigeron foliosus var. foliosus, Eriogonum nudum, Galium aparine, Galium porrigens var. porrigens, Bromus diandrus*, and *Melica imperfecta*.

Elevation: Mean 406.0 m, Range 378 - 434 m.
Aspect: North (1), Northeast (1).
Slope: Mean 24.5 degrees, Range 24-25 degrees.
Macro Topography: Middle to Upper 1/3 of slope (1), Upper 1/3 of slope (1).
Micro Topography: Linear or even (1), Undulating pattern (1).

Fines Cover: Mean 6.0%, Range 2-10%.
Gravel Cover: Mean 1.5%, Range 1-2%.
Cobble Cover: Mean 0.3%, Range 0-0.5%.
Stone Cover: Mean 0.3%, Range 0-0.5%.
Bedrock Cover: Mean 0.0%, Range 0%.
Litter Cover: Mean 88.0%, Range 83-93%.
Stem Basal Area Cover: Mean 4.0%, Range 4 - 4%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Ash (1), Fanglomerate (1).
Soil Texture: Clay or Clay Loam (1), Sandy Loam (1).

Globally

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This association occupies virtually all aspects and slope steepness (0-32 degrees) from between 45 and 700 m elevation. Substrate texture is variable, and stands typically occur on sandstones and shales.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory tree layer is dominated by *Quercus agrifolia var. agrifolia*. The understory shrub layer includes *Ceanothus cuneatus var. cuneatus*. The herbaceous layer may include the forbs *Amsinckia menziesii var. intermedia, Bowlesia incana, Clarkia* sp., *Claytonia perfoliata ssp. perfoliata, Collinsia heterophylla, Delphinium parryi ssp. parryi, Erigeron foliosus var. foliosus, Eriogonum nudum, Galium aparine*, and *Galium porrigens var. porrigens*, and the graminoids *Bromus diandrus* and *Melica imperfecta*.

Total Vegetation Cover: Mean 55.0%, Range 55 - 55%.
Non-native Cover: Mean 12.0%, Range 12 - 12%.
Low Cover (<0.5m): Mean 35.0%, Range 35 - 35%.
Medium Cover (0.5-4.0m): Mean 4.0%, Range 4 - 4%.
Tall Cover (>4.0m): Mean 37.0%, Range 37 - 37%.
Species Richness: Mean 43.0, Range 43 - 43.

Globally

The *Quercus agrifolia* overstory is variable in cover, from open to continuous. Other tree species that may also be present at relatively low cover and include *Platanus racemosa, Populus fremontii, Pseudotsuga menziesii, Quercus chrysolepis, Quercus dumosa, Quercus lobata*, and *Juglans californica*. Introduced invasive trees such as *Eucalyptus* spp. can be abundant in some stands. Shrubs may be present, such as *Artemisia californica, Adenostoma fasciculatum, Eriogonum fasciculatum, Heteromeles arbutifolia, Malosma laurina, Rhus ovata, Sambucus mexicana, Salvia leucophylla*, and *Salvia mellifera*. The herbaceous layer is usually intermittent to open, especially with forbs (e.g., *Brassica* spp., *Claytonia perfoliata*, and *Lupinus* spp.) and non-native annual grasses (e.g., *Avena fatua, Bromus diandrus, Bromus hordeaceus*, and *Vulpia* spp.).

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Tree (canopy & subcanopy)	*Quercus agrifolia var. agrifolia*
Shrub/sapling (tall & short)	*Ceanothus cuneatus var. cuneatus*
Herb (field)	*Bromus diandrus*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Aira caryophyllea, Aphanes arvensis, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Dodecatheon clevelandii ssp. patulum, Erodium cicutarium, Lactuca serriola, Lolium temulentum, Stellaria media ssp. pallida, Vulpia myuros

Globally

Calochortus catalinae, Delphinium parryi ssp. blochmaniae, Dodecatheon clevelandii ssp. patulum, Juglans californica, Quercus dumosa

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (8-Nov-2005).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Other references called these the "/Grass" and "/Annual Grass - Herb", but they are basically the same community concept.

Globally

This association was originally named *Quercus agrifolia* / Grass by Allen et al. (1991) from Solano to Monterey counties, though it has been documented elsewhere in southern California as well as central California. It is called

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Quercus agrifolia / Annual Grass-Herb here to better describe the annual nature of the understory. Other community descriptions that are considered equivalent are the *Quercus agrifolia* / grass associations of Shuford and Timossi (1989) and Evens and Kentner (2006) from Marin County.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_095, PINN_120.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Allen et al. 1989, Allen et al. 1991, Evens and Kentner 2006, Evens and San 2006, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Sawyer and Keeler-Wolf 1995, Shuford and Timossi 1989, Western Ecology Working Group n.d.

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Quercus agrifolia / Toxicodendron diversilobum Intermittently Flooded Woodland
Coast Live Oak / Pacific Poison-oak Intermittently Flooded Woodland

CODE	CEGL005312
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Extremely xeromorphic evergreen woodland (II.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural extremely xeromorphic evergreen woodland (II.A.5.N.)
FORMATION	Sclerophyllous extremely xeromorphic evergreen woodland (II.A.5.N.a.)
ALLIANCE	*QUERCUS AGRIFOLIA* WOODLAND ALLIANCE (A.589) Coast Live Oak Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This riparian and mesic woodland occurs along gentle to steep, intermittently flooded streams. *Quercus agrifolia* is the dominant tree; other trees that may be infrequently to often present in low cover include *Salix laevigata, Quercus engelmannii, Pinus sabiniana, Populus balsamifera*, and *Populus fremontii*. *Toxicodendron diversilobum* is characteristically present and usually dominant in the shrub understory. Other shrub species such as *Salix lasiolepis, Rubus ursinus*, and *Baccharis salicifolia* may also occur. Herbs may include the forbs *Anthriscus caucalis, Galium aparine, Galium porrigens var. porrigens*, and *Marah fabaceus*, and the graminoids *Carex* sp., *Agrostis* sp., and *Bromus diandrus*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1), North Wilderness (2), and Old Boundaries (15) areas of Pinnacles National Monument.

Globally

This association is known from interior coastal mountains of central and southern California, from Marin to San Diego counties.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on gentle to steep slopes on all aspects at elevations between 289 and 492 m. The association is dominated by *Quercus agrifolia var. agrifolia* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Pinus sabiniana*. The understory shrub layer includes *Toxicodendron diversilobum*, and the herbaceous layer may include *Anthriscus caucalis, Galium aparine, Galium porrigens var. porrigens, Marah fabaceus*, and *Bromus diandrus*. Nonvascular taxa include a moss species.

Elevation: Mean 379.7 m, Range 289 - 492 m.
Aspect: East (5), Northeast (3), Northwest (1), South (2), Southeast (1), Southwest (3), West (3).
Slope: Mean 11.2 degrees, Range 1 - 30 degrees.
Macro Topography: (0), Bottom to Lower 1/3 of slope (4), Bottom to Mid 1/3 of slope (1), Bottom to Upper 1/3 of slope (7), Middle 1/3 of slope to Ridgetop (3), Upper 1/3 of slope (1).
Micro Topography: Concave or depression (10), Linear or even (5), Undulating pattern (3).

Fines Cover: Mean 5.9%, Range 0.5 - 30%.
Gravel Cover: Mean 3.1%, Range 0.5 - 10%.
Cobble Cover: Mean 2.0%, Range 0 - 10%.
Stone Cover: Mean 1.5%, Range 0 - 8%.
Bedrock Cover: Mean 0.7%, Range 0 - 9%.
Litter Cover: Mean 81.7%, Range 55 - 95%.
Stem Basal Area Cover: Mean 3.4%, Range 1 - 6%.
Water Cover: Mean 2.4%, Range 0 - 30%.
Parent Material: Fanglomerate (2), General volcanic extrusives (2), Granitic (2), Gravelly alluvium (1), Mixed alluvium (6), Rhyolite (5).

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Soil Texture: Clay or Clay Loam (1), Sand (6), Sandy Loam (11).

Globally
This riparian and mesic woodland occurs along gentle to steep, intermittently flooded streams.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Quercus agrifolia var. agrifolia*. Abundant or characteristic trees present at lower cover may include *Pinus sabiniana*. The understory shrub layer includes *Toxicodendron diversilobum*. The herbaceous layer may include the forbs *Anthriscus caucalis*, *Galium aparine*, *Galium porrigens var. porrigens*, and *Marah fabaceus*, and the graminoid *Bromus diandrus*.

Total Vegetation Cover: Mean 67.9%, Range 49 - 95%.
Non-native Cover: Mean 7.6%, Range 0.5 - 25%.
Low Cover (<0.5m): Mean 15.8%, Range 2 - 38%.
Medium Cover (0.5-4.0m): Mean 19.3%, Range 5 - 41%.
Tall Cover (>4.0m): Mean 50.4%, Range 17 - 86%.
Species Richness: Mean 48.4, Range 26 - 72.

Globally
In this association *Quercus agrifolia* is the dominant tree; other trees that may be infrequently to often present in low cover include *Salix laevigata*, *Quercus engelmannii*, *Pinus sabiniana*, *Populus balsamifera*, and *Populus fremontii*. *Toxicodendron diversilobum* is characteristically present and usually dominant in the shrub understory. Other shrub species such as *Salix lasiolepis*, *Rubus ursinus*, and *Baccharis salicifolia* may also occur from time to time. Herbs may include the forbs *Anthriscus caucalis*, *Galium aparine*, *Galium porrigens var. porrigens*, and *Marah fabaceus*, and the graminoids *Carex* sp., *Agrostis* sp., and *Bromus diandrus*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Toxicodendron diversilobum*
Herb (field)	*Bromus diandrus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Anthriscus caucalis, Bromus arenarius, Bromus diandrus, Bromus rubens, Centaurea melitensis, Cerastium glomeratum, Cirsium occidentale var. venustum, Eriodictyon tomentosum, Ribes californicum var. californicum, Rumex salicifolius, Stellaria media, Stellaria media ssp. pallida, Vulpia myuros

Globally
Eriodictyon tomentosum, Ribes californicum var. californicum

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.

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Pinnacles National Monument Plots: PINN_105, PINN_106, PINN_107, PINN_108, PINN_109, PINN_181, PINN_569, PINN_571, PINN_574, PINN_584, PINN_594, PINN_620, PINN_621, PINN_643, PINN_663, PINN_822, PINN_850, PINN_901.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Allen et al. 1989, Evens and San 2006, Klein and Evens 2006, Western Ecology Working Group n.d.

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Aesculus californica / Toxicodendron diversilobum / Moss Woodland
California Buckeye / Pacific Poison-oak / Moss Woodland

CODE	CEGL005302
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Cold-deciduous woodland (II.B.2.N.a.)
ALLIANCE	*AESCULUS CALIFORNICA* WOODLAND ALLIANCE (A.602) California Buckeye Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This is a diverse woodland occurring on steep upper slopes, mostly north-facing, but it can occur on eastern and other aspects. The tree layer is dominated by *Aesculus californica*. *Quercus wislizeni* may be present as well in lower cover. The shrub layer has several species, of which *Toxicodendron diversilobum* is the most consistent, although it was not present in every stand sampled. Other shrubs that may be present include *Prunus ilicifolia*, *Diplacus aurantiacus (= Mimulus aurantiacus)*, and *Keckiella breviflora*. The herbaceous layer has a high and consistent cover of mosses, as well as overwhelmingly dominant introduced grasses. This type is documented from the foothills of the Sierra Nevada and from the interior Central Coast Ranges of California.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the North Wilderness (1) and Old Boundaries (10) areas of Pinnacles National Monument.

Globally

This association is known from San Benito County and the northern Sierra Nevada foothills, California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on gentle to steep, often northerly-facing slopes, at elevations between 272 and 586 m. The association is dominated by *Aesculus californica* in the overstory tree layer. The understory shrub layer includes *Prunus ilicifolia ssp. ilicifolia*, and the herbaceous layer may include *Anthriscus caucalis, Clarkia unguiculata, Galium porrigens var. porrigens, Pentagramma triangularis ssp. triangularis, Bromus diandrus, Bromus hordeaceus*, and *Vulpia myuros*.

Elevation: Mean 413.9 m, Range 272 - 586 m.
Aspect: East (1), North (7), Northeast (2), Northwest (2).
Slope: Mean 23.1 degrees, Range 1 - 31 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (1), Bottom to Upper 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (4), Middle to Upper 1/3 of slope (1), Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Concave or depression (5), Linear or even (6), Undulating pattern (1).

Fines Cover: Mean 18.3%, Range 1 - 50%.
Gravel Cover: Mean 8.0%, Range 0.5 - 35%.
Cobble Cover: Mean 2.1%, Range 0 - 12%.
Stone Cover: Mean 1.7%, Range 0 - 10%.
Bedrock Cover: Mean 0.9%, Range 0 - 5%.
Litter Cover: Mean 65.5%, Range 30 - 96%.
Stem Basal Area Cover: Mean 4.0%, Range 2 - 7%.
Water Cover: Mean 0.2%, Range 0 - 2%.
Parent Material: Breccia (volcanic) (2), General volcanic extrusives (4), Granitic (3), Mixed alluvium (1), Rhyolite (1), Unknown (1).
Soil Texture: Clay or Clay Loam (4), Sand (1), Sandy Loam (6), Silt or Silt Loam (1).

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Globally
This association occurs between elevations of 272 and 586 m (892-1922 feet), on mostly north-facing slopes, but may occur on eastern and other aspects, especially in draws. It occurs on gentle to steep (1- to 31-degree) slopes, mostly on the upper portions. Rock cover can be high (85%) as well as fines (50%) or litter (96%). Parent materials are volcanic extrusives, metamorphic, volcanic flow or plutonic, and mixed alluvium; soils are often moderately fine sandy clay loam, coarse sandy loam, clay, clay loam, sand, silt or silt loam.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Aesculus californica*. The understory shrub layer includes *Prunus ilicifolia ssp. ilicifolia*. The herbaceous layer may include the forbs *Anthriscus caucalis, Clarkia unguiculata,* and *Galium porrigens var. porrigens,* the fern *Pentagramma triangularis ssp. triangularis,* and the graminoids *Bromus diandrus, Bromus hordeaceus,* and *Vulpia myuros*.

Total Vegetation Cover: Mean 71.4%, Range 50 - 95%.
Non-native Cover: Mean 17.0%, Range 3 - 93%.
Low Cover (<0.5m): Mean 33.2%, Range 13 - 94%.
Medium Cover (0.5-4.0m): Mean 13.7%, Range 4 - 26%.
Tall Cover (>4.0m): Mean 50.2%, Range 31 - 73%.
Species Richness: Mean 36.5, Range 25 - 61.

Globally
In this association, the main overstory tree species is *Aesculus californica*. *Quercus wislizeni* may also occur at relatively low cover. The understory shrub layer may include *Toxicodendron diversilobum, Heteromeles arbutifolia, Diplacus aurantiacus (= Mimulus aurantiacus), Prunus ilicifolia ssp. ilicifolia,* and *Keckiella breviflora*. The herbaceous understory frequently includes a diverse mixture of grass and forb species such as *Bromus hordeaceus, Bromus madritensis, Bromus diandrus, Melica californica, Pentagramma triangularis ssp. triangularis,* and *Phacelia cicutaria*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Aesculus californica*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Allium crispum, Anthriscus caucalis, Avena barbata, Avena fatua, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Dodecatheon clevelandii ssp. patulum, Stellaria media, Vulpia myuros

Globally
Dodecatheon clevelandii ssp. patulum

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (7-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This association occurs on the upper third of fairly steep slopes. One stand occurs along a small stream. The composition is highly variable in this diverse type. *Toxicodendron diversilobum* is present in only half the stands, but otherwise seems identical to the type as described from the Peoria Wildlife Area by the same name (Evens et al. 2004) as well as in the northern Sierra Nevada foothills (Klein et al. 2007).

Globally
Data are not available.

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CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_121, PINN_158, PINN_206, PINN_563, PINN_564, PINN_565, PINN_566, PINN_894, PINN_900, PINN_923, PINN_934, PINN_951.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens et al. 2004, Klein et al. 2007, Western Ecology Working Group n.d.

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Quercus douglasii - Pinus sabiniana / Cercocarpus montanus var. glaber Woodland
Blue Oak - Foothill Pine / Birchleaf Mountain-mahogany Woodland

CODE	CEGL005313
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Cold-deciduous woodland (II.B.2.N.a.)
ALLIANCE	*QUERCUS DOUGLASII* WOODLAND ALLIANCE (A.614) Blue Oak Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This woodland/forest association occurs on somewhat steep to steep north-facing slopes. The overstory tree layer is dominated by *Quercus douglasii* and is typically codominated by *Pinus sabiniana*, but the pine can be merely present. The shrub layer is thickly dominated by *Cercocarpus montanus var. glaber (= Cercocarpus betuloides)*. Other trees and shrubs may be present but never dominant. The herbaceous layer is typically overwhelmingly dominated by non-native graminoids such as *Bromus diandrus, Bromus hordeaceus*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the North Wilderness (1) and Old Boundaries (3) areas of Pinnacles National Monument.

Globally

This association is known from the foothills and mountains of the Sierra Nevada from Butte to Fresno counties and the Central Coast in Monterey and San Benito counties.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on somewhat steep to steep north- and west-facing slopes, at elevations between 419 and 649 m. The association is dominated by *Quercus douglasii* in the overstory tree layer. The understory shrub layer includes *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides), Lonicera subspicata var. denudata*, and *Rhamnus ilicifolia*, and the herbaceous layer may include *Amsinckia menziesii var. intermedia, Erigeron foliosus var. foliosus, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Phacelia distans, Bromus diandrus, Bromus hordeaceus*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Elevation: Mean 518.5 m, Range 419 - 649 m.
Aspect: North (1), Northwest (1), West (2).
Slope: Mean 27.0 degrees, Range 23 - 31 degrees.
Macro Topography: Bottom to Upper 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (3).
Micro Topography: Concave or depression (1), Linear or even (3).

Fines Cover: Mean 6.8%, Range 5 - 12%.
Gravel Cover: Mean 3.8%, Range 0 - 8%.
Cobble Cover: Mean 0.4%, Range 0 - 0.5%.
Stone Cover: Mean 0.3%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.1%, Range 0 - 0.5%.
Litter Cover: Mean 84.3%, Range 80 - 88%.
Stem Basal Area Cover: Mean 5.3%, Range 3 - 8%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (1), Rhyolite (3).
Soil Texture: Sandy Loam (4).

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Globally
This association occurs at elevations between 419 and 1316 m (1374-4320 feet), on mostly northeastern and northwestern aspects, but it can occur on others. Stands occur on somewhat steep to steep slopes, ranging from 23-40 degrees, on all parts of the slope. Surface topography is usually undulating. Parent material is variable, occurring on sedimentary, fanglomerate, or rhyolite. Soil textures tend to be fine and range from fine sandy clay loam to clay to sandy loam.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Quercus douglasii*. The understory shrub layer includes *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides), Lonicera subspicata var. denudata*, and *Rhamnus ilicifolia*. The herbaceous layer may include the forbs *Amsinckia menziesii var. intermedia, Erigeron foliosus var. foliosus, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis*, and *Phacelia distans*, and the graminoids *Bromus diandrus, Bromus hordeaceus,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Total Vegetation Cover: Mean 75.5%, Range 65 - 85%.
Non-native Cover: Mean 8.8%, Range 6 - 14%.
Low Cover (<0.5m): Mean 20.3%, Range 7 - 35%.
Medium Cover (0.5-4.0m): Mean 34.5%, Range 15 - 45%.
Tall Cover (>4.0m): Mean 30.0%, Range 25 - 35%.
Species Richness: Mean 47.3, Range 40 - 57.

Globally
In this association, *Quercus douglasii* is the dominant overstory tree canopy. *Pinus sabiniana* is typically codominant, but it can be merely present. Other tree species occasionally present include *Quercus wislizeni* and *Aesculus californica*. *Cercocarpus montanus var. glaber (= Cercocarpus betuloides)* is consistently present in the understory usually as the dominant shrub. *Fraxinus dipetala, Rhamnus ilicifolia, Ericameria linearifolia, Eriogonum fasciculatum var. foliolosum, Toxicodendron diversilobum, Arctostaphylos virgata, Rhamnus crocea,* and *Juniperus californica* may also be present with <1 to 20% cover. *Bromus hordeaceus, Avena* sp., and *Poa secunda* consistently occur in the herb layer with a variety of other native and non-native grass and forb species.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Quercus douglasii*
Shrub/sapling (tall & short)	*Cercocarpus montanus var. glaber*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Achillea millefolium, Allium crispum, Avena barbata, Avena fatua, Bromus arenarius, Bromus diandrus, Bromus rubens, Calystegia subacaulis ssp. subacaulis, Centaurea melitensis, Cerastium glomeratum, Dodecatheon clevelandii ssp. patulum, Erodium botrys, Erodium cicutarium, Logfia gallica, Stellaria media ssp. pallida, Vulpia myuros

Globally
Arctostaphylos virgata, Calystegia subacaulis ssp. subacaulis, Dodecatheon clevelandii ssp. patulum

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Data are not available.

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CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_077, PINN_207, PINN_954, PINN_955.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Allen et al. 1989, Evens et al. 2006, Western Ecology Working Group n.d.

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Quercus douglasii - Pinus sabiniana / Grass Woodland
Blue Oak - Foothill Pine / Grass Woodland

CODE	CEGL008647
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Cold-deciduous woodland (II.B.2.N.a.)
ALLIANCE	*QUERCUS DOUGLASII* WOODLAND ALLIANCE (A.614) Blue Oak Woodland Alliance

ECOLOGICAL SYSTEM(S): California Lower Montane Blue Oak-Foothill Pine Woodland and Savanna (CES206.936)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

Stands of this woodland are found at low elevations (92-1220 m [300-4000 feet]) on all aspects, primarily on middle to upper slopes with less than 35% steepness, but occasionally found on flat areas. Soil textures range from gravel to clay loam to silt loam from various parent materials. The association is dominated by *Quercus douglasii* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover, such as *Pinus sabiniana*. The understory shrub layer includes *Lonicera subspicata var. denudata, Lonicera hispidula var. vacillans, Ceanothus cuneatus, Rhamnus crocea,* and *Rhamnus ilicifolia*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (8) area of Pinnacles National Monument.

Globally

This association is found in the foothills of the Sierra Nevada from Shasta to Fresno counties and in the Central Coast area from Monterey to Los Angeles counties (Allen et al. 1991).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on somewhat steep to steep slopes on all aspects at elevations between 401 and 682 m. The association is dominated by *Quercus douglasii* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Pinus sabiniana*. The understory shrub layer includes *Lonicera subspicata var. denudata*, and the herbaceous layer may include *Clarkia purpurea ssp. quadrivulnera, Dichelostemma capitatum ssp. capitatum, Galium porrigens var. porrigens, Yabea microcarpa, Bromus diandrus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Poa secunda (= ssp. secunda)*. Nonvascular taxa include a lichen species.

Elevation: Mean 472.0 m, Range 401 - 682 m.
Aspect: East (1), North (1), Northeast (2), Northwest (1), South (1), West (2).
Slope: Mean 23.5 degrees, Range 15 - 32 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (3), Middle to Upper 1/3 of slope (2), Upper 1/3 of slope (1), Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Convex or rounded (5), Linear or even (2), Undulating pattern (1).

Fines Cover: Mean 11.9%, Range 2 - 46%.
Gravel Cover: Mean 12.4%, Range 2 - 42%.
Cobble Cover: Mean 0.8%, Range 0.5 - 1%.
Stone Cover: Mean 0.9%, Range 0.5 - 1%.
Bedrock Cover: Mean 0.2%, Range 0 - 0.5%.
Litter Cover: Mean 66.5%, Range 35 - 88%.
Stem Basal Area Cover: Mean 7.1%, Range 1 - 12%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Fanglomerate (1), General igneous intrusives (2), General volcanic extrusives (4).

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Soil Texture: Clay or Clay Loam (1), Sandy Loam (6), Silt or Silt Loam (1).

Globally
Stands of this woodland are found at low elevations, from 90 to 1220 m (300-4000 feet), on all aspects, primarily on upper slopes of less than 35%; however, they are occasionally found on flat areas. Soil textures range from gravel to clay loam to silt loam from various parent materials.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Quercus douglasii*. Abundant or characteristic trees present at lower cover may include *Pinus sabiniana*. The understory shrub layer includes *Lonicera subspicata var. denudata*. The herbaceous layer may include the forbs *Clarkia purpurea ssp. quadrivulnera, Dichelostemma capitatum ssp. capitatum, Galium porrigens var. porrigens,* and *Yabea microcarpa*, and the graminoids *Bromus diandrus, Bromus rubens (= Bromus madritensis ssp. rubens),* and *Poa secunda (= ssp. secunda)*.

Total Vegetation Cover: Mean 55.5%, Range 40 - 75%.
Non-native Cover: Mean 12.5%, Range 2 - 25%.
Low Cover (<0.5m): Mean 17.1%, Range 10 - 30%.
Medium Cover (0.5-4.0m): Mean 14.0%, Range 2 - 36%.
Tall Cover (>4.0m): Mean 40.0%, Range 20 - 59%.
Species Richness: Mean 48.6, Range 34 - 70.

Globally
Stands of this woodland are dominated by *Quercus douglasii* and *Pinus sabiniana* with an understory of grasses. Shrubs that may be found here include *Lonicera subspicata, Lonicera hispidula var. vacillans, Ceanothus cuneatus, Rhamnus crocea,* and *Rhamnus ilicifolia*. Rarely occurring are other trees and shrubs such as *Aesculus californica, Quercus agrifolia, Quercus lobata, Quercus wislizeni, Quercus durata, Umbellularia californica, Adenostoma fasciculatum, Artemisia californica, Arctostaphylos glauca, Cercocarpus montanus var. glaber (= Cercocarpus betuloides), Ceanothus leucodermis, Ceanothus sorediatus, Corylus cornuta, Eriodictyon californicum, Eriodictyon crassifolium, Eriogonum fasciculatum, Fraxinus dipetala, Ericameria linearifolia (= Haplopappus linearifolius), Hazardia squarrosa, Frangula californica (= Rhamnus californica), Toxicodendron diversilobum, Rhus trilobata, Ribes californicum*, and *Sambucus caerulea*. Most of the tree species in this association have a dbh between 10 and 28 cm (4-11 inches), and some of the tree species have a dbh of 30 to 58 cm (12-23 inches) (Allen et al. 1991).

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Pinus sabiniana*
Tree canopy	*Quercus douglasii*

Globally

Stratum	Species
Tree canopy	*Pinus sabiniana*
Tree canopy	*Quercus douglasii*

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Achillea millefolium, Anthriscus caucalis, Avena barbata, Avena fatua, Bromus arenarius, Bromus diandrus, Bromus rubens, Centaurea melitensis, Cerastium glomeratum, Cirsium occidentale var. venustum, Hypochaeris glabra, Hypochaeris radicata, Logfia gallica, Stellaria media, Triteleia lugens, Vulpia myuros

Globally
Ceanothus leucodermis, Eriodictyon crassifolium, Ribes californicum, Triteleia lugens

CONSERVATION STATUS RANK
Global Rank & Reasons: G4? (6-May-2002). Likely to occur throughout much of the foothill belt of cismontane California, but threatened to some degree by invasive exotics, development, and by higher than modal grazing pressure.

CLASSIFICATION COMMENTS

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Pinnacles National Monument
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_082, PINN_083, PINN_110, PINN_556, PINN_562, PINN_647, PINN_784, PINN_787.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf, mod. G. Kittel

REFERENCES: Allen et al. 1989, Allen et al. 1991, Evens et al. 2004, Klein et al. 2007, Western Ecology Working Group n.d.

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Quercus douglasii / Mixed Herbaceous Woodland
Blue Oak / Mixed Herbaceous Woodland

CODE	CEGL005314
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Cold-deciduous woodland (II.B.2.N.a.)
ALLIANCE	*QUERCUS DOUGLASII* WOODLAND ALLIANCE (A.614) Blue Oak Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This open to shaded woodland occurs across a wide range of elevations, between 30 and 1676 m (100-5500 feet), on moderate to steep slopes of all aspects, from bottom to upper slopes and ridgetops. The surface topography is variable, and soils are mostly sandy loam, but can be a wide variety of textures, including clay, clay loam, silt, silt loam, and sand. The vegetation is an overstory tree layer dominated by *Quercus douglasii*. A shrub layer is absent, although a few scattered individuals and even clumps of shrubs may occur. The herbaceous cover is typically the predominant undergrowth cover in this type and typically comprised of a high cover of grasses (average 90%). However, no one species or suite of species are present in all stands. Commonly encountered native grass species include *Elymus glaucus, Leymus triticoides, Melica californica, Nassella pulchra, Poa secunda,* and *Vulpia microstachys*. Introduced grasses commonly include *Avena barbata, Bromus diandrus, Bromus hordeaceus, Bromus rubens, Brachypodium distachyon,* and *Cynosurus echinatus*. Forb species vary depending on yearly rainfall and are highly diverse.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1), North Wilderness (3), Old Boundaries (4), and South Wilderness (5) areas of Pinnacles National Monument.

Globally

This association has a widespread occurrence ringing the Central Valley of California. It occurs along the central coast from Monterey to Santa Barbara counties, the north-central coast from Sonoma to Contra Costa counties, and in the foothills of the Sierra Nevada from Shasta to Mariposa counties (Allen et al. 1989, Klein et al. 2007). It is also documented in the interior coastal ranges of San Benito County (Pinnacles National Monument) (Evens et al. 2006).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on moderate to steep slopes on most aspects, at elevations between 258 and 771 m. The association is dominated by *Quercus douglasii* in the overstory tree layer. The herbaceous layer may include *Clarkia purpurea ssp. quadrivulnera, Galium porrigens var. porrigens, Lotus wrangelianus, Micropus californicus var. californicus, Pterostegia drymarioides, Bromus diandrus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Poa secunda (= ssp. secunda),* and *Vulpia myuros*. Nonvascular taxa include a lichen species and moss species.

Elevation: Mean 408.7 m, Range 258 - 771 m.
Aspect: East (2), North (6), Northeast (3), Northwest (1), Southeast (1).
Slope: Mean 18.1 degrees, Range 9 - 34 degrees.
Macro Topography: (0), Lower 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (3), Ridge top (2), Upper 1/3 of slope (4), Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Concave or depression (3), Convex or rounded (5), Linear or even (3), Undulating pattern (2).

Fines Cover: Mean 12.3%, Range 1 - 50%.
Gravel Cover: Mean 1.9%, Range 0 - 8%.
Cobble Cover: Mean 0.5%, Range 0 - 1%.
Stone Cover: Mean 0.2%, Range 0 - 0.5%.

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Bedrock Cover: Mean 0.1%, Range 0 - 0.5%.
Litter Cover: Mean 78.4%, Range 44 - 94%.
Stem Basal Area Cover: Mean 7.1%, Range 3 - 13%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (3), General volcanic extrusives (3), Rhyolite (5), Unknown (2).
Soil Texture: Clay or Clay Loam (1), Sandy Loam (11), Silt or Silt Loam (1).

Globally
This open to shaded woodland occurs across a wide range of elevations, between 30 and 1676 m (100-5500 feet), on moderate to steep slopes of all aspects, from bottom to upper slopes and ridgetops. The surface topography is variable, and soils are mostly sandy loam, but can be a wide variety of textures, including clay, clay loam, silt, silt loam, and sand.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated *Quercus douglasii*. The herbaceous layer may include the forbs *Clarkia purpurea ssp. quadrivulnera, Galium porrigens var. porrigens, Lotus wrangelianus, Micropus californicus var. californicus*, and *Pterostegia drymarioides*, and the graminoids *Bromus diandrus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Poa secunda (= ssp. secunda)*, and *Vulpia myuros*.

Total Vegetation Cover: Mean 59.9%, Range 35 - 85%.
Non-native Cover: Mean 14.1%, Range 3 - 36%.
Low Cover (<0.5m): Mean 18.9%, Range 4 - 50%.
Medium Cover (0.5-4.0m): Mean 17.2%, Range 0.5 - 48%.
Tall Cover (>4.0m): Mean 40.8%, Range 25 - 65%.
Species Richness: Mean 44.3, Range 30 - 53.

Globally
In this association, *Quercus douglasii* is the dominant overstory tree. A wide variety of trees may be present, depending on the elevation and neighboring vegetation. Allen et al. (1989) (298 sampled stands of this type) list 16 tree species with less than 15% constancy. These include *Aesculus californica, Juglans californica, Pinus contorta, Pinus coulteri, Pinus jeffreyi, Pinus ponderosa, Pinus sabiniana, Pseudotsuga menziesii, Quercus agrifolia, Quercus chrysolepis, Quercus dumosa, Quercus garryana, Quercus kelloggii, Quercus lobata, Quercus X morehus*, and *Quercus wislizeni*. Stands in the central interior coast have *Pinus sabiniana* and *Quercus lobata* as occasional co-associates. The shrub layer is generally poorly represented, and a wide variety of shrub species may occur in low cover (occasionally high cover), but then the herbaceous cover is very high. Allen et al. (1989) recorded many shrubs that occur with less than 15% constancy. These include *Adenostoma fasciculatum, Arctostaphylos canescens, Arctostaphylos manzanita, Arctostaphylos virgata, Cercocarpus montanus var. glaber (= Cercocarpus betuloides), Ceanothus integerrimus, Eriodictyon californicum, Eriogonum fasciculatum, Ericameria linearifolia (= Haplopappus linearifolius), Heteromeles arbutifolia, Lonicera interrupta, Lonicera subspicata, Lupinus albifrons, Prunus ilicifolia, Frangula californica (= Rhamnus californica), Rhamnus crocea, Toxicodendron diversilobum (= Rhus diversiloba), Rhus trilobata, Ribes californicum, Ribes quercetorum, Salvia apiana, Salvia leucophylla, Salix* spp., and *Xylococcus bicolor*. Additional shrub species from other studies include *Arctostaphylos pungens, Artemisia californica, Ericameria nauseosa (= Chrysothamnus nauseosus), Sambucus mexicana*, and *Symphoricarpos albus*. Non-native grasses *Bromus diandrus, Bromus hordeaceus, Bromus rubens, Avena barbata*, and *Cynosurus echinatus* may be abundant (0-100% cover, average 90%), though a variety of native grasses often occur such as *Elymus glaucus, Leymus triticoides, Melica californica, Nassella pulchra, Poa secunda*, and *Vulpia microstachys*. Forb species vary depending on yearly rainfall and are highly diverse.

MOST ABUNDANT SPECIES
*Pinnacles National Monument*Data are not available.

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument

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Achillea millefolium, Allium crispum, Avena barbata, Avena fatua, Bromus diandrus, Bromus rubens, Centaurea melitensis, Cerastium glomeratum, Dodecatheon clevelandii ssp. patulum, Erodium cicutarium, Hypochaeris radicata, Logfia gallica, Medicago polymorpha, Stellaria media, Vulpia myuros

Globally
Arctostaphylos virgata, Dodecatheon clevelandii ssp. patulum, Quercus dumosa

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Borchert et al. (1993a) types are more finely divided, taking into account the wide variation of forb or grass species dominance that can change year to year depending on the amount of rainfall and the seasonality of that rainfall.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_076, PINN_123, PINN_549, PINN_550, PINN_551, PINN_552, PINN_553, PINN_558, PINN_774, PINN_788, PINN_791, PINN_793, PINN_818.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Allen et al. 1989, Borchert et al. 1993a, Evens et al. 2006, Klein et al. 2007, Western Ecology Working Group n.d.

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Quercus lobata - Quercus agrifolia / Annual Grass - Herb Woodland
Valley Oak - Coast Live Oak / Annual Grass - Herb Woodland

CODE	CEGL002872
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Cold-deciduous woodland (II.B.2.N.a.)
ALLIANCE	*QUERCUS LOBATA* WOODLAND ALLIANCE (A.618) Valley Oak Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This woodland is known from central to southern California. It occurs on gentle to steep slopes with variable aspects at low elevations between 91 and 1158 m. It is usually found on deep clay, sand, or rocky to clay loam soils. It is dominated by *Quercus agrifolia* and *Quercus lobata* in the tree layer and *Brassica nigra* in the herbaceous layer. Other tree species may include *Juglans californica* and *Pseudotsuga menziesii* at low cover. The shrub layer is sparse to intermittent with an herbaceous understory that may include *Hirschfeldia incana, Centaurea melitensis, Lactuca serriola, Marrubium vulgare, Eriogonum elongatum*, and the graminoids *Bromus diandrus* or *Leymus condensatus*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Francis (2), Kingman (1), and Old Boundaries (5) areas of Pinnacles National Monument.

Globally

This association is known from central to southern California ranging from Santa Clara County to Los Angeles County and inland to Kern, Merced, San Benito, and Santa Clara counties.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on flat and gentle slopes with variable aspects, at elevations between 290 and 385 m. The association is dominated by *Quercus lobata* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Quercus agrifolia var. agrifolia*. The understory shrub layer includes *Eriogonum fasciculatum var. foliolosum*, and the herbaceous layer may include *Artemisia dracunculus* and *Bromus diandrus*.

Elevation: Mean 323.1 m, Range 290 - 385 m.
Aspect: (0), Flat (2), South (2), Southeast (1), Southwest (1), West (1).
Slope: Mean 3.6 degrees, Range 0 - 13 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (5), Middle 1/3 of slope (3).
Micro Topography: Linear or even (6), Undulating pattern (2).

Fines Cover: Mean 20.1%, Range 2 - 75%.
Gravel Cover: Mean 1.8%, Range 0 - 5%.
Cobble Cover: Mean 0.5%, Range 0 - 1%.
Stone Cover: Mean 0.1%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 70.6%, Range 15 - 95%.
Stem Basal Area Cover: Mean 7.3%, Range 3 - 13%.
Water Cover: Mean 0.3%, Range 0 - 1%.
Parent Material: Mixed alluvium (7), Sandy alluvium (1).
Soil Texture: Sand (3), Sandy Loam (5).

Globally

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This woodland is usually found on deep clay, sand and sandy loam, on rocky and clay loam soils, on sandstones, shales or mixed alluvium at elevations ranging from near seal level to over 1100 m. It occurs on gentle to steep slopes (0-13 degrees), at all aspects.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory tree layer is dominated by *Quercus lobata*. Abundant or characteristic trees present at lower cover may include *Quercus agrifolia var. agrifolia*. The herbaceous layer may include the forb *Artemisia dracunculus* and the graminoid *Bromus diandrus*.

Total Vegetation Cover: Mean 78.6%, Range 36 - 116%.
Non-native Cover: Mean 21.3%, Range 2 - 62%.
Low Cover (<0.5m): Mean 29.4%, Range 3 - 84%.
Medium Cover (0.5-4.0m): Mean 20.4%, Range 1 - 53%.
Tall Cover (>4.0m): Mean 51.9%, Range 22 - 76%.
Species Richness: Mean 43.8, Range 28 - 54.

Globally

These are moderately open to very open woodlands (10-50% tree cover), with a shared dominance of *Quercus lobata* and *Quercus agrifolia* along with a largely herbaceous understory of grasses and herbs. Other tree species that may be present with low cover include *Juglans californica* and *Pseudotsuga menziesii*. The shrub layer is sparse to intermittent and occasionally includes *Artemisia californica, Eriogonum fasciculatum var. foliolosum, Salvia leucophylla, Sambucus mexicana,* and *Hazardia squarrosa*. The herbaceous layer may include the forbs *Artemisia dracunculus, Brassica nigra, Hirschfeldia incana, Centaurea melitensis, Lactuca serriola, Marrubium vulgare, Eriogonum elongatum,* and the graminoids *Bromus diandrus* or *Leymus condensatus*

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Tree (canopy & subcanopy)	*Quercus lobata*
Herb (field)	*Bromus diandrus*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Achillea millefolium, Anthriscus caucalis, Aphanes arvensis, Avena barbata, Avena fatua, Bromus arenarius, Bromus diandrus, Bromus rubens, Capsella bursa-pastoris, Centaurea solstitialis, Cerastium glomeratum, Draba verna, Erodium brachycarpum, Erodium cicutarium, Galium parisiense, Hirschfeldia incana, Hypochaeris glabra, Lamium amplexicaule, Logfia gallica, Lolium perenne, Marrubium vulgare, Polypogon monspeliensis, Rumex crispus, Rumex salicifolius, Stellaria media, Urtica urens, Vulpia myuros

Globally

Calochortus catalinae, Juglans californica

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (9-Nov-2005).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Data are not available.

Globally

It remains to be seen if the presence of certain southern California shrubs such as *Salvia leucophylla* in about one-third of the samples is sufficient to differentiate the local stands from other similar stands in northern and central California.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

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Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_003, PINN_004, PINN_005, PINN_152, PINN_572, PINN_589, PINN_657, PINN_906.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Allen et al. 1989, Keeler-Wolf and Evens 2006, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d.

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Platanus racemosa - Quercus agrifolia Woodland
California Sycamore - Coast Live Oak Woodland

CODE	CEGL002858
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*PLATANUS RACEMOSA* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.634) California Sycamore Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This mesic woodland occurs on gentle to steep slopes with variable aspects at low elevations between 166 and 480 m. Stands occur on draws and concave areas of hillslopes that are more mesic than surrounding hillsides. Ssince stands are not associated with running water or springs, they are not considered riparian. This association is codominated by *Platanus racemosa* and *Quercus agrifolia* in the tree layer. *Heteromeles arbutifolia* is characteristically present at low cover in the understory shrub layer, and a variety of grasses and forbs are found in the herbaceous layer.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (5) area of Pinnacles National Monument.

Globally

This woodland is known from the Central Valley (Keeler-Wolf et al. 1997), central interior Coast Ranges (Pinnacles National Monument), and the Santa Monica Mountains (Keeler-Wolf and Evens 2006) of California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on gentle to steep east- and northeast-facing slopes at elevations between 251 and 338 m. The association is dominated by *Platanus racemosa* and *Quercus agrifolia var. agrifolia* in the overstory tree layer. The understory shrub layer includes *Toxicodendron diversilobum*, and the herbaceous layer may include *Anthriscus caucalis, Marah fabaceus, Stachys bullata*, and *Bromus diandrus*. Nonvascular taxa include a moss species.

Elevation: Mean 306.3 m, Range 251 - 338 m.
Aspect: East (4), Northeast (1).
Slope: Mean 13.0 degrees, Range 4 - 35 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (4), Middle 1/3 of slope to Ridgetop (1).
Micro Topography: Concave or depression (3), Linear or even (1), Undulating pattern (1).

Fines Cover: Mean 3.5%, Range 1 - 5%.
Gravel Cover: Mean 3.0%, Range 2 - 4%.
Cobble Cover: Mean 5.1%, Range 0.5 - 10%.
Stone Cover: Mean 7.9%, Range 0.5 - 20%.
Bedrock Cover: Mean 0.3%, Range 0 - 1%.
Litter Cover: Mean 73.0%, Range 45 - 89%.
Stem Basal Area Cover: Mean 4.3%, Range 2 - 7%.
Water Cover: Mean 3.8%, Range 0 - 10%.
Parent Material: General volcanic extrusives (3), Mixed alluvium (2).
Soil Texture: Sand (1), Sandy Loam (3), Unknown (1).

Globally

This association occurs between 134 and 460 m (439-1509 feet) elevation on variable aspects, primarily on concave or flat, bottom to midslopes with less than 35 degrees steepness. Soil texture ranges from sand to silty clay loam on general volcanic extrusives and mixed alluvium.

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VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory tree layer is dominated by *Platanus racemosa* and *Quercus agrifolia var. agrifolia*. The understory shrub layer includes *Toxicodendron diversilobum*. The herbaceous layer may include the forbs *Anthriscus caucalis, Marah fabaceus,* and *Stachys bullata,* and the graminoid *Bromus diandrus*.

Total Vegetation Cover: Mean 72.0%, Range 60 - 85%.
Non-native Cover: Mean 11.3%, Range 1 - 33%.
Low Cover (<0.5m): Mean 19.3%, Range 3 - 54%.
Medium Cover (0.5-4.0m): Mean 27.8%, Range 18 - 40%.
Tall Cover (>4.0m): Mean 64.0%, Range 52 - 75%.
Species Richness: Mean 35.8, Range 21 - 57.

Globally

In this association, the tree layer is codominated by *Platanus racemosa* and *Quercus agrifolia*. *Juglans californica* is frequently included in this layer. The shrub layer is sparse to intermittent and often includes *Heteromeles arbutifolia, Malosma laurina,* and *Ceanothus spinosus*. Occasionally, *Toxicodendron diversilobum, Ceanothus megacarpus,* and *Baccharis pilularis* are also present. The herbaceous layer is sparse and includes the forbs *Anthriscus caucalis, Marah fabaceus, Stachys bullata, Marrubium vulgare, Marah macrocarpus,* and *Stellaria media* at low cover, and the graminoid *Bromus diandrus*.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Tree (canopy & subcanopy)	*Quercus agrifolia var. agrifolia*
Tree canopy	*Platanus racemosa*
Shrub/sapling (tall & short)	*Toxicodendron diversilobum*
Herb (field)	*Bromus diandrus*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Anthriscus caucalis, Avena fatua, Bromus diandrus, Bromus rubens, Ribes californicum var. californicum, Rumex salicifolius, Stellaria media, Urtica urens

Globally

Juglans californica, *Ribes californicum var. californicum*

CONSERVATION STATUS RANK

Global Rank & Reasons: G3 (7-Nov-2005).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Data are not available.

Globally

This association is related to the *Quercus agrifolia - Platanus racemosa / Toxicodendron diversilobum* Association of western Riverside (Klein and Evens 2006) and San Diego (Evens and San 2006) counties. However, in that association *Quercus agrifolia* is strongly dominant. This association is differentiated from *Platanus racemosa* Temporarily Flooded Woodland (CEGL005307) by its non-riparian setting and codominance of *Quercus agrifolia*. The name was changed from "South Coast Woodland" because variation in undergrowth species composition is no different from the northern extent of its range.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.

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Pinnacles National Monument Plots: PINN_213, PINN_580, PINN_587, PINN_645, PINN_915.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod G. Kittel

REFERENCES: Evens and San 2006, Keeler-Wolf and Evens 2006, Keeler-Wolf et al. 1997, Klein and Evens 2006, Western Ecology Working Group n.d.

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Platanus racemosa Temporarily Flooded Woodland
California Sycamore Temporarily Flooded Woodland

CODE	CEGL005307
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*PLATANUS RACEMOSA* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.634) California Sycamore Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This woodland association is documented to occur in San Benito, San Diego and Riverside counties, California. It occurs along riparian corridors at elevations of 98 to 1055 m (324-3463 feet). Slopes are gentle to moderate with variable aspects. Soils vary from coarse sand to silty clay loam on alluvial substrates. *Platanus racemosa* dominates the open to intermittent tree overstory layer with an average of 20% cover. Other trees present with low cover include *Quercus agrifolia, Pinus sabiniana, Populus fremontii ssp. fremontii,* and *Salix laevigata.* Non-native trees such as *Eucalyptus camaldulensis, Eucalyptus globulus,* or *Schinus molle* may be invading the overstory. Understory shrubs may include *Baccharis salicifolia, Salix lasiolepis, Toxicodendron diversilobum, Artemisia californica,* and *Eriogonum fasciculatum*; understory vines may include *Vitis girdiana.* The herbaceous layer has moderate cover and often include non-native grasses *Bromus madritensis* and *Bromus diandrus* and native forbs *Amsinckia menziesii* and *Artemisia douglasiana*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (1) area of Pinnacles National Monument.

Globally

This association is documented to occur in San Benito, San Diego and Riverside counties, California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this woodland/forest association occurs on a gentle, south-facing slope at an elevation of 277 m. The association is dominated by *Platanus racemosa* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Pinus sabiniana, Populus fremontii ssp. fremontii, Quercus agrifolia var. agrifolia,* and *Salix laevigata*. The understory shrub layer includes *Toxicodendron diversilobum, Baccharis pilularis, Eriogonum fasciculatum var. foliolosum, Lupinus albifrons var. albifrons, Malacothamnus aboriginum, Diplacus aurantiacus (= Mimulus aurantiacus), Rosa californica, Salix lasiolepis,* and *Sambucus mexicana,* and the herbaceous layer may include *Sairocarpus multiflorus (= Antirrhinum multiflorum), Artemisia douglasiana, Artemisia dracunculus, Centaurea melitensis, Centaurea solstitialis, Cerastium glomeratum, Clarkia unguiculata, Cuscuta ceanothi (= Cuscuta subinclusa), Eschscholzia californica, Euthamia occidentalis, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Bromus diandrus, Avena barbata, Bromus arenarius, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Carex* sp., *Elymus glaucus ssp. glaucus,* and *Vulpia myuros*.

Elevation: 277 m.
Aspect: South (1).
Slope: 2 degrees.
Macro Topography: Middle 1/3 of slope (1).
Micro Topography: Undulating pattern (1).

Fines Cover: 4%.
Gravel Cover: 0.5%.
Cobble Cover: 0.5%.

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Stone Cover: 0.5%.
Bedrock Cover: 0%.
Litter Cover: 92%.
Stem Basal Area Cover: 4%.
Water Cover: 0%.
Parent Material: Gravelly alluvium (1).
Soil Texture: Sand (1).

Globally
This woodland occurs along riparian corridors at elevations of 98 to 1055 m (324-3463 feet). Slopes are gentle to moderate with variable aspects. Soils vary from coarse sand to silty clay loam on alluvial substrates.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Platanus racemosa*. Abundant or characteristic trees present at lower cover may include *Pinus sabiniana, Populus fremontii ssp. fremontii, Quercus agrifolia var. agrifolia*, and *Salix laevigata*. The understory shrub layer includes *Toxicodendron diversilobum, Baccharis pilularis, Eriogonum fasciculatum var. foliolosum, Lupinus albifrons var. albifrons, Malacothamnus aboriginum, Diplacus aurantiacus (= Mimulus aurantiacus), Rosa californica, Salix lasiolepis*, and *Sambucus mexicana*. The herbaceous layer may include the forbs *Sairocarpus multiflorus (= Antirrhinum multiflorum), Artemisia douglasiana, Artemisia dracunculus, Centaurea melitensis, Centaurea solstitialis, Cerastium glomeratum, Clarkia unguiculata, Cuscuta ceanothi (= Cuscuta subinclusa), Eschscholzia californica, Euthamia occidentalis, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens)*, and the graminoids *Bromus diandrus*, *Avena barbata, Bromus arenarius, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Carex* sp., *Elymus glaucus ssp. glaucus*, and *Vulpia myuros*.

Total Vegetation Cover: Mean 51.0%, Range 51%.
Non-native Cover: Mean 11.0%, Range 11%.
Low Cover (<0.5m): Mean 15.0%, Range 15%.
Medium Cover (0.5-4.0m): Mean 20.0%, Range 20%.
Tall Cover (>4.0m): Mean 36.0%, Range 36%.
Species Richness: Mean 43.0, Range 43.

Globally
Platanus racemosa dominates the tree overstory layer with an average of 20% cover (1-63%). Other trees present with low cover include *Quercus agrifolia, Pinus sabiniana, Populus fremontii ssp. fremontii*, and *Salix laevigata*. The non-native trees *Eucalyptus camaldulensis, Eucalyptus globulus*, or *Schinus molle* may be invading the overstory. Understory shrubs may include *Baccharis salicifolia, Salix lasiolepis, Toxicodendron diversilobum, Artemisia californica*, and *Eriogonum fasciculatum*; understory vines may include *Vitis girdiana*. The herbaceous layer has moderate cover and often includes non-native grasses *Bromus madritensis* and *Bromus diandrus* and native forbs *Amsinckia menziesii* and *Artemisia douglasiana*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Platanus racemosa*
Shrub/sapling (tall & short)	*Toxicodendron diversilobum*
Herb (field)	*Bromus diandrus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena barbata, Bromus arenarius, Bromus diandrus, Bromus rubens, Centaurea melitensis, Centaurea solstitialis, Cerastium glomeratum, Hirschfeldia incana, Malacothamnus aboriginum, Melilotus indicus, Vicia sativa ssp. sativa, Vulpia myuros

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Globally
Malacothamnus aboriginum

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (7-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This is a true riparian community, found along streams with running water.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_935.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens and San 2006, Klein and Evens 2006, Western Ecology Working Group n.d.

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Populus fremontii - Salix laevigata Woodland
Fremont Cottonwood - Polished Willow Woodland

CODE	CEGL005308
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*POPULUS FREMONTII* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.644) Fremont Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian woodland is know from northern, central, and southern California, from the Sierra Nevada foothills, central interior Coast Ranges, and San Diego and Riverside counties. It occurs on low-gradient, relatively wide or narrow streams and rivers at elevations from 57 to 1275 m (187-4182 feet). Stream gradients range from 0 to 4 degrees. Valley width is usually moderately wide to wide, with a few occurrences on narrow reaches. *Populus fremontii* and *Salix laevigata* are typically codominant, although some stands lack red willow. Tree cover typically exceeds 50% (4-90%), but some stands have much less cover. Conversely, understory layers are usually open. Shrub species that may be present include *Baccharis salicifolia, Baccharis pilularis, Salix lasiolepis, Rubus discolor (= Rubus procerus), Rubus ursinus*, and *Rosa californica*. The herbaceous cover is also highly variable. No understory species is designated in the name of this association to reflect the high variation and lack of consistency of the understory layers.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (5) and Old Boundaries (5) areas of Pinnacles National Monument.

Globally

This association is known from the central interior Coast Ranges (northern San Benito County), San Diego and Riverside counties of southern California, and from the northern, central, and southern Sierra Nevada foothills.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on flat to gentle, variable-facing slopes, at elevations between 255 and 338 m. The association is dominated by *Populus fremontii ssp. fremontii* and *Salix laevigata* in the overstory tree layer. The understory shrub layer includes *Rubus ursinus, Baccharis pilularis, Rosa californica*, and *Salix lasiolepis*, and the herbaceous layer may include *Artemisia douglasiana, Melilotus indicus, Bromus diandrus*, and *Elymus glaucus ssp. glaucus*.

Elevation: Mean 309.6 m, Range 255 - 338 m.
Aspect: East (1), Flat (1), South (3), Southwest (5).
Slope: Mean 2.0 degrees, Range 0 - 4 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (6), Bottom to Upper 1/3 of slope (1), Lower to Middle 1/3 of slope (2), Middle 1/3 of slope (1).
Micro Topography: Concave or depression (3), Linear or even (3), Undulating pattern (4).

Fines Cover: Mean 11.3%, Range 1 - 36%.
Gravel Cover: Mean 4.8%, Range 0.5 - 10%.
Cobble Cover: Mean 3.8%, Range 0.5 - 20%.
Stone Cover: Mean 0.3%, Range 0 - 1%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 72.0%, Range 53 - 95%.
Stem Basal Area Cover: Mean 4.6%, Range 2 - 9%.
Water Cover: Mean 3.8%, Range 0 - 10%.
Parent Material: Mixed alluvium (8), Sandy alluvium (1), Sedimentary (1).

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Soil Texture: Sand (9), Sandy Loam (1).

Globally
This riparian community occurs on low-gradient, relatively wide or narrow streams and rivers at elevations from 85 to 1275 m (279-4182 feet). Stream gradients range from 0 to 4 degrees. Valley width is usually moderately wide to wide, with a few occurrences on narrow reaches. The parent material is alluvial, and soils range from coarse sand to silty clay loam.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Populus fremontii ssp. fremontii* and *Salix laevigata*. The understory shrub layer includes *Rubus ursinus, Baccharis pilularis, Rosa californica,* and *Salix lasiolepis*. The herbaceous layer may include the forbs *Artemisia douglasiana* and *Melilotus indicus,* and the graminoids *Bromus diandrus* and *Elymus glaucus ssp. glaucus.*

Total Vegetation Cover: Mean 74.4%, Range 45 - 95%.
Non-native Cover: Mean 3.1%, Range 0.5 - 7%.
Low Cover (<0.5m): Mean 6.6%, Range 2 - 15%.
Medium Cover (0.5-4.0m): Mean 40.4%, Range 6 - 75%.
Tall Cover (>4.0m): Mean 47.5%, Range 17 - 80%.
Species Richness: Mean 43.9, Range 24 - 60.

Globally
In this riparian woodland, *Populus fremontii* and *Salix laevigata* are typically codominant, although some stands lack red willow. Tree cover typically exceeds 50% cover, but some stands have much less. Conversely, understory layers are usually open. Although *Baccharis salicifolia, Baccharis pilularis, Salix lasiolepis, Rubus discolor (= Rubus procerus), Rubus ursinus,* and *Rosa californica* can individually approach 50% cover, shrub cover will often be less than 25%. The forb and grass layers are also open. *Artemisia douglasiana* cover exceeds 90% in rare cases, but normally forb cover is less than 25%. Other forbs observed include *Anemopsis californica, Eleocharis* sp., *Iris missouriensis, Rumex* sp., *Stachys albens,* and *Melilotus indicus.* Similarly, graminoids *Carex barbarae, Elymus glaucus, Bromus diandrus, Elymus glaucus ssp. glaucus,* and *Juncus balticus* were observed to have more than 50% cover on individual sites, but grass cover in most cases is less than 25%. Moss and lichen cover is generally absent.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Populus fremontii ssp. fremontii, Salix laevigata*
Shrub/sapling (tall & short)	*Rubus ursinus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Anthriscus caucalis, Apium graveolens, Bromus arenarius, Bromus diandrus, Bromus rubens, Centaurea solstitialis, Datisca glomerata, Hirschfeldia incana, Juglans hindsii, Medicago polymorpha, Melilotus indicus, Mentha x *piperita, Polypogon monspeliensis, Rorippa nasturtium-aquaticum, Rumex crispus, Rumex salicifolius, Sonchus asper, Sonchus oleraceus*

Globally
Juglans hindsii

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This woodland is named with no understory species to allow for phases. There is high variability and little consistency in the shrub cover (usually low) and even higher variability in the herbaceous cover. This name give us greatest

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flexibility for this community, and as such the 10 samples hold together quite well within Pinnacles, and when comparing them to other California literature.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_167, PINN_180, PINN_570, PINN_648, PINN_649, PINN_650, PINN_821, PINN_823, PINN_936, PINN_943.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens and San 2006, Klein and Evens 2006, Klein et al. 2007, Potter 2005, Western Ecology Working Group n.d.

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Populus fremontii / Baccharis salicifolia Woodland
Fremont Cottonwood / Mule's-fat Woodland

CODE	CEGL000941
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*POPULUS FREMONTII* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.644) Fremont Cottonwood Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S): North American Warm Desert Lower Montane Riparian Woodland and Shrubland (CES302.748)

North American Warm Desert Riparian Woodland and Shrubland (CES302.753)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This lowland riparian woodland is described from central and southern coastal interior ranges of California, southwestern Utah and southwestern New Mexico, and may possibly occur along the San Pedro River in southeastern Arizona. Elevations are below 1580 m in New Mexico, below 1300 m in Utah, and between 85 and 1275 m (279-4182 feet) in California. Stands typically occur along lower-elevation reaches of streams and on the main stem of rivers. Sites are on low- to mid-elevation terraces and bars that have shallow water tables and are flooded for brief periods during the growing season. Soils are shallow and coarse-textured, composed of sand, gravel or cobbles derived from alluvium. Diagnostic of this riparian woodland is the tree canopy dominated by *Populus fremontii* with *Baccharis salicifolia* dominating the shrub layer. *Fraxinus velutina, Platanus wrightii* and *Salix gooddingii* may be present but are not well-represented (<5% cover). The shrub layer is composed primarily of *Baccharis salicifolia*. Other common associates may include *Salix exigua, Prosopis* spp., and *Ericameria nauseosa (= Chrysothamnus nauseosus). Tamarix ramosissima* and *Elaeagnus angustifolia* are common introduced shrub and tree species that have invaded many of these stands. The herbaceous layer is variable but is generally sparse. Disturbed sites may be dominated by introduced species such as *Bromus tectorum*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1) and Old Boundaries (1) areas of Pinnacles National Monument.

Globally

This association is found in New Mexico on the main stem of the Gila River near Spar Canyon in southwestern New Mexico (Grant County), the TNC Gila Preserve and on the main stem of the San Francisco River near Sundial Mountain and Devil's Creek. In California, it is documented along streams of the Coast Ranges from San Benito, western Fresno, and western Riverside counties. It also occurs in Utah.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on gentle, southwest-facing slopes, at elevations between 293 and 335 m. The association is dominated by *Populus fremontii ssp. fremontii* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Pinus sabiniana, Quercus agrifolia var. agrifolia,* and *Quercus lobata*. The understory shrub layer includes *Baccharis salicifolia, Baccharis pilularis, Lupinus albifrons var. albifrons,* and *Rosa californica,* and the herbaceous layer may include *Artemisia douglasiana, Artemisia dracunculus, Euthamia occidentalis, Hirschfeldia incana, Lactuca serriola, Melilotus indicus, Rumex salicifolius, Bromus diandrus, Bromus hordeaceus,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Elevation: Mean 314.0 m, Range 293 - 335 m.
Aspect: Southwest (2).
Slope: Mean 2.0 degrees, Range 1 - 3 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (1), Middle 1/3 of slope (1).
Micro Topography: Undulating pattern (2).

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Fines Cover: Mean 2.0%, Range 1 - 3%.
Gravel Cover: Mean 3.8%, Range 0.5 - 7%.
Cobble Cover: Mean 1.3%, Range 0.5 - 2%.
Stone Cover: Mean 0.3%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 91.0%, Range 85 - 97%.
Stem Basal Area Cover: Mean 2.5%, Range 2 - 3%.
Water Cover: Mean 0.3%, Range 0 - 0.5%.
Parent Material: Mixed alluvium (1), Sandy alluvium (1).
Soil Texture: Sand (2).

Globally
In California, this riparian woodland occurs between 85 and 1275 m (279-4182 feet) elevation on low-gradient streams and rivers in wide and occasionally narrow valley bottoms. Parent material is alluvium, and soils range from coarse sand to fine sand to silty clay loam. In Utah and New Mexico, the environmental setting is the same but with elevations reaching 1580 m (5183 feet).

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Populus fremontii ssp. fremontii*. Abundant or characteristic trees present at lower cover may include *Pinus sabiniana, Quercus agrifolia var. agrifolia*, and *Quercus lobata*. The understory shrub layer includes *Baccharis salicifolia, Baccharis pilularis, Lupinus albifrons var. albifrons*, and *Rosa californica*. The herbaceous layer may include the forbs *Artemisia douglasiana, Artemisia dracunculus, Euthamia occidentalis, Hirschfeldia incana, Lactuca serriola, Melilotus indicus*, and *Rumex salicifolius*, and the graminoids *Bromus diandrus, Bromus hordeaceus*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 69.5%, Range 69 - 70%.
Non-native Cover: Mean 10.5%, Range 7 - 14%.
Low Cover (<0.5m): Mean 11.5%, Range 8 - 15%.
Medium Cover (0.5-4.0m): Mean 10.5%, Range 10 - 11%.
Tall Cover (>4.0m): Mean 59.0%, Range 59 - 59%.
Species Richness: Mean 39.0, Range 32 - 46.

Globally
Populus fremontii dominates the tree layer. *Baccharis salicifolia* is characteristically present and most abundant in the shrub understory, while non-native *Tamarix* sp. may be present. *Fraxinus velutina, Platanus wrightii*, and *Salix gooddingii* may be present but are not well-represented (<5% cover). Other common associates may include *Salix exigua, Prosopis* spp., and *Ericameria nauseosa (= Chrysothamnus nauseosus)*. *Tamarix ramosissima* and *Elaeagnus angustifolia* are common introduced shrub and tree species that have invaded many of these stands. The herbaceous layer is variable but is generally sparse. Disturbed sites may be dominated by introduced species such as *Bromus tectorum*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Populus fremontii ssp. fremontii*
Shrub/sapling (tall & short)	*Baccharis salicifolia*
Herb (field)	*Bromus diandrus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena fatua, Bromus arenarius, Bromus diandrus, Bromus rubens, Carduus pycnocephalus, Cirsium occidentale var. venustum, Hirschfeldia incana, Lactuca serriola, Marrubium vulgare, Melilotus indicus, Mentha x *piperita, Rorippa nasturtium-aquaticum, Rumex salicifolius, Vicia villosa ssp. varia*

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Globally
Bromus tectorum

CONSERVATION STATUS RANK
Global Rank & Reasons: G2 (21-Oct-1997). Few intact examples of this association remain in the Southwest U.S. The association continues to be in decline, primarily as a function of major hydrological alterations (dams and diversions), grazing, off-road vehicles, and agricultural conversion. The remaining functional stands are restricted to wild rivers such as the Gila and San Francisco rivers, and possibly along the Mimbres River in New Mexico, or the San Pedro River in Arizona. This is a very significant association with respect to biodiversity, particularly birds in the Southwest. Stands are rare that have not been invaded by exotic trees, shrubs and herbs. Even protected examples are threatened by continued declines in upland watershed conditions.

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Populus fremontii / Baccharis salicifolia Woodland (CEGL000941) as described here has no *Salix gooddingii* present. Authors who list *Salix gooddingii* in the name included stands dominated by *Populus fremontii* with a *Baccharis salicifolia* understory and without any *Salix gooddingii* present, hence these concepts are considered broader than the concept of this association. This type is closely related to both *Populus fremontii - Salix gooddingii / Baccharis salicifolia* Forest (CEGL002683) and *Populus fremontii - Salix gooddingii / Salix exigua* Forest (CEGL002684). All three types, in turn, are probably refinements of the Fremont cottonwood - willow type of Laurenzi et al. (1983) and Brown et al. (1979), and the *Populus fremontii / Salix gooddingii* community type of Reichenbacher (1984) and Szaro (1989) documented for Arizona, and by Campbell and Dick-Peddie (1964) and Dick-Peddie (1993) in New Mexico.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_161, PINN_940.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: E. Milford, E. Muldavin, K. Schulz, mod. G. Kittel

REFERENCES: Bourgeron and Engelking 1994, Campbell and Dick-Peddie 1964, Dick-Peddie 1993, Driscoll et al. 1984, Evens and San 2006, Klein and Evens 2006, Muldavin 1987, Muldavin et al. 2000a, NMNHP unpubl. data, Reichenbacher 1984, Szaro 1989, Webb and Brotherson 1988, Western Ecology Working Group n.d.

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Salix laevigata / Artemisia douglasiana - Rubus ursinus Woodland
Polished Willow / Douglas' Wormwood - California Blackberry Woodland

CODE	CEGL005316
PHYSIOGNOMIC CLASS	Woodland (II)
PHYSIOGNOMIC SUBCLASS	Deciduous woodland (II.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous woodland (II.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous woodland (II.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous woodland (II.B.2.N.b.)
ALLIANCE	*SALIX LAEVIGATA* TEMPORARILY FLOODED WOODLAND ALLIANCE (A.646) Polished Willow Temporarily Flooded Woodland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian woodland occurs in central and southern coastal mountains of California. It occurs along gentle low-gradient stream and river terraces and ranges in elevation from 237 to 890m (777-2923 feet). The parent material is alluvium or mixed granitic, and soils range from sand to silty clay loam with high litter cover. *Salix laevigata* occurs as a tree overstory dominant. *Platanus racemosa, Populus fremontii, Quercus lobata,* and *Quercus agrifolia* may be present with low cover. A shrub layer is often present with high to low cover of *Salix lasiolepis*; other shrubs that may be present with low cover include *Baccharis salicifolia, Salvia spathacea, Rubus ursinus*, and *Amorpha fruticosa*. A wide variety of herb species occupy the understory, with *Artemisia douglasiana* characteristically present. Other herbs often occurring include *Mimulus guttatus, Ambrosia psilostachya, Bromus diandrus, Bromus hordeaceus, Hirschfeldia incana, Marrubium vulgare, Lolium perenne ssp. multiflorum (= Lolium multiflorum),* and *Urtica dioica*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (2) and Old Boundaries (10) areas of Pinnacles National Monument.

Globally

This association occurs in the Coast Ranges of California, ranging from San Diego and Santa Monica to Pinnacles National Monument in northern San Benito County.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This woodland/forest association occurs on flat to gentle slopes with variable aspects, at elevations between 260 and 369 m. The association is dominated by *Salix laevigata* in the overstory tree layer. The understory shrub layer includes *Rubus ursinus*, and the herbaceous layer may include *Artemisia douglasiana, Datisca glomerata, Hirschfeldia incana, Melilotus indicus*, and *Bromus diandrus*.

Elevation: Mean 296.9 m, Range 260 - 369 m.
Aspect: East (1), Flat (4), South (2), Southeast (3), Southwest (2).
Slope: Mean 0.9 degrees, Range 0 - 2 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (6), Bottom to Mid 1/3 of slope (2), Middle 1/3 of slope (4).
Micro Topography: Concave or depression (2), Linear or even (9), Undulating pattern (1).

Fines Cover: Mean 14.2%, Range 3 - 41%.
Gravel Cover: Mean 12.8%, Range 0.5 - 51%.
Cobble Cover: Mean 3.6%, Range 0 - 13%.
Stone Cover: Mean 0.4%, Range 0 - 1%.
Bedrock Cover: Mean 0.0%, Range 0 - 0.5%.
Litter Cover: Mean 58.7%, Range 12 - 93%.
Stem Basal Area Cover: Mean 5.3%, Range 3 - 8%.
Water Cover: Mean 5.5%, Range 0 - 22%.
Parent Material: Clayey alluvium (1), Gravelly alluvium (1), Mixed alluvium (6), Sandy alluvium (2), Silty alluvium (2).
Soil Texture: Sand (8), Sandy Loam (1), Silt or Silt Loam (3).

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Globally
This riparian woodland occurs along gentle low-gradient stream and river terraces and ranges in elevation from 237 to 890m (777-2923 feet). The parent material is alluvium or mixed granitic, and soils range from sand to silty clay loam with high litter cover.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory tree layer is dominated by *Salix laevigata*. The understory shrub layer includes *Rubus ursinus*. The herbaceous layer may include the forbs *Artemisia douglasiana*, *Datisca glomerata*, *Hirschfeldia incana*, and *Melilotus indicus*, and the graminoid *Bromus diandrus*.

Total Vegetation Cover: Mean 76.5%, Range 39 - 95%.
Non-native Cover: Mean 9.3%, Range 1 - 31%.
Low Cover (<0.5m): Mean 11.8%, Range 2 - 39%.
Medium Cover (0.5-4.0m): Mean 53.5%, Range 7 - 85%.
Tall Cover (>4.0m): Mean 32.4%, Range 1 - 72%.
Species Richness: Mean 44.4, Range 20 - 68.

Globally
Salix laevigata occurs as a tree overstory dominant. *Platanus racemosa, Populus fremontii, Quercus lobata*, and *Quercus agrifolia* may be present with low cover. A shrub layer is often present with high to low cover of *Salix lasiolepis*; other shrubs that may be present with low cover include *Baccharis salicifolia, Salvia spathacea, Rubus ursinus*, and *Amorpha fruticosa*. A wide variety of herb species occupy the understory, with *Artemisia douglasiana* characteristically present. Other herbs often occurring include *Mimulus guttatus, Ambrosia psilostachya, Bromus diandrus, Bromus hordeaceus, Hirschfeldia incana, Marrubium vulgare, Lolium perenne ssp. multiflorum (= Lolium multiflorum)*, and *Urtica dioica*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Salix laevigata*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, *Anagallis arvensis*, *Anthriscus caucalis*, *Bromus arenarius*, *Bromus diandrus*, *Bromus rubens*, *Centaurea melitensis*, *Cerastium glomeratum*, *Cirsium vulgare*, *Cotula coronopifolia*, *Datisca glomerata*, *Galium parisiense*, *Hirschfeldia incana*, *Lactuca serriola*, *Marrubium vulgare*, *Melilotus indicus*, *Polypogon monspeliensis*, *Rorippa nasturtium-aquaticum*, *Rumex crispus*, *Rumex salicifolius*, *Silybum marianum*, *Sonchus asper*, *Vulpia myuros*

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This type matches well what was described from Santa Monica. With 12 plots from Pinnacles, we have high confidence in this concept.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

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Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_162, PINN_172, PINN_176, PINN_177, PINN_575, PINN_576, PINN_585, PINN_586, PINN_588, PINN_656, PINN_916, PINN_930.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens and San 2006, Keeler-Wolf and Evens 2006, Western Ecology Working Group n.d.

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Salvia mellifera - Eriogonum fasciculatum / Bromus rubens Shrubland
Black Sage - California Wild Buckwheat / Foxtail Brome Shrubland

CODE	CEGL005317
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Hemi-sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.b.)
ALLIANCE	*SALVIA MELLIFERA* SHRUBLAND ALLIANCE (A.749) Black Sage Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland occurs on steep slopes of the interior Coast Ranges. Stands are found at low elevations (440-1008 m [1443-3310 feet]) on steep, mostly south- or occasionally east-facing slopes. Soils range from coarse loamy sand to clay, and parent materials are sedimentary and volcanic. Stands have nearly continuous shrub cover. *Salvia mellifera* in the dominant shrub with 20-60% cover, while *Eriogonum fasciculatum* and *Artemisia californica* are typically subdominant with generally half the cover of *Salvia*. The herbaceous understory is sparse to dense, depending on the amount of overstory shading, and include non-natives *Bromus madritensis*, *Bromus rubens*, and *Bromus hordeaceus*, and native *Poa secunda*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (13) and South Wilderness (1) areas of Pinnacles National Monument.

Globally

This type has been documented in the South Coast Ranges and Central Coast Ranges of California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on somewhat steep to steep slopes with variable aspects, at elevations between 440 and 633 m. The overstory shrub layer is dominated by *Salvia mellifera* and often contains the abundant or characteristic shrubs *Artemisia californica* and *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Elevation: Mean 550.9 m, Range 440 - 633 m.
Aspect: East (3), South (4), Southeast (4), Southwest (3).
Slope: Mean 31.0 degrees, Range 25 - 36 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (3), Ridgetop (1), Upper 1/3 of slope (7), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Convex or rounded (5), Linear or even (9).

Fines Cover: Mean 21.5%, Range 4 - 35%.
Gravel Cover: Mean 31.0%, Range 3 - 60%.
Cobble Cover: Mean 1.0%, Range 0 - 5%.
Stone Cover: Mean 0.7%, Range 0 - 2%.
Bedrock Cover: Mean 1.7%, Range 0 - 10%.
Litter Cover: Mean 39.3%, Range 11 - 68%.
Stem Basal Area Cover: Mean 5.0%, Range 1 - 10%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (3), Fanglomerate (2), General volcanic extrusives (6), Rhyolite (3).
Soil Texture: Clay or Clay Loam (6), Sand (1), Sandy Loam (7).

Globally

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Stands of this shrubland are found at low elevations (440-1008 m [1443-3310 feet]) on steep, mostly south- or occasionally east-facing slopes. Soils range from coarse loamy sand to clay, and parent materials are sedimentary and volcanic.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory shrub layer is dominated by *Salvia mellifera* and *Eriogonum fasciculatum var. foliolosum*. Characteristic shrubs at lower cover include *Artemisia californica*. The understory herbaceous layer may include the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 46.9%, Range 21 - 73%.
Non-native Cover: Mean 1.0%, Range 0.5 - 3%.
Low Cover (<0.5m): Mean 4.8%, Range 0.5 - 15%.
Medium Cover (0.5-4.0m): Mean 43.4%, Range 20 - 71%.
Tall Cover (>4.0m): Mean 2.0 %, Range 2 - 2%.
Species Richness: Mean 19.8, Range 12 - 36.

Globally

Salvia mellifera is the dominant shrub. *Eriogonum fasciculatum* is frequently present with about half the cover of *Salvia*. *Artemisia californica* is typically present; other shrubs that may occur include *Eriodictyon tomentosum* and *Yucca whipplei*. Emergent trees such as *Pinus sabiniana* are infrequent at trace cover. The herbaceous understory is sparse to dense, depending on the amount of overstory shading, and include non-natives *Bromus madritensis, Bromus rubens*, and *Bromus hordeaceus*, and native *Poa secunda*.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Salvia mellifera*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Bromus rubens, Castilleja foliolosa, Centaurea melitensis, Eriodictyon tomentosum, Erodium cicutarium, Logfia gallica, Vulpia myuros

Globally

Eriodictyon tomentosum

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS

Pinnacles National Monument

This type is abundant on the south-facing steep hills of Pinnacles National Monument.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_040, PINN_041, PINN_044, PINN_045, PINN_093, PINN_530, PINN_531, PINN_532, PINN_533, PINN_534, PINN_535, PINN_610, PINN_752, PINN_846.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens et al. 2006, Kirkpatrick and Hutchinson 1977, Western Ecology Working Group n.d.

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Salvia mellifera Shrubland
Black Sage Shrubland

CODE	CEGL003727
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Hemi-sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.b.)
ALLIANCE	*SALVIA MELLIFERA* SHRUBLAND ALLIANCE (A.749) Black Sage Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association occurs on moderate to very steep southeast- and southwest-facing slopes at low elevations between 20 and 1050 m (65-3444 feet). It occurs in the interior of the Coast and Transverse ranges of central and southern California. In Riverside County, it apparently occurs in drier and more inland southern coastal areas with aspect tending to face more northeast than in the Santa Monica Mountains. Slopes are moderate to very steep; soils are clay or clay loam to sand or sandy loam. Stands are characterized by a strong dominance of *Salvia mellifera* in the shrub layer. A variety of other coastal sage and chaparral species frequently intermix in the shrub layer as subdominants. Some of these species include *Artemisia californica, Ceanothus crassifolius, Adenostoma fasciculatum, Keckiella antirrhinoides,* and *Encelia farinosa*. The understory herbaceous layer consists of native species, such as *Leymus condensatus* and *Nassella lepida*, and non-native species, such as *Bromus madritensis* and *Centaurea melitensis*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Grassy Canyon (2), Marion Canyon (1), Old Boundaries (3), and South Wilderness (2) areas of Pinnacles National Monument.

Globally

This association is known from the Santa Monica Mountains and other portions of the western Transverse Ranges (Malanson 1984) and Coast Ranges of California from the central portion of the state at Pinnacles National Monument, in San Benito County (Evens and San 2004) south to at least the Mexican border. Stands sampled by Borchert et al. (2004) on Los Padres National Forest in Ventura, Santa Barbara, and San Luis Obispo counties can be placed in this association. This association has also been described from San Diego County and Orange County (Desimone and Burk 1992) and may occur as far north as Contra Costa County (Ertter and Bowerman 2002).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to steep, south- and west-facing slopes, at elevations between 475 and 669 m. The overstory shrub layer is dominated by *Salvia mellifera* and often contains the abundant or characteristic shrub *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Elevation: Mean 592.4 m, Range 475 - 669 m.
Aspect: South (4), Southwest (1), West (3).
Slope: Mean 24.3 degrees, Range 8 - 35 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1), Upper 1/3 of slope (6), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Concave or depression (2), Convex or rounded (1), Linear or even (5).

Fines Cover: Mean 14.1%, Range 1 - 30%.
Gravel Cover: Mean 27.6%, Range 6 - 45%.
Cobble Cover: Mean 0.8%, Range 0 - 2%.
Stone Cover: Mean 0.6%, Range 0 - 2%.
Bedrock Cover: Mean 0.7%, Range 0 - 2%.
Litter Cover: Mean 49.6%, Range 35 - 70%.

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Stem Basal Area Cover: Mean 6.6%, Range 4 - 10%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (1), General volcanic extrusives (2), Granitic (2), Rhyolite (3).
Soil Texture: Clay or Clay Loam (1), Sand (3), Sandy Loam (3), Unknown (1).

Globally
Information from Borchert et al. (2004), Klein and Evens (2006), and Evens and San (2006) suggests that the elevational range of this association extends upward to 1050 m in places like Riverside County, apparently in drier and more inland southern coastal areas with aspect tending to face more northeast than in the Santa Monica Mountains (Klein and Evens 2006). Slopes are moderate to very steep; soils are clay or clay loam to sand or sandy loams.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Salvia mellifera*. A characteristic shrub at lower cover includes *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 60.0%, Range 40 - 75%.
Non-native Cover: Mean 0.8%, Range 0.5 - 3%.
Low Cover (<0.5m): Mean 2.5%, Range 0.5 - 6%.
Medium Cover (0.5-4.0m): Mean 58.9%, Range 38 - 75%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 19.4, Range 14 - 26.

Globally
Based on the description of this association from Riverside County (Klein and Evens 2006) and San Diego County (Evens and San 2006), we can add the following information: *Salvia mellifera* is usually dominant shrub in the overstory. *Eriogonum fasciculatum* is consistently present, usually as a subdominant shrub. A variety of other coastal sage and chaparral species frequently intermix in the shrub layer as subdominants. Some of these species include *Artemisia californica, Ceanothus crassifolius, Adenostoma fasciculatum, Keckiella antirrhinoides*, and *Encelia farinosa*. The understory herbaceous layer consists of native species, such as *Leymus condensatus* and *Nassella lepida*, and non-native species, such as *Bromus madritensis* and *Centaurea melitensis*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Salvia mellifera*
Herb (field)	*Bromus rubens*

Globally

Stratum	Species
Shrub/sapling (tall & short)	*Salvia mellifera*

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena barbata, Bromus rubens, Cryptantha microstachys, Eriodictyon tomentosum, Eriophyllum multicaule, Erodium cicutarium, Hypochaeris glabra, Lamarckia aurea, Logfia gallica, Malacothamnus aboriginum, Neogaerrhinum strictum, Vulpia myuros

Globally
Bromus madritensis, Centaurea melitensis, Cryptantha microstachys, Eriodictyon tomentosum, Hemizonia minthornii, Juglans californica, Malacothamnus aboriginum

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (21-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument

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Nearly pure stands of *Salvia mellifera* are typical for Pinnacles and appear to represent the association of the same name described by Borchert et al. (2004), Klein and Evens (2006), and Evens and San (2006).

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_028, PINN_042, PINN_053, PINN_520, PINN_542, PINN_750, PINN_751, PINN_781.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Borchert et al. 2004, Desimone and Burk 1992, Ertter and Bowerman 2002, Evens and San 2004, Evens and San 2006, Evens et al. 2006, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Malanson 1984, Western Ecology Working Group n.d.

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Adenostoma fasciculatum - Arctostaphylos glauca Shrubland
Chamise - Bigberry Manzanita Shrubland

CODE	CEGL003504
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*ADENOSTOMA FASCICULATUM* SHRUBLAND ALLIANCE (A.755) Chamise Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association occurs on somewhat steep to steep northeast- and northwest-facing slopes at low elevations between 367 and 1201 m (1204-3943 feet). Parent material is varied, including granitic metamorphic, sedimentary, and igneous rock. Soil texture is also varied from sandy loam and sand to clay loam. This shrubland is consistently codominated by *Adenostoma fasciculatum* and *Arctostaphylos glauca* in an intermittent to dense shrub layer, with an insignificant herbaceous layer. A variety of other chaparral species intermix as subdominants shrubs (e.g., *Garrya flavescens, Keckiella antirrhinoides, Prunus ilicifolia, Heteromeles arbutifolia*).

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Marion Canyon (1), North Wilderness (4), and Old Boundaries (9) areas of Pinnacles National Monument.

Globally

This is a common association in the southern and central coastal California area.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to steep slopes with variable aspects, at elevations between 388 and 737 m. The overstory shrub layer is dominated by *Adenostoma fasciculatum* and *Arctostaphylos glauca*. The understory herbaceous layer may include *Vulpia myuros*. Nonvascular taxa include lichen species and moss species.

Elevation: Mean 528.4 m, Range 388 - 737 m.
Aspect: North (3), Northeast (3), Northwest (3), South (2), West (3).
Slope: Mean 23.2 degrees, Range 13 - 35 degrees.
Macro Topography: Lower to Middle 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (4), Ridgetop (1), Upper 1/3 of slope (5), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Concave or depression (1), Convex or rounded (5), Linear or even (6), Undulating pattern (2).

Fines Cover: Mean 10.8%, Range 0.5 - 30%.
Gravel Cover: Mean 11.5%, Range 0.5 - 60%.
Cobble Cover: Mean 0.3%, Range 0 - 0.5%.
Stone Cover: Mean 0.3%, Range 0 - 1%.
Bedrock Cover: Mean 0.8%, Range 0 - 6%.
Litter Cover: Mean 70.6%, Range 16 - 92%.
Stem Basal Area Cover: Mean 6.1%, Range 3 - 15%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Fanglomerate (4), General volcanic extrusives (4), Granitic (3), Rhyolite (1), Shale (1).
Soil Texture: Sand (3), Sandy Loam (9), Silt or Silt Loam (2).

Globally

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This shrubland occurs on somewhat steep to steep northeast- and northwest-facing slopes at low elevations between 367 and 1201 m (1204-3943 feet). Parent material is varied, including granitic metamorphic, sedimentary, and igneous rock. Soil texture is also varied from sandy loam and sand to clay loam.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory shrub layer is dominated by *Adenostoma fasciculatum* and *Arctostaphylos glauca*. The understory herbaceous layer may include the graminoid *Vulpia myuros*.

Total Vegetation Cover: Mean 67.7%, Range 40 - 90%.
Non-native Cover: Mean 2.3%, Range 0.5 - 9%.
Low Cover (<0.5m): Mean 8.5%, Range 3 - 22%.
Medium Cover (0.5-4.0m): Mean 64.0%, Range 28 - 90%.
Tall Cover (>4.0m): Mean 4.7 %, Range 1 - 9%.
Species Richness: Mean 21.9, Range 5 - 52.

Globally

This shrubland is consistently codominated by *Adenostoma fasciculatum* and *Arctostaphylos glauca* in the intermittent to dense shrub overstory, with an insignificant herbaceous layer. A variety of other chaparral species intermix as subdominants shrubs (e.g., *Garrya flavescens, Keckiella antirrhinoides, Prunus ilicifolia, Heteromeles arbutifolia*).

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Adenostoma fasciculatum*, *Arctostaphylos glauca*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Aira caryophyllea, *Bromus rubens*, *Cerastium glomeratum*, *Hypochaeris glabra*, *Logfia gallica*, *Vulpia myuros*

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (8-Dec-2005).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Data are not available.

Globally

This is a common association in the southern and central coastal California area. It has been reported in San Diego, Riverside, Los Angeles, Santa Barbara, Ventura, San Benito, Monterey, San Luis Obispo, and Fresno counties. Its presence reflects somewhat drier and warmer conditions than the *Adenostoma fasciculatum - Arctostaphylos glandulosa* association of the *Adenostoma fasciculatum - Arctostaphylos glandulosa* alliance. *Arctostaphylos glauca* is an obligate seeder as opposed to *Arctostaphylos glandulosa*, which is a resprouting species. Similar stands occur as far north as Alameda County in the central Coast Ranges, though they have not been adequately described (T. Keeler-Wolf pers. obs. 2005).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_022, PINN_027, PINN_074, PINN_079, PINN_561, PINN_600, PINN_601, PINN_764, PINN_770, PINN_776, PINN_778, PINN_803, PINN_808, PINN_898.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

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REFERENCES: Evens and San 2006, Evens et al. 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Keeler-Wolf pers. comm., Klein and Evens 2006, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d.

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Adenostoma fasciculatum - Ceanothus cuneatus Sierran Chaparral Shrubland
Chamise - Sedgeleaf Buckbrush Shrubland

CODE	CEGL003468
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*ADENOSTOMA FASCICULATUM* SHRUBLAND ALLIANCE (A.755) Chamise Shrubland Alliance

ECOLOGICAL SYSTEM(S): Northern and Central California Dry-Mesic Chaparral (CES206.931)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This chaparral shrubland is known from central and southern California Coast Ranges and the Sierra Nevada foothills, including Yosemite National Park. It occurs between 243 and 1364 m (797-4474 feet) elevation on middle to upper slopes that are gentle to steep. Soils may be clay, clay loam, silt or silt loam, but most sampled plots were located on sandy loam. *Adenostoma fasciculatum* and *Ceanothus cuneatus* codominate. Other shrubs can be present and include *Cercocarpus montanus var. glaber (= Cercocarpus betuloides)* and *Arctostaphylos pungens*. A variety of native and non-native herbs occupy the understory, such as *Marah fabaceus, Aira caryophyllea, Hypochaeris glabra, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Gloria Peak (1), Kingman (1), Marion Canyon (1), McCabe Canyon (3), North Wilderness (3), and Old Boundaries (21) areas of Pinnacles National Monument.

Globally

This association has been documented from the inner North Coast Ranges, Central Coast Ranges, Sierra Nevada foothills, montane Transverse Ranges (including Santa Monica Mountains), South Coast Ranges, and montane Peninsular Ranges (including western Riverside County: San Jacinto Mountains and foothills).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on gentle to steep slopes on all aspects, at elevations between 243 and 763 m. The overstory shrub layer is dominated by *Adenostoma fasciculatum* and *Ceanothus cuneatus var. cuneatus*. The understory herbaceous layer may include *Marah fabaceus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

Elevation: Mean 445.4 m, Range 243 - 763 m.
Aspect: East (4), North (7), Northeast (1), Northwest (2), South (3), Southeast (5), Southwest (2), West (6).
Slope: Mean 16.5 degrees, Range 3 - 31 degrees.
Macro Topography: (0), Middle 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (8), Middle to Upper 1/3 of slope (5), Ridgetop (2), Upper 1/3 of slope (5), Upper 1/3 of slope to Ridgetop (8).
Micro Topography: Concave or depression (2), Convex or rounded (8), Linear or even (20).

Fines Cover: Mean 12.8%, Range 0.5 - 75%.
Gravel Cover: Mean 15.2%, Range 0.5 - 55%.
Cobble Cover: Mean 0.6%, Range 0 - 3%.
Stone Cover: Mean 0.3%, Range 0 - 1%.
Bedrock Cover: Mean 0.3%, Range 0 - 4%.
Litter Cover: Mean 61.4%, Range 10 - 97%.
Stem Basal Area Cover: Mean 9.9%, Range 1 - 26%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Clayey alluvium (1), Fanglomerate (10), General volcanic extrusives (2), Granitic (1), Igneous (1), Rhyolite (10), Unknown (4).
Soil Texture: Clay or Clay Loam (1), Sand (5), Sandy Loam (23), Silt or Silt Loam (1).

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Globally
This chaparral shrubland occurs between 243 and 1364 m (797-4474 feet) elevation on middle to upper slopes that are gentle to steep. Soils may be clay, clay loam, silt or silt loam, but most sampled plots were located on sandy loam.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Adenostoma fasciculatum* and *Ceanothus cuneatus var. cuneatus*. The understory herbaceous layer may include the forb *Marah fabaceus* and the graminoids *Bromus rubens (= Bromus madritensis ssp. rubens)* and *Vulpia myuros*.

Total Vegetation Cover: Mean 73.0%, Range 49 - 98%.
Non-native Cover: Mean 10.2%, Range 0.5 - 52%.
Low Cover (<0.5m): Mean 24.2%, Range 1 - 85%.
Medium Cover (0.5-4.0m): Mean 62.8%, Range 40 - 90%.
Tall Cover (>4.0m): Mean 0.5 %, Range 0.5 - 0.5%.
Species Richness: Mean 24.1, Range 10 - 39.

Globally
Adenostoma fasciculatum and *Ceanothus cuneatus* codominate. Other shrubs can be present and include *Cercocarpus montanus var. glaber (= Cercocarpus betuloides)* and *Arctostaphylos pungens*. A variety of native and non-native herbs occupy the understory, such as *Marah fabaceus, Aira caryophyllea, Hypochaeris glabra, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Adenostoma fasciculatum*, *Ceanothus cuneatus var. cuneatus*
Herb (field)	*Bromus rubens*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, *Aphanes arvensis*, *Bromus rubens*, *Cerastium glomeratum*, *Cryptantha microstachys*, *Erodium cicutarium*, *Hypochaeris glabra*, *Logfia gallica*, *Vulpia myuros*

Globally
Cryptantha microstachys, *Eriophyllum congdonii*

CONSERVATION STATUS RANK
Global Rank & Reasons: G4? (1-Apr-2003).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_008, PINN_009, PINN_010, PINN_011, PINN_019, PINN_023, PINN_031, PINN_032, PINN_072, PINN_081, PINN_086, PINN_088, PINN_506, PINN_507, PINN_508, PINN_523, PINN_555, PINN_602, PINN_775, PINN_777, PINN_779, PINN_792, PINN_794, PINN_802, PINN_811, PINN_834, PINN_835, PINN_836, PINN_841, PINN_843.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo

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Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens et al. 2006, Gordon and White 1994, Klein and Evens 2006, Klein et al. 2007, Western Ecology Working Group n.d.

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Adenostoma fasciculatum - Salvia mellifera Shrubland
Chamise - Black Sage Shrubland

CODE	CEGL003524
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*ADENOSTOMA FASCICULATUM* SHRUBLAND ALLIANCE (A.755) Chamise Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland is a widespread association in the central and southern coastal regions of California. It is one of the classic intermixings of chaparral and coastal sage scrub in the California Mediterranean climate. It occurs on gentle to steep slopes on all aspects at low elevations between 114 and 769 m (374-2523 feet). Parent material is more often granite and less often sedimentary, metamorphic, gabbro, diorite, or metavolcanic. Soil texture includes sand, clay, various loams, silty clay loam, and silt. This shrubland is codominated by *Adenostoma fasciculatum* and *Salvia mellifera* in the shrub layer, with a typically sparse herbaceous layer. The emergent tree layer is typically non-existent.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Grassy Canyon (3), North Wilderness (3), and Old Boundaries (3) areas of Pinnacles National Monument.

Globally

This association is found along the Central Coast (including Santa Clara County) and southern California (including inner South Coast Ranges, western Transverse Ranges, and Santa Ana, San Jacinto, San Gabriel, and San Bernardino mountains) (Sawyer and Keeler-Wolf 1995).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to steep, easterly-facing slopes, at elevations between 436 and 769 m. The overstory shrub layer is dominated by *Adenostoma fasciculatum* and *Salvia mellifera*. The understory herbaceous layer may include *Vulpia myuros* and *Vulpia octoflora*.

Elevation: Mean 604.2 m, Range 436 - 769 m.
Aspect: East (3), Northeast (1), Southeast (5).
Slope: Mean 22.1 degrees, Range 12 - 31 degrees.
Macro Topography: Ridgetop (1), Upper 1/3 of slope (5), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Convex or rounded (1), Linear or even (7), Undulating pattern (1).

Fines Cover: Mean 15.1%, Range 1 - 38%.
Gravel Cover: Mean 23.3%, Range 0.5 - 60%.
Cobble Cover: Mean 0.8%, Range 0 - 2%.
Stone Cover: Mean 0.4%, Range 0 - 1%.
Bedrock Cover: Mean 0.2%, Range 0 - 1%.
Litter Cover: Mean 55.4%, Range 25 - 90%.
Stem Basal Area Cover: Mean 5.1%, Range 1 - 10%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Fanglomerate (4), General volcanic extrusives (1), Granitic (1), Rhyolite (2).
Soil Texture: Clay or Clay Loam (1), Sand (1), Sandy Loam (5), Silt or Silt Loam (2).

Globally

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Stands are found at elevations between 114 and 769 m (374-2523 feet) on all aspects. Slopes are gentle to steep with variable topography. Parent material is more often granite and less often sedimentary, metamorphic, gabbro, diorite, or metavolcanic. Soil texture includes sand, clay, various loams, silty clay loam, and silt.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory shrub layer is dominated by *Adenostoma fasciculatum* and *Salvia mellifera*. The understory herbaceous layer may include the graminoids *Vulpia myuros* and *Vulpia octoflora*.

Total Vegetation Cover: Mean 59.9%, Range 36 - 95%.
Non-native Cover: Mean 0.5%, Range 0.5 - 0.5%.
Low Cover (<0.5m): Mean 1.3%, Range 0.5 - 6%.
Medium Cover (0.5-4.0m): Mean 59.4%, Range 36 - 95%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 13.4, Range 6 - 25.

Globally

Stands of this shrubland form an open to continuous shrub layer (10-95%, mean 50%) where *Adenostoma fasciculatum* usually codominates with *Salvia mellifera*. The herbaceous layer is typically sparse, and the emergent tree layer is typically non-existent.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Salvia mellifera*
Shrub/sapling (tall & short)	*Adenostoma fasciculatum*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Bromus rubens, *Cryptantha microstachys*, *Logfia gallica*, *Vulpia myuros*

Globally

Calochortus catalinae, *Cryptantha microstachys*, *Lepechinia fragrans*

CONSERVATION STATUS RANK

Global Rank & Reasons: G4 (12-Dec-2005).

CLASSIFICATION COMMENTS

Pinnacles National Monument

This is a widespread association in the central and southern coastal parts of California. It is one of the classic intermixings of chaparral and coastal sage scrub in the California Mediterranean climate. It differs from *Salvia mellifera* Shrubland (CEGL003727) by having a consistent codominance or substantial cover of *Adenostoma fasciculatum*.

Globally

This is a widespread association in the central and southern coastal regions of California. It is one of the classic intermixings of chaparral and coastal sage scrub in the California Mediterranean climate. It differs from *Salvia mellifera* Shrubland (CEGL003727) by having a consistent codominance or substantial cover of *Adenostoma fasciculatum*.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_029, PINN_030, PINN_035, PINN_043, PINN_075, PINN_092, PINN_521, PINN_557, PINN_560.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

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REFERENCES: Borchert et al. 2004, Evens and San 2006, Evens et al. 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d.

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Adenostoma fasciculatum Shrubland
Chamise Shrubland

CODE	CEGL002924
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*ADENOSTOMA FASCICULATUM* SHRUBLAND ALLIANCE (A.755) Chamise Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association occurs on extremely xeric sites at 38 to 1097 m (124-3600 feet) elevation on mid to upper slopes and ridgetops on all aspects. Surface is undulating to linear, on moderately steep to steep slopes. Soils tend to be moderately well-developed and somewhat stony with variable textures including sand, clay, silt, and various loams. The parent material ranges from igneous, granitic, metamorphic, to gneiss and may include gabbro and serpentine substrates in the Sierra Nevada foothills. Vegetation is dominated by *Adenostoma fasciculatum* in the shrub layer, with a diverse but low cover herbaceous layer. *Arctostaphylos glauca, Arctostaphylos pungens, Eriogonum fasciculatum, Heteromeles arbutifolia, Salvia columbariae, Salvia apiana,* and *Yucca whipplei* may occur at low cover. The herb layer is open and may include *Bromus madritensis, Aira caryophyllea, Avena barbata, Erodium cicutarium,* and *Lotus* spp. There are rarely emergent trees, at very low cover, which may include *Pinus sabiniana, Quercus agrifolia, Umbellularia californica,* or *Platanus racemosa*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Gloria Peak (1), McCabe Canyon (1), North Wilderness (1), Old Boundaries (20), and South Wilderness (2) areas of Pinnacles National Monument.

Globally

This association is known from the interior Central Coast Ranges (Pinnacles National Monument), San Diego County (Evens and San 2006), western Riverside County (Klein and Evens 2006), mafic soils type from the Peninsular Ranges (Gordon and White 1994), the Santa Monica Mountains region (Keeler-Wolf and Evens 2006 [469514]), the Sierra Nevada foothills (Klein et al. 2007) including the Yosemite region, Central Coast (including Santa Clara County to San Benito County), South Coast Ranges (Ventura to San Diego County), and Peninsular Ranges (western Riverside to San Diego counties).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on gentle to steep slopes on all aspects, at elevations between 338 and 730 m. The overstory shrub layer is dominated by *Adenostoma fasciculatum*. The understory herbaceous layer may include *Bromus rubens (= Bromus madritensis ssp. rubens).*

Elevation: Mean 535.4 m, Range 338 - 730 m.
Aspect: North (1), Northeast (1), Northwest (1), South (10), Southeast (6), Southwest (4), West (2).
Slope: Mean 16.4 degrees, Range 2 - 29 degrees.
Macro Topography: Entire slope (2), Middle 1/3 of slope (1), Ridgetop (4), Upper 1/3 of slope (9), Upper 1/3 of slope to Ridgetop (9).
Micro Topography: Concave or depression (3), Convex or rounded (6), Linear or even (13), Undulating pattern (3).

Fines Cover: Mean 15.5%, Range 0.5 - 40%.
Gravel Cover: Mean 25.8%, Range 1 - 80%.
Cobble Cover: Mean 0.8%, Range 0 - 4%.
Stone Cover: Mean 0.5%, Range 0 - 2%.
Bedrock Cover: Mean 1.0%, Range 0 - 10%.

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Litter Cover: Mean 44.8%, Range 3 - 96%.
Stem Basal Area Cover: Mean 11.9%, Range 0 - 27%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Fanglomerate (6), General volcanic extrusives (3), Granitic (3), Gravelly alluvium (1), Rhyolite (11).
Soil Texture: Clay or Clay Loam (2), Sand (3), Sandy Loam (20).

Globally
This shrubland occurs on extremely xeric sites at 38 to 1097 m (124-3600 feet) elevation on mid to upper slopes and ridgetops of mostly southeast- to southwest-facing, but can occur on north-facing slopes. Surface is undulating to linear, with moderately steep to steep slopes. Soils tend to be moderately well-developed and somewhat stony with variable textures including sand, clay, silt, and various loams. The parent material ranges from igneous, granitic, metamorphic, to gneiss and may include gabbro and serpentine substrates in the Sierra Nevada foothills.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Adenostoma fasciculatum*. The understory herbaceous layer may include the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 57.3%, Range 14 - 85%.
Non-native Cover: Mean 8.9%, Range 0.5 - 40%.
Low Cover (<0.5m): Mean 10.7%, Range 0.5 - 42%.
Medium Cover (0.5-4.0m): Mean 49.4%, Range 4 - 74%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 22.4, Range 4 - 49.

Globally
Adenostoma fasciculatum is the sole dominant species in the shrub overstory. *Yucca whipplei, Eriogonum fasciculatum, Arctostaphylos glauca, Arctostaphylos pungens, Heteromeles arbutifolia, Salvia columbariae*, and *Salvia apiana* may occur at low cover. The herb layer is open and may include *Bromus madritensis, Aira caryophyllea, Avena barbata, Erodium cicutarium*, and *Lotus* spp. There are rarely emergent trees, which may include *Pinus sabiniana, Quercus agrifolia, Umbellularia californica*, or *Platanus racemosa*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Adenostoma fasciculatum*
Herb (field)	*Bromus rubens*

Globally

Stratum	Species
Shrub/sapling (tall & short)	*Adenostoma fasciculatum*

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Bromus rubens, Cryptantha muricata, Erodium cicutarium, Hypochaeris glabra, Logfia gallica, Vulpia myuros

Globally
Calochortus plummerae, Cryptantha muricata, Hemizonia minthornii

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (8-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
The chamise alliance is the most widespread chaparral vegetation in California and ranges from Shasta County in the north to northwestern Baja California, Mexico. It is differentiated from other *Adenostoma fasciculatum* shrublands by a near total dominance of chamise. Other shrubs that codominant in other associations may be present, but these are generally much less than 10% cover, usually <1%.

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Globally
The chamise alliance is the most widespread chaparral vegetation in California and ranges from Shasta County in the north to northwestern Baja California, Mexico. It is differentiated from other *Adenostoma fasciculatum* shrublands by a near total dominance of chamise. Other shrubs that codominant in other associations may be present, but these are generally much less than 10% cover, usually <1%.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_007, PINN_016, PINN_017, PINN_020, PINN_024, PINN_037, PINN_038, PINN_073, PINN_078, PINN_085, PINN_208, PINN_502, PINN_509, PINN_514, PINN_515, PINN_516, PINN_517, PINN_518, PINN_519, PINN_522, PINN_528, PINN_543, PINN_544, PINN_838, PINN_842.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Evens and San 2004, Evens and San 2006, Evens et al. 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Keeler-Wolf et al. 2003, Klein and Evens 2006, Klein et al. 2007, Western Ecology Working Group n.d.

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Arctostaphylos glauca Shrubland
Bigberry Manzanita Shrubland

CODE	CEGL003008
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*ARCTOSTAPHYLOS GLAUCA* SHRUBLAND ALLIANCE (A.759) Bigberry Manzanita Shrubland Alliance

ECOLOGICAL SYSTEM(S): Northern and Central California Dry-Mesic Chaparral (CES206.931)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland is known from central and southern California and Baja California, Mexico. It occurs in the Central Coast, the inner Central and South Coast, and montane Transverse and Peninsular ranges of southern California, and into Baja California, Mexico. The shrubland occurs on gentle to steep (7-22 degrees) slopes from 423 to 649 m (138-2130 feet) elevation on variable aspects. Soils are clay to coarse or fine sandy loams. Stands occur on mid to upper slopes but can be seen on lower slopes as well. This shrubland is solely dominated by *Arctostaphylos glauca*. Characteristic shrubs at lower cover include *Adenostoma fasciculatum, Ceanothus cuneatus var. cuneatus*, and *Malosma laurina*. The emergent tree layer may include *Pinus sabiniana*. The understory herbaceous layer may include the forbs *Camissonia* spp., *Galium* spp., *Marah macrocarpus, Phacelia cicutaria, Cerastium glomeratum, Logfia gallica (= Filago gallica), Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis*, and *Uropappus lindleyi*, and the graminoid *Vulpia myuros*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the North Wilderness (1) and Old Boundaries (2) areas of Pinnacles National Monument.

Globally

This shrubland is known to occur in the Central Coast Ranges (including Santa Clara County south to Santa Barbara County), inner Central and South Coast Ranges, and montane Transverse and Peninsular ranges (including from southern San Bernardino Mountains, San Jacinto Mountains, and western San Diego County foothills) to Baja California, Mexico.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to somewhat slopes with variable aspects, at elevations between 423 and 506 m. The overstory shrub layer is dominated by *Arctostaphylos glauca* and often contains the abundant or characteristic shrubs *Adenostoma fasciculatum* and *Ceanothus cuneatus var. cuneatus*. The emergent tree layer includes *Pinus sabiniana*. The understory herbaceous layer may include *Cerastium glomeratum, Logfia gallica (= Filago gallica), Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Uropappus lindleyi*, and *Vulpia myuros*. Nonvascular taxa include a moss species.

Elevation: Mean 463.3 m, Range 423 - 506 m.
Aspect: East (1), Northeast (1), Southwest (1).
Slope: Mean 16.0 degrees, Range 7 - 21 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (1), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Concave or depression (1), Linear or even (1), Undulating pattern (1).

Fines Cover: Mean 3.3%, Range 1 - 5%.
Gravel Cover: Mean 4.0%, Range 1 - 10%.
Cobble Cover: Mean 0.5%, Range 0 - 1%.
Stone Cover: Mean 0.8%, Range 0 - 2%.

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Bedrock Cover: Mean 10.0%, Range 0 - 30%.
Litter Cover: Mean 73.3%, Range 50 - 87%.
Stem Basal Area Cover: Mean 8.3%, Range 4 - 15%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (2), Rhyolite (1).
Soil Texture: Clay or Clay Loam (1), Sandy Loam (2).

Globally
This shrubland occurs on gentle to steep (7-22 degrees) slopes from 423 to 649 m (1387-2130 feet) elevation on variable aspects. Soils are clay to coarse or fine sandy loams. Stands occur on mid to upper slopes but can be seen on lower slopes as well.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Arctostaphylos glauca*. Characteristic shrubs at lower cover include *Adenostoma fasciculatum* and *Ceanothus cuneatus var. cuneatus*. The emergent tree layer includes *Pinus sabiniana*. The understory herbaceous layer may include the forbs *Cerastium glomeratum, Logfia gallica (= Filago gallica), Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis*, and *Uropappus lindleyi*, and the graminoid *Vulpia myuros*.

Total Vegetation Cover: Mean 70.0%, Range 60 - 90%.
Non-native Cover: Mean 18.7%, Range 3 - 50%.
Low Cover (<0.5m): Mean 27.7%, Range 6 - 51%.
Medium Cover (0.5-4.0m): Mean 70.3%, Range 60 - 90%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 31.3, Range 22 - 41.

Globally
In this association, the overstory shrub layer is dominated by *Arctostaphylos glauca*. Characteristic shrubs at lower cover include *Adenostoma fasciculatum, Ceanothus cuneatus var. cuneatus*, and *Malosma laurina*. The emergent tree layer may include *Pinus sabiniana*. The understory herbaceous layer may include the forbs *Camissonia* spp., *Galium* spp., *Marah macrocarpus, Phacelia cicutaria, Cerastium glomeratum, Logfia gallica (= Filago gallica), Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis*, and *Uropappus lindleyi*, and the graminoid *Vulpia myuros*. In Los Padres National Forest, the average height of bigberry manzanita decreases with increasing elevation and with increasing solar insolation. Thus, the tallest shrubs occupy mesic, low-elevation (<610 m [<2000 feet]) sites. Shrubs in productive, late-seral stands may become arborescent with heights sometimes exceeding 5.5 m (18 feet). In these stands manzanita usually overtops and suppresses or kills chamise.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Pinus sabiniana*
Shrub/sapling (tall & short)	*Arctostaphylos glauca*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, *Anthriscus caucalis*, *Avena barbata*, *Avena fatua*, *Bromus diandrus*, *Bromus rubens*, *Castilleja foliolosa*, *Cerastium glomeratum*, *Cryptantha microstachys*, *Dodecatheon clevelandii ssp. patulum*, *Draba verna*, *Dudleya lanceolata*, *Hypochaeris glabra*, *Hypochaeris radicata*, *Logfia gallica*, *Sagina apetala*, *Stellaria media*, *Torilis arvensis*, *Vulpia myuros*

Globally
Cryptantha microstachys, Dodecatheon clevelandii ssp. patulum, Dudleya lanceolata

CONSERVATION STATUS RANK

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Global Rank & Reasons: G3G4 (1-Dec-1997).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_080, PINN_783, PINN_797.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Borchert et al. 2004, Evens and San 2004, Evens and San 2006, Evens et al. 2006, Gordon and White 1994, Keeler-Wolf 1990, Keeler-Wolf and Evens 2006, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d.

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Ceanothus cuneatus Shrubland
Sedgeleaf Buckbrush Shrubland

CODE	CEGL003025
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*CEANOTHUS CUNEATUS* SHRUBLAND ALLIANCE (A.765) Sedgeleaf Buckbrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Northern and Central California Dry-Mesic Chaparral (CES206.931)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This chaparral shrubland is found in the Klamath Mountains and the central and southern coastal mountains of California. It occurs on moderately steep to steep slopes on most aspects. Sites can be on very rocky serpentine soils in northern California, or on sand to sandy loams derived from fanglomerate, granite, and rhyolite. Shrub cover is moderate to continuous, with *Ceanothus cuneatus* being the sole dominant shrub. Other shrubs present include *Adenostoma fasciculatum* in central California, and *Ericameria ophitidis (= Haplopappus ophitidis)* on serpentine sites in northern California, each with sparse cover.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Grassy Canyon (1) and Old Boundaries (6) areas of Pinnacles National Monument.

Globally

This chaparral association is known from the Klamath Mountains and the central and southern coastal mountains of California, possibly extending into Baja California, Mexico.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to somewhat steep slopes on most aspects, at elevations between 273 and 507 m. The overstory shrub layer is dominated by *Ceanothus cuneatus var. cuneatus* and often contains the abundant or characteristic shrub *Adenostoma fasciculatum*. The understory herbaceous layer may include *Claytonia perfoliata ssp. perfoliata, Logfia gallica (= Filago gallica), Marah fabaceus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

Elevation: Mean 366.4 m, Range 273 - 507 m.
Aspect: East (2), North (1), Northeast (2), Northwest (1), Southeast (1).
Slope: Mean 19.9 degrees, Range 11 - 26 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (3), Middle to Upper 1/3 of slope (2), Upper 1/3 of slope (2).
Micro Topography: Concave or depression (1), Convex or rounded (2), Linear or even (4).

Fines Cover: Mean 17.1%, Range 1 - 48%.
Gravel Cover: Mean 8.8%, Range 0.5 - 25%.
Cobble Cover: Mean 0.4%, Range 0 - 0.5%.
Stone Cover: Mean 0.1%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 69.4%, Range 43 - 97%.
Stem Basal Area Cover: Mean 4.7%, Range 1 - 9%.
Water Cover: Mean 0.1%, Range 0 - 0.5%.
Parent Material: Fanglomerate (3), Granitic (2), Rhyolite (2).
Soil Texture: Sand (1), Sandy Loam (6).

Globally

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This chaparral shrubland occurs on moderately steep to steep slopes on most aspects. Sites can be on very rocky serpentine soils in northern California, or on sand to sandy loams derived from fanglomerate, granite, and rhyolite.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory shrub layer is dominated by *Ceanothus cuneatus var. cuneatus*. Characteristic shrubs at lower cover include *Adenostoma fasciculatum*. The understory herbaceous layer may include the forbs *Claytonia perfoliata ssp. perfoliata, Logfia gallica (= Filago gallica),* and *Marah fabaceus,* and the graminoids *Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens),* and *Vulpia myuros*.

Total Vegetation Cover: Mean 70.6%, Range 54 - 90%.
Non-native Cover: Mean 16.1%, Range 2 - 53%.
Low Cover (<0.5m): Mean 19.4%, Range 5 - 40%.
Medium Cover (0.5-4.0m): Mean 62.6%, Range 44 - 85%.
Tall Cover (>4.0m): Mean 1.5 %, Range 0.5 - 2%.
Species Richness: Mean 28.9, Range 18 - 44.

Globally

Ceanothus cuneatus is the sole dominant shrub. Other shrubs present include *Adenostoma fasciculatum* in central California, and *Ericameria ophitidis (= Haplopappus ophitidis)* on serpentine sites in northern California, each with sparse cover.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Ceanothus cuneatus var. cuneatus*
Herb (field)	*Bromus hordeaceus, Bromus rubens*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Avena barbata, Bromus arenarius, Bromus diandrus, Bromus rubens, Centaurea melitensis, Cerastium glomeratum, Cryptantha microstachys, Eriodictyon tomentosum, Hypochaeris glabra, Hypochaeris radicata, Logfia gallica, Stellaria media, Stellaria media ssp. pallida, Vulpia myuros

Globally

Cryptantha microstachys, Eriodictyon tomentosum

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (1-Dec-1997).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Data are not available.

Globally

There are various associations in California where *Ceanothus cuneatus* dominates the shrub layer while the understory is characterized by herbs on various parent materials (differentiated in some associations by serpentine versus non-serpentine substrates).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_089, PINN_090, PINN_094, PINN_567, PINN_568, PINN_789, PINN_796.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

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REFERENCES: Borchert et al. 2004, Evens et al. 2004, Keeler-Wolf et al. 2003, Klein and Evens 2006, Klein et al. 2007, Sawyer and Keeler-Wolf 1995, Taylor and Teare 1979a, Taylor and Teare 1979b, Western Ecology Working Group n.d.

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Prunus ilicifolia - Ceanothus cuneatus Shrubland
Hollyleaf Cherry - Sedgeleaf Buckbrush Shrubland

CODE	CEGL005309
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*PRUNUS ILICIFOLIA* SHRUBLAND ALLIANCE (A.2608) Hollyleaf Cherry Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This association is known only from central and southern California coastal mountains and currently only documented from Pinnacles National Monument. This tall shrubland occupies north-facing, dry slopes of the central and southern Coast Ranges of California. Stands occur between 415 and 770 m (1361-2526 feet) in elevation, on the upper third or ridgetops of moderate to steep slopes (13-32 degrees). Stands are codominated by *Prunus ilicifolia* and *Ceanothus cuneatus*, which are often present and in similar abundance (range 1-35%, average 16%). Other shrubs and vines may be present such as *Rhamnus ilicifolia* and *Clematis lasiantha*. The herbaceous understory is rich and may include over 50 species.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (10) area of Pinnacles National Monument.

Globally

This association is known only from central and southern California coastal mountains.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to steep, northerly-facing slopes, at elevations between 415 and 770 m. The overstory shrub layer is dominated by *Ceanothus cuneatus var. cuneatus* and often contains the abundant or characteristic shrubs *Clematis lasiantha, Prunus ilicifolia ssp. ilicifolia,* and *Rhamnus ilicifolia*. The understory herbaceous layer may include *Bowlesia incana, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis,* and *Bromus rubens (= Bromus madritensis ssp. rubens).* Nonvascular taxa include a lichen species.

Elevation: Mean 600.4 m, Range 415 - 770 m.
Aspect: North (6), Northeast (2), Northwest (2).
Slope: Mean 24.1 degrees, Range 13 - 32 degrees.
Macro Topography: Bottom to Upper 1/3 of slope (3), Ridgetop (1), Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Concave or depression (3), Linear or even (6), Undulating pattern (1).

Fines Cover: Mean 8.1%, Range 0.5 - 34%.
Gravel Cover: Mean 16.5%, Range 1 - 42%.
Cobble Cover: Mean 1.4%, Range 0 - 4%.
Stone Cover: Mean 0.7%, Range 0 - 5%.
Bedrock Cover: Mean 2.8%, Range 0 - 20%.
Litter Cover: Mean 66.7%, Range 25 - 87%.
Stem Basal Area Cover: Mean 4.6%, Range 1 - 15%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), General volcanic extrusives (3), Rhyolite (6).
Soil Texture: Sandy Loam (10).

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Globally
Stands occur between 415 and 770 m (1361-2526 feet) in elevation, on the upper third or ridgetops of steep slopes (13-32 degrees). This tall shrubland occupies north-facing, dry slopes of the central and southern Coast Ranges of California.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Ceanothus cuneatus var. cuneatus* and *Prunus ilicifolia ssp. ilicifolia*. Characteristic shrubs at lower cover include *Clematis lasiantha* and *Rhamnus ilicifolia*. The understory herbaceous layer may include the forbs *Bowlesia incana, Galium porrigens var. porrigens, Marah fabaceus*, and *Pentagramma triangularis ssp. triangularis*, and the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 60.6%, Range 46 - 95%.
Non-native Cover: Mean 4.8%, Range 0.5 - 18%.
Low Cover (<0.5m): Mean 25.8%, Range 4 - 60%.
Medium Cover (0.5-4.0m): Mean 45.5%, Range 30 - 82%.
Tall Cover (>4.0m): Mean 4.5 %, Range 2 - 12%.
Species Richness: Mean 41.7, Range 27 - 52.

Globally
Stands are codominated by *Prunus ilicifolia* and *Ceanothus cuneatus*, which are often present and in similar abundance (range 1-35%, average 16%). Other shrubs and vines may be present such as *Rhamnus ilicifolia* and *Clematis lasiantha*. The herbaceous understory is rich and may include over 50 species.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Ceanothus cuneatus var. cuneatus*
Herb (field)	*Bromus rubens*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, Anthriscus caucalis, Bromus rubens, Cerastium glomeratum, Garrya congdonii, Ribes californicum var. californicum, Vulpia myuros

Globally
Garrya congdonii, Ribes californicum var. californicum

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_091, PINN_606, PINN_608, PINN_612, PINN_614, PINN_615, PINN_616, PINN_759, PINN_760, PINN_800.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

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REFERENCES: Borchert et al. 2004, Evens et al. 2006, Klein and Evens 2006, Western Ecology Working Group n.d.

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Prunus ilicifolia - Fraxinus dipetala Shrubland
Hollyleaf Cherry - California Ash Shrubland

CODE	CEGL005310
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*PRUNUS ILICIFOLIA* SHRUBLAND ALLIANCE (A.2608) Hollyleaf Cherry Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

Described only from the Central Coast Ranges of California, this shrubland occurs on moderate to steep north- and northeast-facing slopes with elevations between 348 and 627 m (1141-2057 feet). Stands occupy sandy soils on volcanic, fanglomerate, and igneous substrates. In this association, the overstory shrub layer is codominated by *Prunus ilicifolia ssp. ilicifolia* and *Fraxinus dipetala*. The climbing vine *Clematis lasiantha* is often present, overtopping the taller shrubs. The understory herbaceous layer may include the forbs *Anthriscus caucalis, Galium porrigens var. porrigens, Marah fabaceus,* and *Pentagramma triangularis ssp. triangularis,* and the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens).*

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (15) area of Pinnacles National Monument.

Globally

This association is known from the Central Coast Ranges of California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to steep north- and northeast-facing slopes, at elevations between 348 and 627 m. The overstory shrub layer is dominated by *Prunus ilicifolia ssp. ilicifolia* and often contains the abundant or characteristic shrubs *Clematis lasiantha* and *Fraxinus dipetala*. The understory herbaceous layer may include *Anthriscus caucalis, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Elevation: Mean 447.9 m, Range 348 - 627 m.
Aspect: North (9), Northeast (6).
Slope: Mean 28.8 degrees, Range 10 - 38 degrees.
Macro Topography: Bottom to Upper 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (5), Upper 1/3 of slope (6), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Concave or depression (3), Linear or even (9), Undulating pattern (3).

Fines Cover: Mean 5.8%, Range 2 - 22%.
Gravel Cover: Mean 17.7%, Range 0.5 - 50%.
Cobble Cover: Mean 1.6%, Range 0 - 7%.
Stone Cover: Mean 0.8%, Range 0 - 3%.
Bedrock Cover: Mean 1.9%, Range 0 - 17%.
Litter Cover: Mean 64.8%, Range 25 - 88%.
Stem Basal Area Cover: Mean 7.9%, Range 3 - 15%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Fanglomerate (1), General volcanic extrusives (10), Rhyolite (3).
Soil Texture: Sand (1), Sandy Loam (14).

Globally

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This shrubland association occurs on moderate to steep north- and northeast-facing slopes, at elevations between 348 and 627 m. Stands occupy sandy soils on volcanic, fanglomerate, and igneous substrates.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory shrub layer is codominated by *Prunus ilicifolia ssp. ilicifolia* and *Fraxinus dipetala*. The climbing vine *Clematis lasiantha* is often present overtopping the taller shrubs. The understory herbaceous layer may include the forbs *Anthriscus caucalis, Galium porrigens var. porrigens, Marah fabaceus,* and *Pentagramma triangularis ssp. triangularis,* and the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens).*

Total Vegetation Cover: Mean 81.5%, Range 63 - 95%.
Non-native Cover: Mean 24.8%, Range 0.5 - 67%.
Low Cover (<0.5m): Mean 42.2%, Range 11 - 82%.
Medium Cover (0.5-4.0m): Mean 65.7%, Range 27 - 90%.
Tall Cover (>4.0m): Mean 23.9 %, Range 0.5 - 70%.
Species Richness: Mean 32.9, Range 22 - 45.

Globally

In this association, the overstory shrub layer is codominated by *Prunus ilicifolia ssp. ilicifolia* and *Fraxinus dipetala*, with <1 to 81% cover (averages are 40 and 18%, respectively). The climbing vine *Clematis lasiantha* is often present, overtopping the taller shrubs, and can be as much as 40% cover. The understory herbaceous layer may include the forbs *Anthriscus caucalis, Galium porrigens var. porrigens, Marah fabaceus,* and *Pentagramma triangularis ssp. triangularis,* and the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens).*

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Prunus ilicifolia*
Herb (field)	*Anthriscus caucalis*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Aira caryophyllea, Anthriscus caucalis, Avena fatua, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Delphinium californicum ssp. interius, Vulpia myuros

Globally

Delphinium californicum ssp. interius

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS

Pinnacles National Monument

This is a confident type, with 15 sampled points.

Globally

Although this association has not been described from anywhere else, there is strong confidence in the validity of the type, with 15 plots documented in Pinnacles National Monument. Central Coast Ranges is the center of distribution of *Prunus ilicifolia*.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_191, PINN_196, PINN_200, PINN_212, PINN_757, PINN_758, PINN_761, PINN_763, PINN_785, PINN_786, PINN_799, PINN_801, PINN_805, PINN_806, PINN_807.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo

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Global Description Authors: G. Kittel and J. Evens

REFERENCES: Western Ecology Working Group n.d.

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Prunus ilicifolia - Heteromeles arbutifolia Shrubland
Hollyleaf Cherry - Toyon Shrubland

CODE	CEGL003715
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*PRUNUS ILICIFOLIA* SHRUBLAND ALLIANCE (A.2608) Hollyleaf Cherry Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland is a mesic chaparral community that occurs in central and southern coastal California on moderate to steep northeast- and northwest-facing slopes at low elevations below 1000 m. Topography is usually concave, mid to upper slopes. Rock cover is relatively high in most stands, derived from granite, sedimentary or metamorphic parent material. Soils tend to be rich sandy to silt loams, mostly shallow but occasionally deep. Stands are characterized by a dominance or codominance of *Prunus ilicifolia* along with *Heteromeles arbutifolia* in the shrub layer. A variety of other shrub species may intermix as subdominant shrubs, such as *Adenostoma fasciculatum, Arctostaphylos pringlei, Brickellia californica, Cercocarpus montanus var. glaber (= Cercocarpus betuloides), Ceanothus cuneatus var. cuneatus, Ceanothus oliganthus, Eriogonum fasciculatum, Keckiella antirrhinoides, Diplacus aurantiacus (= Mimulus aurantiacus), Rhamnus ilicifolia, Salvia apiana, Salvia mellifera,* and *Toxicodendron diversilobum.* The herbaceous layer may have native grasses such as *Leymus condensatus* and *Melica imperfecta* at low cover. An emergent tree layer may be present and include *Umbellularia californica* and *Quercus agrifolia* at low cover.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Marion Canyon (1), North Wilderness (2), and Old Boundaries (1) areas of Pinnacles National Monument.

Globally

This association is known from central and southern coastal California (including San Benito, Santa Barbara, Ventura, and western Riverside counties) and the Peninsular Ranges (including western Riverside County: San Jacinto foothills; San Diego County: western foothills).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on somewhat steep to steep north-facing slopes, at elevations between 532 and 654 m. The overstory shrub layer is dominated by *Prunus ilicifolia ssp. ilicifolia* and often contains the abundant or characteristic shrubs *Ceanothus cuneatus var. cuneatus* and *Heteromeles arbutifolia*. The understory herbaceous layer may include *Bowlesia incana, Claytonia perfoliata ssp. perfoliata, Eucrypta chrysanthemifolia var. chrysanthemifolia, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Phacelia malvifolia, Pterostegia drymarioides,* and *Bromus hordeaceus*.

Elevation: Mean 581.0 m, Range 532 - 654 m.
Aspect: North (4).
Slope: Mean 26.0 degrees, Range 18 - 33 degrees.
Macro Topography: Ridgetop (1), Upper 1/3 of slope (2), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Concave or depression (2), Linear or even (2).

Fines Cover: Mean 8.0%, Range 1 - 16%.
Gravel Cover: Mean 2.8%, Range 0.5 - 5%.
Cobble Cover: Mean 0.1%, Range 0 - 0.5%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.

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Litter Cover: Mean 81.5%, Range 71 - 93%.
Stem Basal Area Cover: Mean 8.0%, Range 1 - 15%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: General igneous intrusives (1), General volcanic extrusives (1), Rhyolite (1), Unknown (1).
Soil Texture: Sandy Loam (3), Silt or Silt Loam (1).

Globally
Elevation is usually below 1000 m and ranges between 281 and 999 m (921-3280 feet). Aspect is usually north-facing, and slopes are moderate to somewhat steep. Topography is usually concave, mid to upper slopes. Rock cover is relatively high in most stands, derived from granite, sedimentary or metamorphic parent material. Soils tend to be rich sandy to silt loams, mostly shallow but occasionally deep.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Prunus ilicifolia ssp. ilicifolia* and *Heteromeles arbutifolia*. Characteristic shrubs at lower cover include *Ceanothus cuneatus var. cuneatus*. The understory herbaceous layer may include the forbs *Bowlesia incana, Claytonia perfoliata ssp. perfoliata, Eucrypta chrysanthemifolia var. chrysanthemifolia, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Phacelia malvifolia*, and *Pterostegia drymarioides*, and the graminoid *Bromus hordeaceus*.

Total Vegetation Cover: Mean 76.8%, Range 62 - 95%.
Non-native Cover: Mean 5.5%, Range 1 - 10%.
Low Cover (<0.5m): Mean 44.5%, Range 5 - 83%.
Medium Cover (0.5-4.0m): Mean 69.8%, Range 57 - 85%.
Tall Cover (>4.0m): Mean 2.3 %, Range 0.5 - 4%.
Species Richness: Mean 41.3, Range 30 - 53.

Globally
Prunus ilicifolia dominates or codominates in the overstory shrub layer, and *Heteromeles arbutifolia* is present with low to near equal cover. A variety of other species may intermix as subdominant shrubs, such as *Adenostoma fasciculatum, Arctostaphylos pringlei, Brickellia californica, Cercocarpus montanus var. glaber (= Cercocarpus betuloides), Ceanothus cuneatus var. cuneatus, Ceanothus oliganthus, Eriogonum fasciculatum, Keckiella antirrhinoides, Diplacus aurantiacus (= Mimulus aurantiacus), Rhamnus ilicifolia, Salvia apiana, Salvia mellifera*, and *Toxicodendron diversilobum*. The herbaceous layer is simple and sometimes includes *Bowlesia incana, Claytonia perfoliata ssp. perfoliata, Eucrypta chrysanthemifolia var. chrysanthemifolia, Galium porrigens var. porrigens, Hirschfeldia incana, Marah fabaceus, Marah macrocarpus, Melica imperfecta, Muhlenbergia rigens, Leymus condensatus, Pentagramma triangularis ssp. triangularis, Phacelia malvifolia*, and *Pterostegia drymarioides*, and the non-native *Bromus madritensis*. An emergent tree layer is occasionally present with *Umbellularia californica* or *Quercus agrifolia* at low cover.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Prunus ilicifolia*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Anthriscus caucalis, Aphanes arvensis, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Cryptantha microstachys, Delphinium californicum ssp. interius, Hypochaeris glabra, Poa annua, Ribes californicum var. californicum, Senecio vulgaris, Stellaria media, Stellaria media ssp. pallida, Vulpia bromoides, Vulpia myuros

Globally
Cryptantha microstachys, Delphinium californicum ssp. interius, Juglans californica, Ribes californicum var. californicum

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CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (21-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This is one of the most mesic of the local chaparral associations. It tends to occur at higher elevations and only on northerly-facing slopes.

Globally
Elsewhere *Prunus ilicifolia* stands may reach great age and become semi-arborescent (*sensu* mainland Cherry stands of Sawyer and Keeler-Wolf 1995). Most of the Santa Monica Mountains stands appear to have burned in the relatively recent past and are multi-stemmed. Borchert et al. (2004) describe this same vegetation type as a *Prunus ilicifolia - Heteromeles arbutifolia* alliance, and they separate it from two other similar alliances: the *Ceanothus megacarpus - Prunus ilicifolia* Alliance and the *Cercocarpus betuloides - Prunus ilicifolia* Alliance. All three of these mixed alliances will be treated by Sawyer and Keeler-Wolf (2005 MS) as a part of the *Prunus ilicifolia* Alliance, which allows for codominance of other species with *Prunus ilicifolia*. The rationale behind this involves similar mesic conditions for all of these and apparently low variance within each one of these types not requiring further differentiation into alliances but into associations of the *Prunus ilicifolia* Alliance.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_559, PINN_607, PINN_771, PINN_780.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Borchert et al. 2004, Evens and San 2006, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Sawyer and Keeler-Wolf 2005, Western Ecology Working Group n.d.

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Prunus ilicifolia Shrubland
Hollyleaf Cherry Shrubland

CODE	CEGL005311
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*PRUNUS ILICIFOLIA* SHRUBLAND ALLIANCE (A.2608) Hollyleaf Cherry Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland occurs on steep dry slopes of the coastal mountains of central and southern California. Stands are uncommon and distributed on convex middle and upper slopes between the elevations of 448 and 915 m (1470-3000 feet). Most (60%) stands occur on north-facing exposures on slopes >45%. Stands are nearly pure *Prunus ilicifolia*. Other shrubs, if present, are less than half the cover of *Prunus ilicifolia* and may include *Heteromeles arbutifolia* and *Rhus ovata*. The herbaceous undergrowth is abundant and rich. Dominant forbs include *Anthriscus caucalis, Delphinium californicum ssp. interius*, and *Marah fabaceus*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (1) area of Pinnacles National Monument.

Globally

This association is currently known from the Central Coast Ranges and South Coast Ranges of California and is expected to occur in the interior Central Coast Ranges.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this shrubland association occurs on a steep north-facing slope, at an elevation of 448 m. The overstory shrub layer is dominated by *Prunus ilicifolia ssp. ilicifolia*. The understory herbaceous layer may include *Anthriscus caucalis, Adiantum jordanii, Amsinckia menziesii var. menziesii, Bowlesia incana, Claytonia perfoliata ssp. perfoliata, Delphinium californicum ssp. interius, Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Bromus rubens (= Bromus madritensis ssp. rubens), Melica torreyana*, and *Vulpia myuros*.

Elevation: 448 m.
Aspect: North (1).
Slope: 34 degrees.
Macro Topography: Upper 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 30%.
Gravel Cover: 30%.
Cobble Cover: 0%.
Stone Cover: 0%.
Bedrock Cover: 0.5%.
Litter Cover: 10%.
Stem Basal Area Cover: 30%.
Water Cover: 0%.
Parent Material: General volcanic extrusives (1).
Soil Texture: Sandy Loam (1).

Globally

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This association is uncommon and patchily distributed on convex middle and upper slopes between the elevations of of 448 and 915 m (1470-3000 feet). Most (60%) stands occur on north-facing exposures with slopes >45%. In general, hollyleaf cherry is most abundant in the coastal and near-coastal mountain ranges.

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the overstory shrub layer is dominated by *Prunus ilicifolia ssp. ilicifolia*. The understory herbaceous layer may include the forbs *Anthriscus caucalis, Amsinckia menziesii var. menziesii, Bowlesia incana, Claytonia perfoliata ssp. perfoliata, Delphinium californicum ssp. interius, Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis*, the fern *Adiantum jordanii*, and the graminoids *Bromus rubens (= Bromus madritensis ssp. rubens), Melica torreyana*, and *Vulpia myuros*.

Total Vegetation Cover: 97%.
Non-native Cover: 75%.
Low Cover (<0.5m): 98%.
Medium Cover (0.5-4.0m): 90%.
Tall Cover (>4.0m): 0%.
Species Richness: 21.

Globally

Stands are nearly pure *Prunus ilicifolia*. Other shrubs, if present, are less than half the cover of *Prunus ilicifolia* and may include *Heteromeles arbutifolia* and *Rhus ovata*. The herbaceous undergrowth is abundant and rich. Dominant forbs include *Anthriscus caucalis, Delphinium californicum ssp. interius*, and *Marah fabaceus*.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Prunus ilicifolia*
Herb (field)	*Anthriscus caucalis*
Herb (field)	*Bromus rubens*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Anthriscus caucalis, Bromus rubens, Delphinium californicum ssp. interius, Stellaria media, Stellaria media ssp. pallida, Vulpia myuros

Globally

Delphinium californicum ssp. interius

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Only one plot was sampled, but many stands were observed, as Pinnacles is in the center of the distribution of *Prunus ilicifolia*.

Globally

Described from eleven sampled points, with many more stands observed, as the Central Coast Ranges is the center of the distribution of *Prunus ilicifolia*.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_762.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo

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Global Description Authors: G. Kittel and J. Evens

REFERENCES: Borchert et al. 2004, Western Ecology Working Group n.d.

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Quercus berberidifolia Shrubland
California Scrub Oak Shrubland

CODE	CEGL003716
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Temperate broad-leaved evergreen shrubland (III.A.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate broad-leaved evergreen shrubland (III.A.2.N.)
FORMATION	Sclerophyllous temperate broad-leaved evergreen shrubland (III.A.2.N.c.)
ALLIANCE	*QUERCUS BERBERIDIFOLIA* SHRUBLAND ALLIANCE (A.2673) California Scrub Oak Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland occurs on gentle to very steep northwest- and northeast-facing slopes at elevations between 353 and 1676 m (1158-5500 feet). The topography is variable, and the ground cover contains a moderate to high litter content. Parent material is sedimentary, granitic, metamorphic, gabbro diorite, or metavolcanic. Soil texture varies from loamy sand, silt loam, to clay. It is characterized by strong dominance of *Quercus berberidifolia* in the shrub layer. Other shrub species may be present in low cover, such as *Adenostoma fasciculatum, Arctostaphylos glauca, Eriogonum fasciculatum, Fraxinus dipetala, Heteromeles arbutifolia, Rhamnus crocea*, and *Salvia mellifera*. The herbaceous layer is sparse and has no characteristic species, the most common being non-natives such as *Hirschfeldia incana, Bromus diandrus, Bromus madritensis*, or *Bromus tectorum*. An emergent tree layer includes *Quercus agrifolia* in some stands.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (2) and Old Boundaries (6) areas of Pinnacles National Monument.

Globally

This association is known from the Santa Monica Mountains as well as San Diego County (Evens and San 2006), Riverside County (Klein and Evens 2006), other parts of the eastern Transverse and Peninsular ranges (Gordon and White 1994), northward and westward to the northern ranger districts of the Los Padres National Forest (Borchert et al. 2004), in the central interior Coast Ranges (Pinnacles National Monument), and the northern Sierra Nevada foothills (Klein et al. 2007). It is likely that the same association occurs north well into the central and inner northern Coast Ranges (Sawyer and Keeler-Wolf 1995, Thorne et al. 2004).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on somewhat steep to steep, north- and northeast-facing slopes, at elevations between 353 and 685 m. The overstory shrub layer is dominated by *Quercus berberidifolia*. The understory herbaceous layer may include *Galium porrigens var. porrigens, Pentagramma triangularis ssp. triangularis*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*. Nonvascular taxa include a lichen species.

Elevation: Mean 515.8 m, Range 353 - 685 m.
Aspect: North (3), Northeast (5).
Slope: Mean 30.9 degrees, Range 19 - 40 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (2), Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Convex or rounded (2), Linear or even (5), Undulating pattern (1).

Fines Cover: Mean 8.0%, Range 1 - 23%.
Gravel Cover: Mean 3.0%, Range 0.5 - 9%.
Cobble Cover: Mean 0.8%, Range 0.5 - 1%.
Stone Cover: Mean 0.9%, Range 0 - 4%.
Bedrock Cover: Mean 1.2%, Range 0 - 5%.
Litter Cover: Mean 84.9%, Range 70 - 91%.
Stem Basal Area Cover: Mean 2.3%, Range 2 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.

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Parent Material: Breccia (volcanic) (3), Granitic (1), Rhyolite (2), Sedimentary (2).
Soil Texture: Sandy Loam (4), Silt or Silt Loam (4).

Globally
Elevation ranges from 353 to 1676 m (1158-5500 feet). Aspect is usually northerly and less often southerly. Stands are found on moderate to steep slopes with variable topography. Ground cover contains a moderate to high litter content. Parent material is sedimentary, granitic, metamorphic, gabbro diorite, or metavolcanic. Soil texture varies from loamy sand, silt loam, to clay.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Quercus berberidifolia*. The understory herbaceous layer may include the forbs *Galium porrigens var. porrigens* and *Pentagramma triangularis ssp. triangularis*, and the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens).*

Total Vegetation Cover: Mean 60.5%, Range 41 - 90%.
Non-native Cover: Mean 3.9%, Range 0.5 - 8%.
Low Cover (<0.5m): Mean 16.5%, Range 3 - 29%.
Medium Cover (0.5-4.0m): Mean 36.6%, Range 2 - 83%.
Tall Cover (>4.0m): Mean 18.9 %, Range 4 - 35%.
Species Richness: Mean 33.5, Range 20 - 41.

Globally
Quercus berberidifolia is the sole dominant shrub in the intermittent to continuous shrub layer. A variety of other chaparral, coastal sage, and desert shrub species may be present, the most common being *Adenostoma fasciculatum, Arctostaphylos glauca, Eriogonum fasciculatum, Fraxinus dipetala, Heteromeles arbutifolia, Rhamnus crocea*, and *Salvia mellifera.* The most common herb species include non-native annuals *Hirschfeldia incana, Bromus diandrus, Bromus madritensis*, or *Bromus tectorum* though natives such as *Marah macrocarpus* and *Paeonia californica* may occur (Klein and Evens 2006).

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Quercus berberidifolia*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Allium crispum, Avena barbata, Bromus diandrus, Bromus rubens, Dodecatheon clevelandii ssp. patulum, Vicia sativa ssp. sativa, Vulpia myuros

Globally
Baccharis malibuensis, Calochortus catalinae, Dodecatheon clevelandii ssp. patulum, Juglans californica

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (21-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Stunted and non-stunted stands are part of the variation of this one type.

Globally
There may be some minor local variation in this widespread association based on locally distributed low-constancy species. Sufficient sampling has yet to be done in the northern part of its range.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

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Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_190, PINN_639, PINN_640, PINN_892, PINN_893, PINN_929, PINN_945, PINN_946.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Borchert et al. 2004, Evens and San 2006, Evens et al. 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Klein et al. 2007, Sawyer and Keeler-Wolf 1995, Thorne et al. 2004, Western Ecology Working Group n.d.

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Artemisia californica - Eriogonum fasciculatum / Annual Grass - Herb Shrubland
California Sagebrush - California Wild Buckwheat / Annual Grass - Herb Shrubland

CODE	CEGL003544
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE (A.813)	*ARTEMISIA CALIFORNICA - ERIOGONUM FASCICULATUM* SHRUBLAND ALLIANCE California Sagebrush - California Wild Buckwheat Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association is found in southern coastal California and occurs on gentle to steep southwest- and southeast-facing slopes at low elevations between 99 and 442 m. Parent material includes sedimentary or granite, less often gabbro, diorite, metavolcanic, or mixed granitic and metamorphic. Soil texture is more often sandy loam but varies from sand to clay or silt loam. Stands are characterized by a codominance of *Artemisia californica* and *Eriogonum fasciculatum* in the shrub layer, with occasional subdominants such as *Salvia apiana* and *Lotus scoparius*. There are a variety of native and non-native species in the herbaceous layer; more common ones include *Amsinckia menziesii, Bromus madritensis, Bromus diandrus, Bromus hordeaceus,* and *Avena fatua*. An emergent tree layer is usually absent.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Gloria Peak (4), Kingman (1), and Old Boundaries (8) areas of Pinnacles National Monument.

Globally

This association is known from California's South Coast (including Ventura to western Riverside and San Diego counties) and Peninsular ranges (western Riverside County: Santa Ana Mountains, Perris Valley and Hills, Fontana Plain; San Diego County: hills north of Ramona), and interior Central Coast Ranges (Pinnacles National Monument).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on somewhat steep to steep slopes on most aspects, at elevations between 394 and 705 m. The overstory shrub layer is dominated by *Artemisia californica* and *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include *Centaurea melitensis, Pellaea andromedifolia,* and *Bromus rubens (= Bromus madritensis ssp. rubens)*. Nonvascular taxa include a moss species.

Elevation: Mean 537.8 m, Range 394 - 705 m.
Aspect: East (1), Northeast (1), South (4), Southeast (2), Southwest (4), West (1).
Slope: Mean 30.3 degrees, Range 22 - 36 degrees.
Macro Topography: Lower 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (1), Upper 1/3 of slope (8), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Concave or depression (2), Convex or rounded (3), Linear or even (6), Undulating pattern (2).

Fines Cover: Mean 17.1%, Range 2 - 50%.
Gravel Cover: Mean 13.9%, Range 1 - 33%.
Cobble Cover: Mean 1.0%, Range 0.5 - 3%.
Stone Cover: Mean 0.6%, Range 0 - 2%.
Bedrock Cover: Mean 2.1%, Range 0 - 12%.
Litter Cover: Mean 62.9%, Range 18 - 94%.
Stem Basal Area Cover: Mean 2.4%, Range 0.5 - 4%.
Water Cover: Mean 0.0%, Range 0 - 0%.

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Parent Material: Breccia (volcanic) (1), Fanglomerate (1), General igneous intrusives (2), Granitic (4), Rhyolite (2), Sedimentary (1), Unknown (2).
Soil Texture: ASH (1), Clay or Clay Loam (1), Sand (4), Sandy Loam (6), Silt or Silt Loam (1).

Globally
Elevation ranges from 95 to 1095 m. Slopes are gentle to steep with variable aspects (north to south), and topography is variable. Parent material is more often sedimentary or granite, less often gabbro, diorite, metavolcanic, or mixed granitic and metamorphic. Soil texture is more often sandy loam but varies from sand to clay loam or silt loam (Evens and San 2006, Klein and Evens 2006).

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Artemisia californica* and *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include the forb *Centaurea melitensis*, the fern *Pellaea andromedifolia*, and the graminoid *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 48.5%, Range 22 - 75%.
Non-native Cover: Mean 9.5%, Range 2 - 27%.
Low Cover (<0.5m): Mean 13.2%, Range 3 - 28%.
Medium Cover (0.5-4.0m): Mean 38.2%, Range 15 - 76%.
Tall Cover (>4.0m): Mean 2.0 %, Range 2 - 2%.
Species Richness: Mean 26.2, Range 11 - 43.

Globally
Stands are characterized by a codominance of *Artemisia californica* and *Eriogonum fasciculatum* in the shrub layer, with occasional subdominants such as *Salvia apiana* and *Lotus scoparius*. There are a variety of native and non-native species in the herbaceous layer; more common ones include *Amsinckia menziesii, Bromus madritensis, Bromus diandrus, Bromus hordeaceus*, and *Avena fatua*. An emergent tree layer is usually absent.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Artemisia californica*, *Eriogonum fasciculatum var. foliolosum*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena barbata, *Bromus rubens*, *Centaurea melitensis*, *Erodium cicutarium*, *Hypochaeris glabra*, *Logfia gallica*, *Vulpia myuros*

Globally
Dudleya blochmaniae, *Eriogonum crocatum*

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (12-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
This is a widespread association in the central and southern coastal areas of California. Similar stands have been seen as far north as San Benito County (T. Keeler-Wolf pers. obs. 2005).

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.

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Pinnacles National Monument Plots: PINN_595, PINN_596, PINN_598, PINN_599, PINN_611, PINN_646, PINN_826, PINN_832, PINN_833, PINN_895, PINN_947, PINN_949, PINN_950.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Boyd et al. 1995, Evens and San 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Keeler-Wolf pers. comm., Klein and Evens 2006, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d., White 1994b

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Artemisia californica Shrubland
California Sagebrush Shrubland

CODE	CEGL003536
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*ARTEMISIA CALIFORNICA* SHRUBLAND ALLIANCE (A.815) California Sagebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland occurs in the Central Coast, South Coast, Transverse and Peninsular ranges of California and south to at least the Mexican border. Stands occur at elevations below 700 m, mostly on southwestern aspects but occasionally on northern aspects. Slopes are gentle to steep, mostly moderate. Topography is variable along lower slopes to ridgetops. Parent material is often Mesozoic granite, occasionally sandstone, and soil texture varies from sand to clay and includes sand and clay loams. Stands are characterized by a dominance of *Artemisia californica* in the shrub layer and a mostly non-native herbaceous layer. Shrub species *Malosma laurina* and *Eriogonum fasciculatum* are often present but at relatively low cover. Herbaceous species may be abundant in the understory, including *Dichelostemma capitatum ssp. capitatum, Logfia gallica (= Filago gallica), Lotus scoparius var. scoparius, Lotus wrangelianus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Nassella lepida, Bromus madritensis,* and *Centaurea melitensis*. An emergent tree layer is infrequent and may include *Quercus agrifolia, Juglans californica,* and *Schinus molle*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (2) and South Wilderness (1) areas of Pinnacles National Monument.

Globally

This shrubland is found in the Central Coast (Pinnacles National Monument), South Coast (including Ventura to western Riverside and San Diego counties), Transverse (including Santa Monica Mountains), and Peninsular ranges (including San Diego County: western foothills), and is likely to be found in Los Padres National Forest and south to at least the Mexican border.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on somewhat steep to steep slopes on variable aspects, at elevations between 273 and 622 m. The overstory shrub layer is dominated by *Artemisia californica* and often contains the abundant or characteristic shrubs *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include *Dichelostemma capitatum ssp. capitatum, Logfia gallica (= Filago gallica), Lotus scoparius var. scoparius, Lotus wrangelianus, Bromus hordeaceus,* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Elevation: Mean 475.7 m, Range 273 - 622 m.
Aspect: South (2), West (1).
Slope: Mean 27.3 degrees, Range 18 - 39 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1), Ridgetop (1), Upper 1/3 of slope (1).
Micro Topography: Convex or rounded (1), Linear or even (2).

Fines Cover: Mean 15.3%, Range 13 - 18%.
Gravel Cover: Mean 25.0%, Range 5 - 60%.
Cobble Cover: Mean 0.7%, Range 0 - 1%.
Stone Cover: Mean 0.3%, Range 0 - 0.5%.
Bedrock Cover: Mean 1.3%, Range 0 - 3%.
Litter Cover: Mean 38.3%, Range 20 - 65%.

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Stem Basal Area Cover: Mean 19.3%, Range 3 - 40%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Andesite (1), Fanglomerate (1), Rhyolite (1).
Soil Texture: Clay or Clay Loam (2), Sandy Loam (1).

Globally
Stands occur at elevations below 700 m, mostly on southwestern aspects but occasionally on northern aspects. Slopes are gentle to steep, mostly moderate. Topography is variable along lower slopes to ridgetops. Parent material is often Mesozoic granite, occasionally sandstone, and soil texture varies from sand to clay and includes sand to clay loams.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Artemisia californica*. Characteristic shrubs at lower cover include *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include the forbs *Dichelostemma capitatum ssp. capitatum, Logfia gallica (= Filago gallica), Lotus scoparius var. scoparius*, and *Lotus wrangelianus*, and the graminoids *Bromus hordeaceus* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 55.0%, Range 30 - 70%.
Non-native Cover: Mean 25.3%, Range 2 - 59%.
Low Cover (<0.5m): Mean 20.0%, Range 3 - 40%.
Medium Cover (0.5-4.0m): Mean 39.7%, Range 27 - 47%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 31.7, Range 17 - 49.

Globally
Artemisia californica is the sole dominant shrub in the understory. *Malosma laurina* and *Eriogonum fasciculatum* are often present in the shrub layer but in relatively low cover. Herbaceous species may be abundant in the understory, including *Dichelostemma capitatum ssp. capitatum, Logfia gallica (= Filago gallica), Lotus scoparius var. scoparius, Lotus wrangelianus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Nassella lepida, Bromus madritensis*, and *Centaurea melitensis*. An emergent tree layer is infrequent and may include *Quercus agrifolia, Juglans californica*, and *Schinus molle*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Artemisia californica*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena barbata, Avena fatua, Bromus rubens, Calystegia subacaulis ssp. subacaulis, Castilleja foliolosa, Centaurea melitensis, Centaurea solstitialis, Eriodictyon tomentosum, Eriogonum elongatum, Erodium brachycarpum, Erodium cicutarium, Herniaria hirsuta ssp. cinerea, Logfia gallica, Malacothamnus aboriginum, Silene gallica, Vulpia myuros

Globally
Calochortus catalinae, Calystegia subacaulis ssp. subacaulis, Eriodictyon tomentosum, Juglans californica, Malacothamnus aboriginum

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (12-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally

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In addition to the studies listed in Related Concepts, Borchert et al. (2004) describe stands strongly dominated by *Artemisia californica* from the Los Padres National Forest of Monterey County south to Ventura County. Gordon and White (1994) describe this alliance in a similar setting to Borchert et al. (2004). White and Padley (1997) describe a California sagebrush series (alliance) in Riverside County that has a mean elevation of 410 m (1350 feet).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_046, PINN_536, PINN_554.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Borchert et al. 2004, Evens and San 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Kirkpatrick and Hutchinson 1977, Western Ecology Working Group n.d., White and Padley 1997

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Baccharis pilularis / Annual Grass - Herb Shrubland
Coyotebrush / Annual Grass - Herb Shrubland

CODE	CEGL003183
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Microphyllous evergreen shrubland (III.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural microphyllous evergreen shrubland (III.A.4.N.)
FORMATION	Lowland microphyllous evergreen shrubland (III.A.4.N.a.)
ALLIANCE	*BACCHARIS PILULARIS* SHRUBLAND ALLIANCE (A.836) Coyotebrush Shrubland Alliance

ECOLOGICAL SYSTEM(S): Northern California Coastal Scrub (CES206.932)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association of northern to southern coastal California occurs on gentle valley bottoms to steep slopes with flat to variable aspect at low elevations between 1 and 568 m. It is characterized by the dominance of *Baccharis pilularis* in the shrub layer and a variety of non-native, largely annual grasses and herbs in the herbaceous layer. The herbaceous understory can be dominated by annual exotic grasses such as *Lolium perenne ssp. multiflorum (= Lolium multiflorum), Bromus hordeaceus, Bromus diandrus*, and *Avena barbata*, along with annual herbs such as *Raphanus sativus*. Other native herbaceous species include *Distichlis spicata, Juncus* spp., *Muhlenbergia rigens*, and *Corethrogyne filaginifolia (= Lessingia filaginifolia).* The emergent tree layer includes occasional ruderal trees such as *Schinus molle, Eucalyptus* spp., and *Phoenix canariensis*, as well as the native *Quercus agrifolia*. This association is indicative of a disturbed seral stage that typically comes following the reversion of cleared pastureland or non-native grassland back to shrubland. *Baccharis pilularis* behaves similarly in other areas of northern California where it often forms the first wave of woody species to recolonize cleared land.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (3) area of Pinnacles National Monument.

Globally

This association is well-known from the Santa Monica Mountains region. It has also been documented in Suisun Marsh (Keeler-Wolf and Vaghti 2000), Point Reyes (Keeler-Wolf et al. 2003), Coyote Hills of Santa Clara County (Evens and San 2004), San Dieguito, and Pinnacles National Monument, San Benito County. It is likely to be a common and widespread association from northern to southern coastal California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on gentle south- and west-facing slopes, at elevations between 303 and 345 m. The overstory shrub layer is dominated by *Baccharis pilularis* and often contains the abundant or characteristic shrubs *Rosa californica*. The emergent tree layer includes *Quercus lobata* and *Quercus agrifolia var. agrifolia*. The understory herbaceous layer may include *Artemisia dracunculus, Bromus hordeaceus*, and *Distichlis spicata*.

Elevation: Mean 317.3 m, Range 303 - 345 m.
Aspect: South (1), Southwest (1), West (1).
Slope: Mean 2.3 degrees, Range 2 - 3 degrees.
Macro Topography: Middle 1/3 of slope (3).
Micro Topography: Linear or even (3).

Fines Cover: Mean 10.7%, Range 2 - 25%.
Gravel Cover: Mean 0.7%, Range 0.5 - 1%.
Cobble Cover: Mean 0.2%, Range 0 - 0.5%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 55.0%, Range 0 - 93%.
Stem Basal Area Cover: Mean 33.0%, Range 1 - 96%.

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Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Silty alluvium (1), Unknown (2).
Soil Texture: Sandy Loam (1), Silt or Silt Loam (2).

Globally
This shrubland association occurs on gentle valley bottoms to steep slopes with flat to variable aspect at low elevations between 1 and 568 m.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Baccharis pilularis*. Characteristic shrubs at lower cover include *Rosa californica*. The emergent tree layer includes *Quercus lobata* and *Quercus agrifolia var. agrifolia*. The understory herbaceous layer may include the forb *Artemisia dracunculus* and the graminoids *Bromus hordeaceus* and *Distichlis spicata*.

Total Vegetation Cover: Mean 82.0%, Range 72 - 99%.
Non-native Cover: Mean 1.0%, Range 0.5 - 2%.
Low Cover (<0.5m): Mean 3.7%, Range 3 - 5%.
Medium Cover (0.5-4.0m): Mean 79.3%, Range 67 - 99%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 14.0, Range 9 - 19.

Globally
Baccharis pilularis is the most common shrub with 55-70% cover. Other shrubs present include *Artemisia dracunculus, Baccharis salicifolia, Eriogonum fasciculatum,* and *Rosa californica*. The herbaceous understory can be dominated by annual exotic grasses such as *Lolium perenne ssp. multiflorum (= Lolium multiflorum), Bromus hordeaceus, Bromus diandrus*, and *Avena barbata*, along with annual herbs such as *Raphanus sativus*. Other native herbaceous species include *Distichlis spicata, Juncus* spp., *Muhlenbergia rigens*, and *Corethrogyne filaginifolia (= Lessingia filaginifolia).* The emergent tree layer includes occasional ruderal trees such as *Schinus molle, Eucalyptus* spp., and *Phoenix canariensis*, as well as the native *Quercus agrifolia*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Tree canopy	*Quercus lobata*
Shrub/sapling (tall & short)	*Baccharis pilularis*
Herb (field)	*Artemisia dracunculus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena fatua, Bromus madritensis, Conium maculatum, Convolvulus arvensis, Lactuca serriola, Rumex crispus, Vulpia myuros

Globally
Juglans californica, Phoenix canariensis

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (6-Mar-2003). Likely to be a common association in disturbed coastal sites throughout most of California.

CLASSIFICATION COMMENTS
Pinnacles National Monument
This type occurs in dry washes along valley bottoms.

Globally
Data are not available.

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CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_174, PINN_178, PINN_179.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf, mod. G. Kittel and J. Evens

REFERENCES: Borchert et al. 2004, Evens and San 2004, Evens and San 2006, Heady et al. 1977, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Keeler-Wolf et al. 2000, Keeler-Wolf et al. 2003, Western Ecology Working Group n.d.

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Diplacus aurantiacus Shrubland
Orange Bush-monkeyflower Shrubland

CODE	CEGL003705
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Extremely xeromorphic evergreen shrubland (III.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural extremely xeromorphic evergreen shrubland (III.A.5.N.)
FORMATION	Facultatively deciduous extremely xeromorphic subdesert shrubland (III.A.5.N.b.)
ALLIANCE	*DIPLACUS AURANTIACUS* SHRUBLAND ALLIANCE (A.2672) Orange Bush-monkeyflower Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland is known from southern and central interior coastal mountains of California. It occurs on abrupt, somewhat steep to steep slopes with variable aspect at low elevations between 43 and 657 m (141-2155 feet). Soils are sand to silt loams, on volcanic, sedimentary, and colluvial parent materials. Slopes are often unstable, or recently burned, or a product of recent land- or rockslides. It is characterized by a strong dominance of *Diplacus aurantiacus (= Mimulus aurantiacus)* in the shrub layer. It has a presence of *Leymus condensatus, Selaginella bigelovii*, and *Bromus diandrus* in the herbaceous layer of many stands, but none are consistently present. The emergent tree layer is usually absent but may include *Juglans californica, Eucalyptus* sp., *Pinus* sp., *Quercus agrifolia*, and *Platanus racemosa*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the McCabe Canyon (8) and Old Boundaries (3) areas of Pinnacles National Monument.

Globally

This association is known from the Santa Monica Mountains region and interior Central Coast Ranges (Pinnacles National Monument). Small stands have been seen as far north as Contra Costa County (T. Keeler-Wolf pers. obs. 2005). These also occur on steep slopes and include *Artemisia californica*. It is likely to occur throughout much of cismontane central and southern California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on moderate to abrupt slopes on most aspects, at elevations between 480 and 657 m. The overstory shrub layer is dominated by *Diplacus aurantiacus (= Mimulus aurantiacus)*. The understory herbaceous layer may include *Selaginella bigelovii* and *Bromus diandrus*. Nonvascular taxa include a moss species.

Elevation: Mean 537.7 m, Range 480 - 657 m.
Aspect: East (1), North (1), Northeast (2), Northwest (1), South (4), Southeast (2).
Slope: Mean 41.7 degrees, Range 12 - 90 degrees.
Macro Topography: Bottom to Upper 1/3 of slope (2), Middle 1/3 of slope to Ridgetop (2), Upper 1/3 of slope (4), Upper 1/3 of slope to Ridgetop (3).
Micro Topography: Concave or depression (1), Linear or even (6), Undulating pattern (4).

Fines Cover: Mean 27.7%, Range 0.5 - 50%.
Gravel Cover: Mean 35.5%, Range 5 - 60%.
Cobble Cover: Mean 3.2%, Range 0.5 - 10%.
Stone Cover: Mean 0.6%, Range 0 - 2%.
Bedrock Cover: Mean 1.0%, Range 0 - 5%.
Litter Cover: Mean 29.4%, Range 0.5 - 88%.
Stem Basal Area Cover: Mean 2.7%, Range 0.5 - 8%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (2), Fanglomerate (1), Large landslide (1), Rhyolite (1), Sedimentary (6).
Soil Texture: Sand (9), Sandy Loam (1), Silt or Silt Loam (1).

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Globally
It appears on generally steep, often somewhat unstable slopes in relatively mesic settings within the general vicinity of stands of *Artemisia californica* or *Salvia leucophylla* alliances. It also appears to be closely associated with recent burns in many cases. In some cases, this type also appears to be associated with natural ground disturbance such as rockslides. This shrubland association occurs on abrupt, somewhat steep to steep slopes with variable aspect at low elevations between 43 and 657 m (141-2155 feet). Soils are sand to silt loams, on volcanic, sedimentary, and colluvial parent materials.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Diplacus aurantiacus (= Mimulus aurantiacus)*. The understory herbaceous layer may include the fern ally *Selaginella bigelovii* and the graminoid *Bromus diandrus*.

Total Vegetation Cover: Mean 31.1%, Range 1 - 75%.
Non-native Cover: Mean 5.4%, Range 0.5 - 21%.
Low Cover (<0.5m): Mean 10.6%, Range 1 - 30%.
Medium Cover (0.5-4.0m): Mean 26.0%, Range 2 - 57%.
Tall Cover (>4.0m): Mean 3.0 %, Range 1 - 4%.
Species Richness: Mean 23.7, Range 2 - 43.

Globally
This association is characterized by a strong dominance of *Diplacus aurantiacus (= Mimulus aurantiacus)* in the shrub layer. Other shrubs present may include *Artemisia californica, Malosma laurina, Adenostoma fasciculatum, Prunus ilicifolia ssp. ilicifolia, Arctostaphylos glauca, Salvia leucophylla, Toxicodendron diversilobum, Sambucus mexicana,* and *Eriogonum fasciculatum var. foliolosum.* It has a presence of *Leymus condensatus, Selaginella bigelovii,* and *Bromus diandrus* in the herbaceous layer of many stands, but none are consistently present. The emergent tree layer is usually absent but may include *Juglans californica, Eucalyptus* sp., *Pinus* sp., *Quercus agrifolia,* and *Platanus racemosa* at low cover.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Diplacus aurantiacus*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena barbata, Avena fatua, Bromus arenarius, Bromus diandrus, Bromus rubens, Dudleya lanceolata, Erodium cicutarium, Hypochaeris glabra, Vulpiamyuros

Globally
Calochortus catalinae, Calochortus plummerae, Dudleya lanceolata, Juglans californica

CONSERVATION STATUS RANK
Global Rank & Reasons: G3 (21-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This type occurs on steep slopes with much bare ground and gravel. It appears the community is revegetating old landslides.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

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Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_114, PINN_115, PINN_116, PINN_117, PINN_118, PINN_119, PINN_183, PINN_185, PINN_613, PINN_641, PINN_642.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Keeler-Wolf and Evens 2006, Keeler-Wolf pers. comm., Western Ecology Working Group n.d.

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Eriogonum fasciculatum Shrubland
California Wild Buckwheat Shrubland

CODE	CEGL001258
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Evergreen shrubland (III.A.)
PHYSIOGNOMIC GROUP	Extremely xeromorphic evergreen shrubland (III.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural extremely xeromorphic evergreen shrubland (III.A.5.N.)
FORMATION	Facultatively deciduous extremely xeromorphic subdesert shrubland (III.A.5.N.b.)
ALLIANCE	*ERIOGONUM FASCICULATUM* SHRUBLAND ALLIANCE (A.868) California Wild Buckwheat Shrubland Alliance

ECOLOGICAL SYSTEM(S): Mojave Mid-Elevation Mixed Desert Scrub (CES302.742)
North American Warm Desert Pavement (CES302.750)
Sonora-Mojave Creosotebush-White Bursage Desert Scrub (CES302.756)

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This chaparral shrubland occurs in the interior Central Coast Ranges, from the Santa Monica Mountains to northern San Benito County, California. It occurs on gentle to very steep slopes of variable but often southerly aspects, along a wide range of elevations from 5 to 1585 m (16-5200 feet). This association usually occurs on alluvial/depositional, lower to upper slopes that are undulating or convex. The parent material is highly variable, including granitic, volcanic, or sedimentary substrates. Soils are various loams, sands, and clays. *Eriogonum fasciculatum* is consistently present at low to high cover. A wide variety of chaparral, coastal sage, and disturbance shrub species (e.g., *Adenostoma fasciculatum, Artemisia californica, Ericameria linearifolia, Ceanothus cuneatus, Corethrogyne filaginifolia (= Lessingia filaginifolia), Lotus scoparius, Rhus ovata, Salvia apiana, Yucca whipplei*) may be present at low cover. Diverse annual herbs comprise the herbaceous understory, the most common being natives *Cryptantha* spp., *Dichelostemma capitatum ssp. capitatum, Erodium brachycarpum*, and *Erodium cicutarium*, and non-natives such as *Hirschfeldia incana, Erodium* spp., *Bromus* spp., and *Avena* spp. Occasionally there is an emergent tree layer, with species such as *Juniperus californica, Pinus sabiniana*, and *Quercus douglasii* found at trace cover.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1), Old Boundaries (24), and South Wilderness (3) areas of Pinnacles National Monument.

Globally

This association is known from the interior Coast Ranges. It is documented from the Santa Monica Mountains, as well as San Diego, western Riverside, northern and southern San Benito, and western Fresno counties. It probably is widespread throughout much of central and southern coastal California and Nevada.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on flat to steep slopes on most aspects, at elevations between 277 and 661 m. The overstory shrub layer is dominated by *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include *Dichelostemma capitatum ssp. capitatum, Erodium brachycarpum, Erodium cicutarium, Avena barbata*, and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Elevation: Mean 459.1 m, Range 277 - 661 m.
Aspect: East (4), Flat (1), South (10), Southeast (3), Southwest (8), West (2).
Slope: Mean 20.0 degrees, Range 0 - 36 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (5), Middle 1/3 of slope to Ridgetop (8), Middle to Upper 1/3 of slope (1), Upper 1/3 of slope (9), Upper 1/3 of slope to Ridgetop (5).
Micro Topography: Concave or depression (4), Convex or rounded (2), Linear or even (16), Undulating pattern (6).

Fines Cover: Mean 20.5%, Range 0.5 - 80%.
Gravel Cover: Mean 33.9%, Range 1 - 90%.
Cobble Cover: Mean 0.5%, Range 0 - 1%.

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Stone Cover: Mean 0.3%, Range 0 - 1%.
Bedrock Cover: Mean 0.5%, Range 0 - 5%.
Litter Cover: Mean 34.3%, Range 2 - 95%.
Stem Basal Area Cover: Mean 10.1%, Range 0.5 - 32%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (2), Fanglomerate (5), General volcanic extrusives (3), Granitic (3), Gravelly alluvium (2), Mixed alluvium (4), Pumice (1), Rhyolite (8).
Soil Texture: Clay or Clay Loam (1), Sand (6), Sandy Loam (19), Unknown (2).

Globally
This association occurs over a wide range of elevations, from 5 to 1585 m (16-5200 feet) and has one of the widest elevational expressions of coastal chaparral types (Borchert et al. 2004). It usually occurs on alluvial/depositional, lower to upper slopes that are undulating or convex. Slopes are gentle to very steep (0-35 degrees). Often found on south-facing slopes, it can occur on all aspects. Parent material is highly variable, including granitic, volcanic, or sedimentary substrates. Soils are various loams, sands, and clays. Many stands denote recent disturbance from invasive annual species, grazing, erosion, foot traffic, etc.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Eriogonum fasciculatum var. foliolosum*. The understory herbaceous layer may include the forbs *Dichelostemma capitatum ssp. capitatum, Erodium brachycarpum*, and *Erodium cicutarium*, and the graminoids *Avena barbata* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 47.0%, Range 16 - 80%.
Non-native Cover: Mean 14.6%, Range 1 - 47%.
Low Cover (<0.5m): Mean 23.3%, Range 2 - 51%.
Medium Cover (0.5-4.0m): Mean 26.3%, Range 6 - 55%.
Tall Cover (>4.0m): Mean 0.8 %, Range 0.5 - 1%.
Species Richness: Mean 30.1, Range 15 - 46.

Globally
Eriogonum fasciculatum is consistently present at low to high cover. A wide variety of chaparral, coastal sage, and disturbance shrub species (e.g., *Artemisia californica, Ericameria linearifolia, Ceanothus cuneatus, Lotus scoparius, Corethrogyne filaginifolia (= Lessingia filaginifolia), Rhus ovata, Salvia apiana, Adenostoma fasciculatum, Yucca whipplei*) may be present at low cover. Diverse annual herbs comprise the herbaceous understory, the most common being natives *Cryptantha* spp., *Dichelostemma capitatum ssp. capitatum, Erodium brachycarpum*, and *Erodium cicutarium*, and non-natives such as *Hirschfeldia incana, Erodium* spp., *Bromus* spp., and *Avena* spp. Occasionally there is an emergent tree, with species such as *Juniperus californica, Pinus sabiniana* and *Quercus douglasii* found at trace cover.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Eriogonum fasciculatum var. foliolosum*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aphanes arvensis, Avena barbata, Avena fatua, Bromus diandrus, Bromus rubens, Centaurea melitensis, Erodium brachycarpum, Erodium cicutarium, Hypochaeris glabra, Logfia gallica, Vulpia myuros

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (23-Feb-1994).

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CLASSIFICATION COMMENTS
Pinnacles National Monument
This is one of the most common shrublands and was sampled throughout the park.

Globally
The colonization abilities of *Eriogonum fasciculatum* are prodigious in southern California; however, they may be helped in some areas by artificial seeding programs along road cuts, etc.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_001, PINN_002, PINN_012, PINN_013, PINN_014, PINN_015, PINN_021, PINN_033, PINN_034, PINN_036, PINN_055, PINN_098, PINN_500, PINN_505, PINN_513, PINN_524, PINN_525, PINN_526, PINN_527, PINN_529, PINN_541, PINN_756, PINN_768, PINN_816, PINN_828, PINN_829, PINN_830, PINN_839.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Borchert et al. 2004, Bourgeron and Engelking 1994, Driscoll et al. 1984, Evens and San 2006, Evens et al. 2006, Gordon and White 1994, Holland 1982, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Sawyer and Keeler-Wolf 1995, Western Ecology Working Group n.d.

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Cercocarpus montanus var. glaber Shrubland
Birchleaf Mountain-mahogany Shrubland

CODE	CEGL003615
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*CERCOCARPUS MONTANUS VAR. GLABER* SHRUBLAND ALLIANCE (A.587) Birchleaf Mountain-mahogany Shrubland Alliance

ECOLOGICAL SYSTEM(S):

USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland association has been described from the northern Sierra Nevada foothills, Santa Monica Mountains National Recreation Area, and Pinnacles National Monument, California. It occurs on moderately steep to steep slopes with rocky and occasionally deep soils on all aspects at elevations between 10 and 1800 m. It is characterized by a dominance of *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides)* in the shrub layer. The herbaceous layer has no characteristic species. The emergent tree layer may include infrequent *Quercus agrifolia, Quercus wislizeni, Juglans californica, Platanus racemosa, Pinus sabiniana,* and *Umbellularia californica*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the North Wilderness (1) and Old Boundaries (11) areas of Pinnacles National Monument.

Globally

This association is known from the North Coast Range and South Coast Range of California, including the Santa Monica Mountains and western Riverside County (Klein and Evens 2006). It also occurs in the foothills of the Sierra-Nevada.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on gentle to steep slopes with variable aspects at elevations between 356 and 607 m. The overstory shrub layer is dominated by *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides)*. The understory herbaceous layer may include *Clarkia unguiculata, Galium porrigens var. porrigens, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

Elevation: Mean 457.1 m, Range 356 - 607 m.
Aspect: East (2), North (2), Northeast (3), Northwest (3), West (2).
Slope: Mean 19.6 degrees, Range 5 - 36 degrees.
Macro Topography: Bottom to Upper 1/3 of slope (1), Middle 1/3 of slope (2), Middle 1/3 of slope to Ridgetop (1), Middle to Upper 1/3 of slope (2), Upper 1/3 of slope (6).
Micro Topography: Concave or depression (1), Convex or rounded (1), Linear or even (9), Undulating pattern (1).

Fines Cover: Mean 12.8%, Range 1 - 30%.
Gravel Cover: Mean 23.7%, Range 0.5 - 70%.
Cobble Cover: Mean 1.5%, Range 0 - 5%.
Stone Cover: Mean 0.8%, Range 0 - 5%.
Bedrock Cover: Mean 0.7%, Range 0 - 5%.
Litter Cover: Mean 57.8%, Range 25 - 90%.
Stem Basal Area Cover: Mean 3.3%, Range 2 - 6%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), General volcanic extrusives (7), Granitic (1), Gravelly alluvium (1), Rhyolite (1), Sandy alluvium (1).

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Soil Texture: Clay or Clay Loam (3), Sand (3), Sandy Loam (4), Silt or Silt Loam (1), Unknown (1).

Globally
It occurs on moderately steep to steep slopes on all aspects at elevations between 10 and 1800 m. Soils are rocky and occasionally deep clay, sand or loam.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides)*. The understory herbaceous layer may include the forbs *Clarkia unguiculata* and *Galium porrigens var. porrigens*, and the graminoids *Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

Total Vegetation Cover: Mean 54.9%, Range 32 - 75%.
Non-native Cover: Mean 7.8%, Range 3 - 17%.
Low Cover (<0.5m): Mean 20.7%, Range 11 - 40%.
Medium Cover (0.5-4.0m): Mean 35.3%, Range 21 - 58%.
Tall Cover (>4.0m): Mean 12.0 %, Range 1 - 31%.
Species Richness: Mean 34.8, Range 20 - 53.

Globally
Cercocarpus montanus var. glaber (= Cercocarpus betuloides) is the dominant species in the shrub overstory. A variety of shrubs consistently intermix as subdominants, including *Adenostoma fasciculatum, Heteromeles arbutifolia, Ceanothus crassifolius, Rhamnus ilicifolia, Prunus ilicifolia, Salvia mellifera,* and *Toxicodendron diversilobum*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Cercocarpus montanus var. glaber*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, Avena barbata, Avena fatua, Bromus arenarius, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Vulpia myuros

Globally
Calochortus plummerae, Juglans californica, Lepechinia fragrans

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (4-Jan-2006).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
This association appears to be widespread throughout coastal California and also ranges into the foothills of the Sierra Nevada.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_126, PINN_126, PINN_127, PINN_157, PINN_197, PINN_198, PINN_202, PINN_204, PINN_205, PINN_209, PINN_772, PINN_927, PINN_928.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod G. Kittel

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REFERENCES: Borchert et al. 2004, Evens and San 2006, Gordon and White 1994, Keeler-Wolf and Evens 2006, Keeler-Wolf et al. 2003, Keeler-Wolf pers. comm., Klein and Evens 2006, Klein et al. 2007, Taylor and Teare 1979a, Western Ecology Working Group n.d.

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Lotus scoparius Shrubland
Deerweed Shrubland

CODE	CEGL005304
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temperate cold-deciduous shrubland (III.B.2.N.a.)
ALLIANCE	*LOTUS SCOPARIUS* SHRUBLAND ALLIANCE (A.2678) Deerweed Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This low shrubland is a disturbance-induced community that occurs on ground damaged by clearing or fire. It tends to occur in small (<1 acre, often much less) patches. It likely occurs throughout California but has been documented only in central and southern California. A small "weedy" community, it is easily overlooked. Stands occur on somewhat steep slopes to flat areas on variable aspects, most often southerly. Elevations range from 25 to 1043 m (84-3422 feet). Stands are often located on variable topography, sometimes lower to middle slopes. Soils are variable, including sands, clays, and loams. The low-shrub layer is dominated by *Lotus scoparius var. scoparius. Artemisia californica, Eriogonum fasciculatum, Rhus ovata, Lupinus albifrons var. albifrons,* and *Corethrogyne filaginifolia (= Lessingia filaginifolia)* may be present at low cover. The herbaceous layer is diverse and often includes abundant non-native species, such as *Centaurea melitensis, Erodium* spp., and *Bromus rubens (= Bromus madritensis ssp. rubens),* and native species, such as *Artemisia dracunculus* and *Croton californicus*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (1) area of Pinnacles National Monument.

Globally

This association occurs in the Central Coast Ranges (including San Benito County), western Transverse Ranges (including Santa Monica Mountains), Sierra Nevada foothills, Sacramento Delta, South Coast and Peninsular ranges (including Ventura County south to western Riverside and San Diego counties), and the Colorado Desert (including the Anza-Borrego Desert).

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this shrubland association occurs on a gentle, southeast-facing slope, at an elevation of 217 m. The overstory shrub layer is dominated by *Lotus scoparius var. scoparius*. Other shrubs such as *Eriogonum fasciculatum var. foliolosum* and *Lupinus albifrons var. albifrons* are present. The understory herbaceous layer may include *Artemisia dracunculus, Chaenactis glabriuscula, Cuscuta californica, Eriogonum elegans, Hirschfeldia incana, Lupinus bicolor, Nemacladus gracilis, Silene gallica, Trifolium microcephalum, Trifolium willdenowii, Aira caryophyllea, Avena barbata, Bromus arenarius, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens),* and *Vulpia myuros*.

Elevation: 217 m.
Aspect: Southeast (1).
Slope: 1 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 50%.
Gravel Cover: 16%.
Cobble Cover: 0.5%.
Stone Cover: 0%.
Bedrock Cover: 0%.

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Litter Cover: 30%.
Stem Basal Area Cover: 2%.
Water Cover: 0%.
Parent Material: Mixed alluvium (1).
Soil Texture: Sand (1).

Globally
Stands occur on somewhat steep slopes to flat areas on variable aspects, most often southerly. Elevations range from 25 to 1043 m (84-3422 feet). Stands are often located on variable topography, sometimes lower to middle slopes. Soils are variable, including sands, clays, and loams.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Lotus scoparius var. scoparius*. Other shrubs present include *Eriogonum fasciculatum var. foliolosum* and *Lupinus albifrons var. albifrons*. The understory herbaceous layer may include the forbs *Artemisia dracunculus, Chaenactis glabriuscula, Cuscuta californica, Eriogonum elegans, Hirschfeldia incana, Lupinus bicolor, Nemacladus gracilis, Silene gallica, Trifolium microcephalum*, and *Trifolium willdenowii*, and the graminoids *Aira caryophyllea, Avena barbata, Bromus arenarius, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

Total Vegetation Cover: 27%.
Non-native Cover: 2%.
Low Cover (<0.5m): 3%.
Medium Cover (0.5-4.0m): 25%.
Tall Cover (>4.0m): 0%.
Species Richness: 19.

Globally
Lotus scoparius is dominant with intermittent to clumpy shrub cover (15-35% cover). Total vegetative cover is generally low (8-75%, a mean of 32%). *Artemisia californica, Eriogonum fasciculatum, Rhus ovata, Lupinus albifrons var. albifrons*, and *Corethrogyne filaginifolia (= Lessingia filaginifolia)* may be present at low cover. The herbaceous layer is diverse and often includes non-native species, such as *Centaurea melitensis, Erodium* spp., and *Bromus rubens (= Bromus madritensis ssp. rubens)*, and native species, such as *Artemisia dracunculus* and *Croton californicus*. The understory herbaceous layer may also include *Chaenactis glabriuscula, Cuscuta californica, Eriogonum elegans, Hirschfeldia incana, Lupinus bicolor, Nemacladus gracilis, Silene gallica, Trifolium microcephalum, Trifolium willdenowii, Aira caryophyllea, Avena barbata, Bromus arenarius, Bromus hordeaceus*, and *Vulpia myuros*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Eriogonum fasciculatum var. foliolosum, Lupinus albifrons var. albifrons*
Herb (field)	*Lotus scoparius var. scoparius*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, Avena barbata, Bromus arenarius, Bromus rubens, Eriogonum elegans, Hirschfeldia incana, Nemacladus gracilis, Silene gallica, Vulpia myuros

Globally
Eriogonum elegans, Nemacladus gracilis

CONSERVATION STATUS RANK
Global Rank & Reasons: GNA (ruderal) (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument

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One stand was sampled in a disturbed sandy wash.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_582.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Evens and San 2006, Hickson and Keeler-Wolf 2007, Keeler-Wolf and Evens 2006, Klein and Evens 2006, Western Ecology Working Group n.d.

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Baccharis salicifolia Riparian Shrubland
Mule's-fat Riparian Shrubland

CODE	CEGL003549
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Intermittently flooded cold-deciduous shrubland (III.B.2.N.c.)
ALLIANCE (A.933)	*BACCHARIS SALICIFOLIA* INTERMITTENTLY FLOODED SHRUBLAND ALLIANCE Mule's-fat Intermittently Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S): North American Warm Desert Riparian Woodland and Shrubland (CES302.753)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This riparian shrubland is known from central and southern interior coastal mountains of California, the Anza-Borrego Desert, and south into Baja California, Mexico. It is often found along washes, springs and riparian corridors. It is usually a small stringer community. It can occur on steep slopes associated with springs. Soils are course to fine sandy loams, mostly derived from alluvium. Elevation ranges from 216 to over 914 m (708-3000+ feet). The shrub layer is dominated by *Baccharis salicifolia*. Non-native *Tamarix* is often found but usually in relatively low cover. *Baccharis pilularis* may also be present in low cover. The herbaceous layer is dominated by a variety of non-native and native species such as *Ambrosia psilostachya, Bromus hordeaceus, Hirschfeldia incana, Lepidium latifolium, Artemisia douglasiana*, and *Urtica dioica*. *Salix gooddingii* or *Platanus racemosa* may be emergent in some stands.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1) and Old Boundaries (16) areas of Pinnacles National Monument.

Globally

This association is known from the Santa Monica Mountains region, interior Central Coast Ranges (Pinnacles National Monument), central San Diego County, and the Anza-Borrego Desert. In addition, *Baccharis salicifolia* stands range widely from the northern Sacramento Valley south into Baja California, Mexico.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on gentle, southerly-facing slopes, at elevations between 276 and 384 m. The overstory shrub layer is dominated by *Baccharis salicifolia*. The understory herbaceous layer may include *Artemisia douglasiana, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Melilotus indicus, Rumex salicifolius, Aira caryophyllea, Bromus diandrus, Bromus hordeaceus*, and *Vulpia myuros*.

Elevation: Mean 319.8 m, Range 276 - 384 m.
Aspect: East (2), South (5), Southeast (8), Southwest (2).
Slope: Mean 1.8 degrees, Range 1 - 4 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (13), Middle 1/3 of slope (4).
Micro Topography: Concave or depression (5), Linear or even (9), Other (2), Undulating pattern (1).

Fines Cover: Mean 19.2%, Range 1 - 60%.
Gravel Cover: Mean 28.3%, Range 2 - 68%.
Cobble Cover: Mean 9.5%, Range 0 - 40%.
Stone Cover: Mean 2.4%, Range 0 - 8%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 36.5%, Range 2 - 82%.
Stem Basal Area Cover: Mean 2.4%, Range 0.5 - 4%.
Water Cover: Mean 2.1%, Range 0 - 16%.
Parent Material: Gravelly alluvium (3), Mixed alluvium (12), Sandy alluvium (2).

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Soil Texture: Sand (16), Unknown (1).

Globally
This shrubland is often found along washes, springs and riparian corridors. It is usually small, stringer community. It can occur on steep slopes associated with springs. Soils are course to fine sandy loams, mostly derived from alluvium. Elevation ranges from 216 m to over 915 m (708-3000+ feet). In the Anza-Borrego Desert, *Baccharis salicifolia* is found scattered as small stands associated with springs and riparian stringers above 915 m and is most extensive at Sentenac Cienega.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Baccharis salicifolia*. The understory herbaceous layer may include the forbs *Artemisia douglasiana, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Melilotus indicus,* and *Rumex salicifolius,* and the graminoids *Aira caryophyllea, Bromus diandrus, Bromus hordeaceus,* and *Vulpia myuros*.

Total Vegetation Cover: Mean 27.2%, Range 12 - 40%.
Non-native Cover: Mean 6.8%, Range 2 - 14%.
Low Cover (<0.5m): Mean 11.2%, Range 3 - 22%.
Medium Cover (0.5-4.0m): Mean 18.1%, Range 7 - 35%.
Tall Cover (>4.0m): Mean 2.2 %, Range 0.5 - 4%.
Species Richness: Mean 42.4, Range 15 - 68.

Globally
Baccharis salicifolia is usually dominant. Non-native *Tamarix* is often found but usually in relatively low cover. *Baccharis pilularis* may also be present in low cover. *Salix gooddingii* may be emergent in some stands. The herbaceous layer is dominated by a variety of non-native and native species such as *Ambrosia psilostachya, Bromus hordeaceus, Hirschfeldia incana, Lepidium latifolium, Artemisia douglasiana,* and *Urtica dioica*. Other herbaceous species include forbs *Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Melilotus indicus,* and *Rumex salicifolius,* and graminoids *Aira caryophyllea, Bromus diandrus,* and *Vulpia myuros*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Baccharis salicifolia*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, *Anagallis arvensis*, *Anthriscus caucalis*, *Avena barbata*, *Bromus arenarius*, *Bromus diandrus*, *Bromus rubens*, *Centaurea melitensis*, *Cerastium glomeratum*, *Galium parisiense*, *Hirschfeldia incana*, *Hypochaeris glabra*, *Hypochaeris radicata*, *Lactuca serriola*, *Medicago polymorpha*, *Melilotus indicus*, *Polypogon monspeliensis*, *Rumex crispus*, *Rumex salicifolius*, *Senecio vulgaris*, *Sonchus asper*, *Vicia sativa ssp. sativa*, *Vulpia myuros*

Globally
Juglans californica

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (14-Dec-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally

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A similar *Baccharis salicifolia - Sambucus mexicana* association has been described from western Riverside County (Klein and Evens 2006). Very similar stands occur at least as far north as Shasta County in the Sacramento Valley of California (T. Keeler-Wolf pers. obs. 2004). Due to the inherent variability of these riparian scrublands, it remains to be seen if these associations should stay separate.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_129, PINN_130, PINN_133, PINN_160, PINN_169, PINN_170, PINN_171, PINN_592, PINN_662, PINN_888, PINN_889, PINN_917, PINN_932, PINN_933, PINN_938, PINN_939, PINN_944.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Evens and San 2006, Keeler-Wolf and Evens 2006, Keeler-Wolf et al. 1998, Keeler-Wolf pers. comm., Klein and Evens 2006, Muldavin et al. 2000a, Western Ecology Working Group n.d.

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Rosa californica Shrubland
California Rose Shrubland

CODE	CEGL005315
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*ROSA CALIFORNICA* SHRUBLAND TEMPORARILY FLOODED ALLIANCE (A.2679) California Rose Shrubland Temporarily Flooded Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This shrubland is known from the Sacramento River, Suisan Marsh and Pinnacles National Monument, and is expected to occur throughout California. The shrubland is an early-seral community, often found along roads, ditches, edges of drying marshes, riparian areas, washes, and other naturally disturbed or human-impacted areas. This shrubland ranges from less than 0.3 to over 2 m in height. Slopes are low (0-3%), and soils highly variable, from clay, silt loam, to sand. More natural settings are found along riparian areas and around wetlands, where it occurs in narrow strips. *Rosa californica* is the dominant and characteristic shrub, though *Artemisia californica, Baccharis pilularis, Rubus discolor, Salix lasiolepis, Salvia mellifera, Sambucus canadensis (= Sambucus nigra ssp. canadensis),* and *Symphoricarpos mollis* may be equally important. Emergent trees such as *Salix laevigata* may be present. Herbaceous species may be present as well in an open understory, with many non-natives.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (4), McCabe Canyon (1), and Old Boundaries (4) areas of Pinnacles National Monument.

Globally

This association is known from the Sacramento River, Suisan Marsh and Pinnacles National Monument, and is expected to occur throughout California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on flat to gentle slopes on all aspects, at elevations between 285 and 414 m. The overstory shrub layer is dominated by *Rosa californica*. The understory herbaceous layer may include *Artemisia dracunculus, Bromus diandrus, Bromus hordeaceus,* and *Leymus triticoides*.

Elevation: Mean 350.2 m, Range 285 - 414 m.
Aspect: East (1), Flat (3), North (1), Northwest (1), South (2), West (1).
Slope: Mean 1.3 degrees, Range 0 - 3 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (1), Middle 1/3 of slope (8).
Micro Topography: Linear or even (8), Undulating pattern (1).

Fines Cover: Mean 5.2%, Range 0.5 - 20%.
Gravel Cover: Mean 0.9%, Range 0.5 - 3%.
Cobble Cover: Mean 0.3%, Range 0 - 0.5%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 81.2%, Range 5 - 98%.
Stem Basal Area Cover: Mean 13.1%, Range 2 - 93%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (1), Granitic (1), Mixed alluvium (3), Sandy alluvium (2), Silty alluvium (1), Unknown (1).
Soil Texture: Clay or Clay Loam (3), Sand (2), Sandy Loam (1), Silt or Silt Loam (3).

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Globally
This is an early-seral community in which *Rosa californica* is dominant and conspicuous, often forming narrow briar patches along levees and roads, riparian areas, washes, lower-lying (drying) portions of marsh (Keeler-Wolf and Vaghti 2000), and other naturally disturbed or human-impacted areas. This shrubland ranges from less than 0.3 to over 2 m in height. Slopes are low (0-3%), and soils are highly variable, from clay, silt loam, to sand. More natural settings are found along riparian areas and around wetlands, where it occurs in narrow strips.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Rosa californica*. The understory herbaceous layer may include the forb *Artemisia dracunculus* and the graminoids *Bromus diandrus*, *Bromus hordeaceus*, and *Leymus triticoides*.

Total Vegetation Cover: Mean 79.4%, Range 50 - 97%.
Non-native Cover: Mean 11.9%, Range 0.5 - 42%.
Low Cover (<0.5m): Mean 11.1%, Range 0.5 - 47%.
Medium Cover (0.5-4.0m): Mean 74.5%, Range 22 - 96%.
Tall Cover (>4.0m): Mean 6.0 %, Range 2 - 8%.
Species Richness: Mean 21.3, Range 10 - 44.

Globally
Rosa californica is the dominant and characteristic shrub, though *Artemisia californica, Baccharis pilularis, Rubus discolor, Salix lasiolepis, Salvia mellifera, Sambucus canadensis (= Sambucus nigra ssp. canadensis)*, and *Symphoricarpos mollis* may be equally important. Emergent trees such as *Salix laevigata* may be present. Herbaceous species may be present as well in an open understory, with many non-natives.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Rosa californica*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Bromus diandrus, Bromus rubens, Centaurea solstitialis, Erodium cicutarium, Hirschfeldia incana, Marrubium vulgare, Melilotus indicus, Vulpia myuros

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (8-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This shrubland was sampled on upper terraces of floodplains and small drainages.

Globally
This is a common but poorly documented type. It is expected to occur throughout California.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_139, PINN_173, PINN_654, PINN_670, PINN_882, PINN_883, PINN_884, PINN_921, PINN_925.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo

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Global Description Authors: G. Kittel and J. Evens

REFERENCES: Hickson and Keeler-Wolf 2007, Keeler-Wolf and Vaghti 2000, Western Ecology Working Group n.d.

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Salix exigua Temporarily Flooded Shrubland
Coyote Willow Temporarily Flooded Shrubland

CODE	CEGL001197
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE (A.947)	*SALIX (EXIGUA, INTERIOR)* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (Coyote Willow, Sandbar Willow) Temporarily Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S): Northwestern Great Plains Floodplain (CES303.676)
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This willow shrubland is found throughout the western United States and Great Plains north into the Boreal Plains. This is a highly flood-tolerant community that occurs along rivers and streams at lower elevations, on recently flooded riparian areas, and in moist swales and ditches that are frequently disturbed. Stands occur most commonly on alluvial sand, but silt, clay or gravel may also be present. *Salix exigua* is the dominant canopy species (*Salix interior* or intermediates of the two willow species may be present in the eastern part of the range). It can form dense stands up to 4 m tall, but there are often patches where the shrub layer is absent. Seedlings and small saplings of *Populus deltoides, Populus balsamifera*, and *Salix amygdaloides* may be present. The herbaceous cover is sparse to moderate but rarely exceeds 30%. Species present may include *Cenchrus longispinus, Polygonum lapathifolium, Schoenoplectus americanus (= Scirpus americanus), Triglochin maritima,* and *Xanthium strumarium.*

In California, the overstory shrub canopy is open to continuous and dominated by *Salix exigua*, with *Rubus discolor* often present. Trees such as *Ailanthus altissima, Fraxinus latifolia*, and *Salix laevigata* sometimes occur as scattered emergents. Other shrubs that may be present include *Rhus trilobata var. trilobata (= Rhus aromatica var. trilobata), Quercus gambelii, Rosa woodsii, Rosa nutkana, Ericameria nauseosa, Arctostaphylos patula*, and *Dasiphora fruticosa ssp. floribunda* The herbaceous layer is typically open and often includes *Artemisia douglasiana*. The composition of this community, especially the herbaceous layer, varies from year to year with succession or renewed disturbance.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (1) area of Pinnacles National Monument.

Globally

This willow shrubland community is found along rivers and streams at lower elevations throughout the western United States and Great Plains, ranging sporadically from Oklahoma northwest to the Dakotas and Manitoba, into the Rocky Mountains of Colorado, Wyoming, Montana and Idaho, west to Washington, and south to the Rio Grande, San Juan and Canadian River watersheds in northern New Mexico. In California, this association has been sampled along the Sacramento River, in the Central Coast Ranges, northern and central Sierra Nevada foothills, and Cascade Range foothills. Part of this type's former range in the Great Plains and eastward is actually occupied, at least in part, by *Salix interior* [see *Salix interior* Temporarily Flooded Shrubland (CEGL008562)].

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this shrubland association occurs on a gentle, southwest-facing slope, at an elevation of 290 m. The overstory shrub layer is dominated by *Salix exigua* and often contains the abundant or characteristic shrubs *Artemisia californica, Baccharis pilularis, Rhamnus ilicifolia, Rubus ursinus*, and *Toxicodendron diversilobum*. The emergent tree layer includes *Juglans hindsii (= Juglans californica var. hindsii)*. The understory herbaceous layer may include *Artemisia douglasiana, Artemisia dracunculus, Claytonia perfoliata ssp. perfoliata, Conium maculatum, Cuscuta ceanothi (= Cuscuta subinclusa), Euthamia occidentalis, Galium porrigens var. porrigens, Marrubium vulgare,*

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Melilotus indicus, Urtica dioica ssp. holosericea, Bromus diandrus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Elymus glaucus ssp. glaucus, Juncus balticus, and *Melica torreyana*.

Elevation: 290 m.
Aspect: Southwest (1).
Slope: 1 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 37%.
Gravel Cover: 0.5%.
Cobble Cover: 0%.
Stone Cover: 0%.
Bedrock Cover: 0%.
Litter Cover: 60%.
Stem Basal Area Cover: 3%.
Water Cover: 0%.
Parent Material: Sandy alluvium (1).
Soil Texture: Sand (1).

Globally
This community is found on recently deposited or disturbed alluvial material. The parent material is alluvial sand, although silt, clay, or gravel may be present. Soil development is poor to absent. In New Mexico, this community occurs along wide, low-gradient streams and rivers in foothill regions and in lowland valleys and canyons at low to mid elevations of 1430 to 2266 m (4700- 7450 feet). The type is common on low alluvial bars that are subject to repeated flooding (1- to 5-year recurrence intervals). Soils are poorly stratified and generally consist of a thin layer of sandy loam at the surface overlying deep deposits of sand, gravel, or cobble. Rock fragments comprise upwards of 80% of the soil profile. These well-drained soils provide good aeration and rapid movement of water through the profile. Sites composed mostly of riverwash are moist at the surface for much of the season, while high bars may be dry on the surface, but tend to be moist at depths of 15 to 30 cm (6-12 inches) during most years.

In California, this association has been sampled along the Sacramento River, in the Central Coast Ranges, northern and central Sierra Nevada foothills, and Cascade Range foothills (Vaghti 2003, Klein et al. 2007). Stands occur along riparian corridors and stream terraces. They usually occupy slope bottoms, occasionally extending to lower slopes that were flat to somewhat steep. Stands usually occur on mixed, sandy, or silty alluvium and infrequently occur on gabbro, granitic, greenstone, sedimentary, slate, or volcanic substrates.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Salix exigua*. Characteristic shrubs at lower cover include *Artemisia californica, Baccharis pilularis, Rhamnus ilicifolia, Rubus ursinus*, and *Toxicodendron diversilobum*. The emergent tree layer includes *Juglans hindsii (= Juglans californica var. hindsii)*. The understory herbaceous layer may include the forbs *Artemisia douglasiana, Artemisia dracunculus, Claytonia perfoliata ssp. perfoliata, Conium maculatum, Cuscuta ceanothi (= Cuscuta subinclusa), Euthamia occidentalis, Galium porrigens var. porrigens, Marrubium vulgare, Melilotus indicus*, and *Urtica dioica ssp. holosericea*, and the graminoids *Bromus diandrus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Elymus glaucus ssp. glaucus, Juncus balticus*, and *Melica torreyana*.

Total Vegetation Cover: Mean 66.0%, Range 66%.
Non-native Cover: Mean 2.0%, Range 2%.
Low Cover (<0.5m): Mean 3.0%, Range 3%.
Medium Cover (0.5-4.0m): Mean 65.0%, Range 65%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0%.
Species Richness: Mean 23.0, Range 23.

Globally

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This community is dominated by shrubs, generally between 2 and 4 m tall. The most common of these is *Salix exigua* (*Salix interior* or intermediates of the two willow species may be present in the eastern part of the range). *Salix irrorata, Salix lutea,* and saplings of *Populus deltoides* or *Salix amygdaloides* are also frequently found in the shrub layer in lower elevation stands. *Populus balsamifera* seedlings become more common in northern and western stands. Several other shrub species can be present (usually in much lower abundance than *Salix exigua*), such as *Purshia stansburiana (= Purshia mexicana var. stansburiana), Rhus trilobata var. trilobata (= Rhus aromatica var. trilobata), Quercus gambelii, Rosa woodsii, Rosa nutkana, Ericameria nauseosa, Arctostaphylos patula,* and *Dasiphora fruticosa ssp. floribunda*. This stratum can have moderate to high stem density in the community as a whole. The species in the shrub layer do not form a closed canopy, allowing significant light to reach the ground layer. There are often patches where the shrub layer is absent. The herbaceous cover is sparse to moderate but rarely exceeds 30%. Older stands and places with less competition from the shrubs have greater herbaceous cover. The composition of the herbaceous layer can vary greatly. Species that are often found in this community are *Cenchrus longispinus, Polygonum lapathifolium, Schoenoplectus americanus (= Scirpus americanus), Triglochin maritima, Xanthium strumarium, Juncus balticus, Eleocharis palustris, Elymus repens (= Elytrigia repens), Poa pratensis, Phleum pratense, Agrostis scabra, Bromus inermis, Heracleum maximum, Achillea millefolium, Solidago* sp., *Equisetum arvense,* and *Linaria vulgaris*.

In New Mexico, thickets of *Salix exigua* range from open to closed and attain heights of 1.5 to 3 m (4-9 feet). *Salix irrorata* may be common but clearly not dominant. In the densest stands, *Salix exigua* dominates to the exclusion of other species. Seedlings or young saplings of native *Populus deltoides* and/or *Populus angustifolia* are present but usually widely scattered. In some stands, exotic species such as *Tamarix ramosissima* and *Elaeagnus angustifolia* are increasing in cover. The herbaceous understory can be diverse (85 species have been recorded for the type), but cover is low. Of the 18 wetland herbaceous species recorded for the type, the most prevalent are *Eleocharis palustris, Juncus bufonius, Juncus saximontanus, Schoenoplectus pungens (= Scirpus pungens), Argentina anserina, Epilobium ciliatum, Equisetum laevigatum,* and *Mentha arvensis*.

In California, the overstory shrub canopy is open to continuous and dominated by *Salix exigua,* with *Rubus discolor* often present. Trees such as *Ailanthus altissima, Fraxinus latifolia,* and *Salix laevigata* sometimes occur as scattered emergents. The herbaceous layer is typically open and often includes *Artemisia douglasiana*.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Tree canopy	*Juglans hindsii*
Shrub/sapling (tall & short)	*Salix exigua*
Herb (field)	*Artemisia douglasiana*

Globally

Stratum	Species
Shrub/sapling (tall & short)	*Salix exigua*
Herb (field)	*Polygonum lapathifolium, Xanthium strumarium*
Herb (field)	*Cenchrus longispinus, Schoenoplectus americanus, Triglochin maritima*

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Bromus diandrus, Bromus rubens, Conium maculatum, Juglans hindsii, Marrubium vulgare, Melilotus indicus

Globally

Ailanthus altissima, Bromus inermis, Elaeagnus angustifolia, Elymus repens, Juglans hindsii, Linaria vulgaris, Phleum pratense, Poa pratensis, Rubus discolor, Tamarix ramosissima

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (6-May-1999). This type is widespread and common throughout its range.

CLASSIFICATION COMMENTS

Pinnacles National Monument

This association was only sampled once, but small patches occur in many places in the park.

Globally

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This type may be an early-successional shrubland that develops into *Salix exigua* / Mesic Graminoids Shrubland (CEGL001203), or the two types may be essentially synonymous. This plant association occupies a wide geographic range. The range of this type was reviewed and it was split into eastern, *Salix interior* Temporarily Flooded Shrubland (CEGL008562), and western components. The western stands may all be composed of *Salix exigua* (*sensu stricto*), and Great Plains stands may contain either *Salix exigua, Salix interior*, or intermediates of the two willow species, the *Salix interior* being distributed entirely in the Great Plains and eastward (Kartesz 1999).

Because this type is subject to repeated scouring by floods, pioneering herbaceous species are often buried or removed. Woody debris and deep sandy sediments help build the sites by becoming trapped among the basal stems of the willows. These sites are also potential sites for the reproduction of native cottonwoods. As sites develop, succession is initially towards mesic types with the undergrowth dominated by *Equisetum* spp. or mesic graminoids *Scirpus* spp. and ultimately toward cottonwoods. Dense stands usually deter livestock, but open stands may be susceptible to overuse resulting in reduced vigor and loss of the willow component in the stand.

The type can occur in a matrix with cottonwood-dominated forested wetlands on higher bars and emergent vegetation dominated by sedges, cattails, and bulrushes in intermittent overflow channels or oxbows, and along banks.

This type has been previously reported in the Rocky Mountain region by Kittel (1993), Kittel and Lederer (1993), Kittel et al. (1995, 1996), and Padgett et al. (1988a).

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_135.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: J.F. Drake, mod. E. Muldavin, L. Allen, G. Kittel

REFERENCES: ANHIC 2005, Bellah and Hulbert 1974, Borchert et al. 2004, Bourgeron and Engelking 1994, Donnelly et al. 2006, Driscoll et al. 1984, Evenden 1990, Foti et al. 1994, Greenall 1996, Hansen et al. 1989, Hansen et al. 1991, Hansen et al. 1995, Hoagland 1998c, Hoagland 2000, INAI unpubl. data, Kagan et al. 2004, Kartesz 1999, Kittel 1993, Kittel and Lederer 1993, Kittel et al. 1995, Kittel et al. 1996, Klein et al. 2007, Kovalchik 1987, MTNHP 2002b, Muldavin et al. 2000a, NDNHI n.d., Padgett et al. 1988a, Phillips 1977, Steinauer 1989, Steinauer and Rolfsmeier 2000, Thompson and Hansen 2002, Vaghti 2003, Von Loh et al. 2000, WNHP unpubl. data, Western Ecology Working Group n.d., Wilson 1970

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Salix lasiolepis / Baccharis salicifolia Shrubland
Arroyo Willow / Mule's-fat Shrubland

CODE	CEGL002875
PHYSIOGNOMIC CLASS	Shrubland (III)
PHYSIOGNOMIC SUBCLASS	Deciduous shrubland (III.B.)
PHYSIOGNOMIC GROUP	Cold-deciduous shrubland (III.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural cold-deciduous shrubland (III.B.2.N.)
FORMATION	Temporarily flooded cold-deciduous shrubland (III.B.2.N.d.)
ALLIANCE	*SALIX LASIOLEPIS* TEMPORARILY FLOODED SHRUBLAND ALLIANCE (A.977) Arroyo Willow Temporarily Flooded Shrubland Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This shrubland association occurs on gentle- to high-gradient streams at elevations between 259 and 1118 m (849-3667 feet), on alluvium and sand and sandy loam soils. *Salix lasiolepis* codominates with *Baccharis salicifolia* in the shrub layer. *Quercus agrifolia* is occasionally found at low cover in the overstory tree layer. Other shrubs present include *Baccharis pilularis, Centaurea melitensis, Eriodictyon crassifolium, Ceanothus leucodermis,* and *Ricinus communis*. The herbaceous layer is diverse and occasionally includes the forbs *Artemisia douglasiana, Conium maculatum, Brassica nigra, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Rumex salicifolius,* and *Urtica dioica,* and the graminoids *Arundo donax, Bromus diandrus, Bromus rubens (= Bromus madritensis ssp. rubens), Piptatherum miliaceum,* and *Typha* spp.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (10) area of Pinnacles National Monument.

Globally

This association is known from the South Coast Ranges, including the Santa Monica Mountains in Ventura and Los Angeles counties (Santa Monica Mountains National Recreation Area), San Dieguito River drainage in central San Diego County, the interior Central Coast Ranges (Pinnacles National Monument), and Los Padres National Forest. This association is likely to occur elsewhere in central and southern California.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This shrubland association occurs on flat to gentle slopes with variable aspects, at elevations between 259 and 439 m. The overstory shrub to small-tree layer is dominated or codominated by *Salix lasiolepis* and often includes *Baccharis salicifolia* as a characteristic riparian associate. Other shrubs may be present at low cover, including *Rosa californica* and *Toxicodendron diversilobum*. The understory herbaceous layer may include *Artemisia douglasiana, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Rumex salicifolius, Bromus diandrus,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Elevation: Mean 393.9 m, Range 259 - 439 m.
Aspect: East (3), Flat (1), Northeast (3), South (2), Southwest (1).
Slope: Mean 2.1 degrees, Range 0 - 4 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (7), Bottom to Upper 1/3 of slope (1), Middle 1/3 of slope (2).
Micro Topography: Concave or depression (4), Linear or even (5), Undulating pattern (1).

Fines Cover: Mean 3.8%, Range 1 - 8%.
Gravel Cover: Mean 12.5%, Range 2 - 41%.
Cobble Cover: Mean 6.3%, Range 1 - 12%.
Stone Cover: Mean 2.7%, Range 0 - 6%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 68.7%, Range 40 - 81%.
Stem Basal Area Cover: Mean 3.1%, Range 2 - 8%.
Water Cover: Mean 3.1%, Range 0 - 15%.

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Parent Material: General volcanic extrusives (1), Gravelly alluvium (1), Mixed alluvium (7), Sandy alluvium (1).
Soil Texture: Sand (7), Sandy Loam (1), Unknown (2).

Globally
This association occurs in riparian areas and sandy washes at low elevations from 259 to 1118 m (849-3667 feet), on gentle- to high-gradient streams, on alluvium and sand and sandy loam soils.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the overstory shrub layer is dominated by *Salix lasiolepis*; the understory shrub layer is dominated by *Baccharis salicifolia*. The understory herbaceous layer may include the forbs *Artemisia douglasiana, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus),* and *Rumex salicifolius,* and the graminoids *Bromus diandrus* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Total Vegetation Cover: Mean 51.8%, Range 24 - 91%.
Non-native Cover: Mean 4.3%, Range 0.5 - 11%.
Low Cover (<0.5m): Mean 9.9%, Range 3 - 18%.
Medium Cover (0.5-4.0m): Mean 33.5%, Range 10 - 65%.
Tall Cover (>4.0m): Mean 13.3 %, Range 1 - 25%.
Species Richness: Mean 40.3, Range 29 - 51.

Globally
Stands have a sparse to intermittent tree layer, a sparse to open shrub layer and a sparse to open herbaceous layer. *Salix lasiolepis* codominates with *Baccharis salicifolia*. *Quercus agrifolia* is occasionally found at low cover in the overstory tree layer. Other shrubs present include *Baccharis pilularis, Centaurea melitensis, Eriodictyon crassifolium, Ceanothus leucodermis,* and *Ricinus communis*. The herbaceous layer is diverse and occasionally includes the forbs *Artemisia douglasiana, Conium maculatum, Brassica nigra, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus),* and *Rumex salicifolius,* and the graminoids *Arundo donax, Bromus diandrus, Bromus rubens (= Bromus madritensis ssp. rubens), Piptatherum miliaceum,* and *Typha* spp.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Salix lasiolepis*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, Anthriscus caucalis, Bromus arenarius, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Cirsium occidentale var. venustum, Hirschfeldia incana, Hypochaeris glabra, Lactuca serriola, Melilotus indicus, Polypogon monspeliensis, Rumex crispus, Rumex salicifolius, Sonchus asper, Vulpia myuros

Globally
Juglans californica

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (9-Nov-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
This association occurs along streambanks and nearby toeslopes of riparian areas.

Globally
Data are not available.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

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Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_153, PINN_163, PINN_164, PINN_165, PINN_659, PINN_660, PINN_661, PINN_886, PINN_887, PINN_903.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Bendix 1994, Keeler-Wolf and Evens 2006, Western Ecology Working Group n.d.

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Muhlenbergia rigens Herbaceous Vegetation
Deergrass Herbaceous Vegetation

CODE	CEGL005306
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Medium-tall bunch temperate or subpolar grassland (V.A.5.N.d.)
ALLIANCE	*MUHLENBERGIA RIGENS* HERBACEOUS ALLIANCE (A.2677) Deergrass Herbaceous Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This herbaceous bunchgrass association has been documented in southern and central California and in the lower Sierra Nevada foothills. It occurs on gently rolling slopes (1-3%) or flat areas between 90 and 1496 m (296-4909 feet) elevation. Soils are well-drained sandy to sandy loams. Stands form open to dense grasslands dominated by *Muhlenbergia rigens*. Other graminoids present include *Bromus diandrus, Bromus hordeaceus, Elymus glaucus, Leymus triticoides*, and *Lolium perenne ssp. multiflorum (= Lolium multiflorum).* Forbs are also often present and include *Clarkia purpurea ssp. quadrivulnera, Erodium cicutarium, Eschscholzia californica*, and *Hypochaeris glabra*. Shrubs may also be present with <10% cover, including *Eriogonum fasciculatum, Eriogonum wrightii, Rubus discolor*, and *Toxicodendron diversilobum*.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the McCabe Canyon (1) area of Pinnacles National Monument.

Globally

This grassland is known from the Coast Ranges of central and southern California and from the Sierra Nevada foothills.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this herbaceous association occurs on a gentle, south-facing slope, at an elevation of 394 m. It is dominated by *Bromus diandrus* and *Muhlenbergia rigens* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum*.

Elevation: 394 m.
Aspect: South (1).
Slope: 3 degrees.
Macro Topography: Middle 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 5%.
Gravel Cover: 3%.
Cobble Cover: 0.5%.
Stone Cover: 0%.
Bedrock Cover: 0%.
Litter Cover: 87%.
Stem Basal Area Cover: 5%.
Water Cover: 0%.
Parent Material: Breccia (volcanic) (1).
Soil Texture: Sand (1).

Globally

It occurs on gently rolling slopes (1-3%) or flat areas between 90 and 1496 m (296-4909 feet) elevation. Soils are well-drained sandy to sandy loams.

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VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the herbaceous layer is dominated by *Bromus diandrus* and *Muhlenbergia rigens*. Characteristic forbs include *Amsinckia menziesii var. intermedia, Artemisia dracunculus, Clarkia purpurea ssp. quadrivulnera, Erodium cicutarium, Eschscholzia californica, Hirschfeldia incana, Hypochaeris glabra, Hypochaeris radicata,* and *Senecio flaccidus var. douglasii,* and characteristic graminoids are *Avena barbata, Bromus arenarius, Bromus hordeaceus, Leymus triticoides*, and *Vulpia myuros*.

Total Vegetation Cover: 36%.
Non-native Cover: 15%.
Low Cover (<0.5m): 26%.
Medium Cover (0.5-4.0m): 10%.
Tall Cover (>4.0m): 0%.
Species Richness: 17.

Globally

Stands form open to dense grasslands dominated by *Muhlenbergia rigens*. Other graminoids present include *Bromus diandrus, Bromus hordeaceus, Elymus glaucus, Leymus triticoides*, and *Lolium perenne ssp. multiflorum (= Lolium multiflorum).* Forbs are also often present and include *Clarkia purpurea ssp. quadrivulnera, Erodium cicutarium, Eschscholzia californica*, and *Hypochaeris glabra*. Shrubs may also be present with <10% cover, including *Eriogonum fasciculatum, Eriogonum wrightii, Rubus discolor,* and *Toxicodendron diversilobum.*

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Eriogonum fasciculatum var. foliolosum*
Herb (field)	*Bromus diandrus, Muhlenbergia rigens*

Globally

Data are not available.

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Avena barbata, Bromus arenarius, Bromus diandrus, Erodium cicutarium, Hirschfeldia incana, Hypochaeris glabra, Hypochaeris radicata, Vulpia myuros

Globally

Data are not available.

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (9-Mar-2007).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Data are not available.

Globally

Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_669.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Klein and Evens 2006, Klein et al. 2007, NRCS 2002, Western Ecology Working Group n.d.

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Distichlis spicata Herbaceous Vegetation
Inland Saltgrass Herbaceous Vegetation

Saltgrass Saline Prairie

CODE	CEGL001770
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Intermittently flooded temperate or subpolar grassland (V.A.5.N.i.)
ALLIANCE (A.1332)	*DISTICHLIS SPICATA* INTERMITTENTLY FLOODED HERBACEOUS ALLIANCE Inland Saltgrass Intermittently Flooded Herbaceous Alliance
ECOLOGICAL SYSTEM(S):	Inter-Mountain Basins Greasewood Flat (CES304.780) Inter-Mountain Basins Wash (CES304.781) Chihuahuan Mixed Salt Desert Scrub (CES302.017) Inter-Mountain Basins Playa (CES304.786) Sonora-Mojave Mixed Salt Desert Scrub (CES302.749) Western Great Plains Saline Depression Wetland (CES303.669) Inter-Mountain Basins Alkaline Closed Depression (CES304.998) Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821) North American Warm Desert Lower Montane Riparian Woodland and Shrubland (CES302.748)
USFWS WETLAND SYSTEM:	Palustrine

CONCEPT SUMMARY

Globally

These grasslands occur in semi-arid and arid western North America from southern Saskatchewan, Canada, to Mexico. Stands are found in lowland habitats such as playas, swales, and terraces along washes that are typically intermittently to seasonally flooded. The flooding is usually the result of highly localized thunderstorms or winter rains which can flood one basin and leave the next dry. However, this association may also occur in other flood regimes (temporarily and semipermanently). Soil texture ranges from clay loam, silty loam, to sandy clay. These soils are often deep, saline and alkaline. They generally have an impermeable layer and therefore are poorly drained. When the soil is dry, the surface usually has salt accumulations. Salinity is likely more important than flooding as an environmental factor. Vegetation cover is sparse to dense and is dominated by *Distichlis spicata*, occurring in nearly pure stands. Minor cover of associated graminoids may include *Muhlenbergia asperifolia, Hordeum jubatum, Pascopyrum smithii, Sporobolus airoides, Carex filifolia, Eleocharis palustris, Puccinellia nuttalliana*, and *Juncus balticus*. Associated forbs, such as *Iva axillaris, Helianthus* spp., Asteraceae spp. (from lower salinity sites), *Salicornia rubra, Triglochin maritima*, and *Suaeda* spp., may also be present. Shrubs are rare, but scattered *Atriplex canescens* and *Sarcobatus vermiculatus* may be present.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1) area of Pinnacles National Monument.

Globally

This grassland association occurs in low areas in semi-arid and arid western North America from southern Saskatchewan, Canada, west to Washington and south to Arizona, California, New Mexico, and possibly northern Mexico.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this herbaceous association occurs on a flat at an elevation of 345 m. It is dominated by *Distichlis spicata* in the herbaceous layer. It is associated with a meadow complex with other native perennial wetland types such as *Hordeum brachyantherum* and *Juncus balticus*. It occurs in a heavily grazed meadow on the Kingman Property that has silty loam, alkaline soils.

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Elevation: 345 m.
Aspect: Flat (1).
Slope: 0 degrees.
Macro Topography: Middle 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 1%.
Gravel Cover: 0%.
Cobble Cover: 0%.
Stone Cover: 0%.
Bedrock Cover: 0%.
Litter Cover: 96%.
Stem Basal Area Cover: 6%.
Water Cover: 0%.
Parent Material: Clayey alluvium (1).
Soil Texture: Silt or Silt Loam (1).

Globally
These grasslands occur in semi-arid and arid western North America on saline and alkaline soils from southern Saskatchewan, Canada, to Mexico. Elevation ranges from 1000-2300 m (3280-7545 feet). Stands are found in lowland habitats such as playas, swales, floodplains, and terraces along washes that are typically intermittently or seasonally flooded. The flooding is usually the result of highly localized thunderstorms or winter rains which can flood one basin and leave the next dry. However, this association may also occur in other flood regimes (temporarily and semipermanently). Soil texture ranges from clay loam, silty loam, to sandy clay (Johnston 1987). These soils are often deep, saline and alkaline. They generally have an impermeable layer and therefore are poorly drained. When the soil is dry, the surface usually has salt accumulations. Salinity is likely more important than flooding as an environmental factor.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the herbaceous layer is dominated by *Distichlis spicata*. Forbs include *Centaurea solstitialis, Conyza* sp., *Erodium cicutarium, Heliotropium curassavicum, Hirschfeldia incana, Madia* sp., *Melilotus indicus, Rumex crispus,* and *Verbena lasiostachys*, and graminoids are *Bromus hordeaceus, Carex* sp., *Hordeum brachyantherum ssp. californicum, Juncus balticus, Leymus triticoides,* and *Polypogon monspeliensis*.

Total Vegetation Cover: 90%.
Non-native Cover: 10%.
Low Cover (<0.5m): 90%.
Medium Cover (0.5-4.0m): 4%.
Tall Cover (>4.0m): 0%.
Species Richness: 16.

Globally
Cover is sparse to dense and is dominated by *Distichlis spicata*, occurring in nearly pure stands. Stands have higher diversity and cover during wet years and near boundaries with other vegetation types. Higher soil salinity favors *Distichlis spicata* over less salt-tolerant species. However, very high salinity will dwarf the *Distichlis spicata* and reduce cover. Generally, vegetation height and cover and species diversity tend to vary inversely with salinity on the plains but may increase on very saline sites (Brotherson 1987). Minor cover of associated graminoids may include *Muhlenbergia asperifolia, Hordeum jubatum, Pascopyrum smithii, Sporobolus airoides, Carex filifolia, Eleocharis palustris, Puccinellia nuttalliana,* and *Juncus balticus*. Associated forbs, such as *Iva axillaris, Helianthus* spp. and Asteraceae spp. (from lower salinity sites), *Salicornia rubra, Triglochin maritima,* and *Suaeda* spp., may also be present. Shrubs are rare, but scattered *Atriplex canescens, Chrysothamnus viscidiflorus, Ericameria nauseosa,* and *Sarcobatus vermiculatus* may be present. Introduced species are present in some stands and may include *Bromus tectorum, Elymus repens, Lepidium latifolium, Lepidium perfoliatum, Bassia scoparia (= Kochia scoparia),* and occasionally *Tamarix* spp.

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MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Herb (field)	*Centaurea solstitialis*
Herb (field)	*Distichlis spicata*

Globally

Stratum	Species
Herb (field)	*Distichlis spicata*

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Centaurea solstitialis, Erodium cicutarium, Hirschfeldia incana, Melilotus indicus, Polypogon monspeliensis, Rumex crispus

Globally
Bassia scoparia, Bromus tectorum, Elymus repens, Lepidium latifolium, Lepidium perfoliatum

CONSERVATION STATUS RANK
Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
This graminoid association is characteristically dominated by *Distichlis spicata*. Closely related communities include *Pascopyrum smithii - Distichlis spicata* Herbaceous Vegetation (CEGL001580), *Sporobolus airoides - Distichlis spicata* Herbaceous Vegetation (CEGL001687), and several others.

CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_671.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: K.A. Schulz, mod. J. Coles, G. Kittel, J. Evens

REFERENCES: Baker 1984a, Beatley 1976, Bourgeron and Engelking 1994, Brotherson 1987, Bunin 1985, CONHP unpubl. data 2003, Carsey et al. 2003a, Costello 1944b, Crouch 1961a, Daniels 1911, Daubenmire 1970, Dodd and Coupland 1966, Driscoll et al. 1984, Franklin and Dyrness 1973, Graham 1937, Hansen et al. 1991, Hansen et al. 1995, Hyder et al. 1966, IDCDC 2005, Johnston 1987, Jones and Walford 1995, Kagan et al. 2000, Keeler-Wolf and Vaghti 2000, Kittel and Lederer 1993, Kittel et al. 1994, Kittel et al. 1999a, Kittel et al. 1999b, Klipple and Costello 1960, MTNHP 2002b, Muldavin et al. 2000a, Osborn 1974, Pickart 2006, Ralston 1969, Ramaley 1942, Rogers 1953, Sawyer and Keeler-Wolf 1995, Shanks 1977, Shupe et al. 1986, Soil Conservation Service 1978, Stearns-Roger, Inc. 1978, Tuhy and Jensen 1982, Ungar 1967, Ungar 1968, Ungar 1970, Ungar et al. 1969, Vestal 1914, WNHP unpubl. data, Weaver and Albertson 1956, Western Ecology Working Group n.d.

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Hordeum brachyantherum Herbaceous Vegetation
Meadow Barley Herbaceous Vegetation

CODE	CEGL003430
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
ALLIANCE	*HORDEUM BRACHYANTHERUM* TEMPORARILY FLOODED HERBACEOUS
ALLIANCE (A.2585)	Meadow Barley Temporarily Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Wash (CES304.781)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This association is found at 348-2684 m (1140-8800 feet) elevation in widely scattered mountain, basin, foothill, and valley locations ranging from the Central Coast Ranges of California, Central Valley, northwestern California, to the northern half of the Great Basin in Nevada through the southern one-third of Idaho and into southwestern Wyoming. The association is found along both intermittent and perennial streams but most commonly occurs in ephemerally moist to semipermanently saturated, often spring-fed, meadows and swales. It occurs in low- to moderate-gradient valley bottoms that range from very narrow to very wide with clayey, silty, or fine loamy soil. It is a small-patch community, generally occupying 0.1 to 1 acres. *Hordeum brachyantherum* typically forms a continuous layer with cover ranging from 25% to nearly 100%. Cover of graminoid associates varies and may include *Carex athrostachya, Carex microptera, Danthonia californica, Deschampsia caespitosa, Eleocharis palustris, Elymus trachycaulus, Poa secunda (= Poa nevadensis)*, which is occasionally codominant, and/or *Poa pratensis*. Forb cover is sparse and is characterized by *Camassia quamash, Epilobium* spp., *Mimulus guttatus, Iris missouriensis, Rumex crispus, Symphyotrichum* spp., and various vernal annuals. At Pinnacles National Monument, stands can have many introduced herbaceous species (sometimes more that 30% relative cover) and typically occur in seasonal wetland meadows and adjacent to streams, with clay or silt loam soils that include serpentine or other poor-nutrient soils.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1) area of Pinnacles National Monument.

Globally

This association occurs in widely scattered mountain and basin locations ranging from the northern half of the Great Basin in Nevada through the southern one-third of Idaho and extending into southwestern Wyoming. It is also reported from west-central California. *Hordeum brachyantherum* occurs across western North America so this association is likely more widespread.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this herbaceous association occurs on a flat at an elevation of 348 m. It is dominated by *Centaurea solstitialis* and *Hordeum brachyantherum ssp. californicum* in the herbaceous layer. The stand occurs in a meadow complex with other wetland herbaceous types, including *Juncus balticus* and *Distichlis spicata*. The site has active grazing at the Kingman area.

Elevation: Mean 348.0 m, Range 348 m.
Aspect: Flat (1).
Slope: Mean 0.0 degrees, Range 0 degrees.
Macro Topography: Middle 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 35%.
Gravel Cover: 0.5%.
Cobble Cover: 0.5%.

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Stone Cover: 0%.
Bedrock Cover: 0%.
Litter Cover: 60%.
Stem Basal Area Cover: 5%.
Water Cover: 0%.
Parent Material: Clayey alluvium (1).
Soil Texture: Silt or Silt Loam (1).

Globally
This association is found at 348-2684 m (1140-8800 feet) elevation in widely scattered mountain, basin, foothill, and valley locations ranging from the Central Coast Ranges of California, Central Valley, northwestern California, to the northern half of the Great Basin in Nevada through the southern one-third of Idaho and into southwestern Wyoming. The association is found along both intermittent and perennial streams, but most commonly it occurs in ephemerally moist to semipermanently saturated, often spring-fed, meadows and swales. It occurs in low- to moderate-gradient valley bottoms that range from very narrow to very wide with clayey, silty, or fine loamy soil. It is a small-patch community, generally occupying 0.1 to 1 acres. Parent materials are sandstones and shale that have eroded and deposited as secondary stream alluvium.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the herbaceous layer is dominated by *Hordeum brachyantherum ssp. californicum*. Forbs include *Centaurea solstitialis, Heliotropium curassavicum, Hirschfeldia incana, Lactuca serriola, Medicago polymorpha,* and *Rumex crispus*, and characteristic graminoids are *Bromus diandrus, Bromus hordeaceus, Juncus balticus, Leymus triticoides*, and *Lolium perenne ssp. multiflorum (= Lolium multiflorum).*

Total Vegetation Cover: 90%.
Non-native Cover: 62%.
Low Cover (<0.5m): 85%.
Medium Cover (0.5-4.0m): 5%.
Tall Cover (>4.0m): 0%.
Species Richness: 12.

Globally
This association is characterized by moderate to dense cover of the perennial grass *Hordeum brachyantherum*, which typically forms a continuous layer with cover ranging from 25% to nearly 100%. Cover of graminoid associates varies and may include *Carex athrostachya, Carex microptera, Danthonia californica, Deschampsia caespitosa, Eleocharis palustris, Elymus trachycaulus*, and *Poa secunda (= Poa nevadensis)*, which generally provide sparse to low cover but may occasionally codominate. Forb diversity is low and provides sparse cover, including *Argentina anserina (= Potentilla anserina), Camassia quamash, Epilobium* spp., *Iris missouriensis, Mimulus guttatus, Pyrrocoma lanceolata (= Haplopappus lanceolatus), Symphyotrichum* spp., and various vernal annuals. Introduced species such as *Poa pratensis, Rumex crispus,* and *Taraxacum officinale* are common in some stands. In California, characteristic species include a mixture of graminoids *Bromus diandrus, Bromus hordeaceus, Juncus balticus, Leymus triticoides*, and *Lolium perenne ssp. multiflorum*, and forbs such as *Heliotropium curassavicum, Hirschfeldia incana, Lactuca serriola, Medicago polymorpha,* and *Rumex crispus*. At Pinnacles National Monument, stands can have many introduced herbaceous species (sometimes more that 30% relative cover) and typically occur in seasonal wetland meadows and adjacent to streams, with clay or silt loam soils that include serpentine or other poor-nutrient soils.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Herb (field)	*Centaurea solstitialis*
Herb (field)	*Hordeum brachyantherum ssp. californicum*

Globally

Stratum	Species
Herb (field)	*Hordeum brachyantherum*

OTHER NOTEWORTHY SPECIES

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Pinnacles National Monument
Bromus diandrus, Centaurea solstitialis, Hirschfeldia incana, Lactuca serriola, Lolium perenne ssp. multiflorum, Medicago polymorpha, Rumex crispus

Globally
Bromus diandrus, Centaurea solstitialis, Hirschfeldia incana, Lactuca serriola, Lolium perenne ssp. multiflorum, Medicago polymorpha, Poa pratensis, Rumex crispus, Taraxacum officinale

CONSERVATION STATUS RANK
Global Rank & Reasons: G2 (25-Sep-2007). *Hordeum brachyantherum* is a wide-ranging, but infrequently observed, association found at 348 to 2684 m (1141-8800 feet) elevation in mountain and basin locations scattered from California's Central Coast Ranges, Central Valley, northwestern California, the northern half of Nevada, on through the southern one-third of Idaho. There are only about 16 occurrences currently known, although more are expected to be found throughout the association's range. The association occurs in a variety of ephemerally moist to semipermanently saturated sites along both intermittent and perennial streams, but most often in spring-fed meadows and swales. Ephemerally moist wetlands at low to mid elevations in the Intermountain West are naturally patchy and uncommon in this semi-arid area. Many of these sites have been cultivated or seeded with hay grasses and are now unsuitable to support this association. In addition, many springs (such as those feeding *Hordeum brachyantherum* sites) have been, and continue to be, diverted for cattle water storage. Other sites have been heavily grazed by livestock leading to invasion by *Poa pratensis* or other exotic species. Overall, *Hordeum brachyantherum* is an early-seral species resilient to moderate grazing disturbance. Based on the natural and human-caused rarity of potential habitat for this association, current threats, and low number of occurrences, this association is best ranked as G2 rather than G3. Further inventory may find higher quality stands of this association.

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
This association has been quantitatively defined with 9 plots by Manning and Padgett (1995) from eastern and northern Nevada, supplemented with two plots and two stand observations from central and southern Idaho (Jankovsky-Jones et al. 2001, IDCDC 2002). The *Poa secunda* (formerly *Poa nevadensis*) plant association is closely related to this plant association and *Poa secunda* and *Hordeum brachyantherum* can sometimes codominate in some in stands. According to Manning and Padgett (1995), if a stand in which both species occur is clearly dominated by *Poa secunda*, the stand is placed in the *Poa secunda* plant association. If the species have nearly equivalent cover, the stand is placed in the *Hordeum brachyantherum* plant association. Generally, the site conditions must be fairly moist for the *Hordeum brachyantherum* plant association, and much drier for the *Poa secunda* plant association.

CLASSIFICATION CONFIDENCE: 3 - Weak

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_673.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: C. Murphy, mod. G. Kittel and K.A. Schulz

REFERENCES: Evens and San 2004, Hansen and Hall 2002, IDCDC 2005, IDCDC unpubl. data 2002, Jankovsky-Jones et al. 2001, Manning and Padgett 1995, Smith 1998b, Western Ecology Working Group n.d.

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Leymus triticoides Herbaceous Vegetation
Beardless Wildrye Herbaceous Vegetation

CODE	CEGL001571
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
ALLIANCE (A.1353)	*LEYMUS TRITICOIDES* TEMPORARILY FLOODED HERBACEOUS ALLIANCE Beardless Wildrye Temporarily Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Playa (CES304.786)
Inter-Mountain Basins Alkaline Closed Depression (CES304.998)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

Once a widespread grassland of California on heavy clay soils, *Leymus triticoides* grasslands today are restricted to relict places in California's Central Valley and neighboring coastal and Sierra Nevada foothills. It has also been documented along riparian areas in Nevada. It occurs on clay or clay loam soils and has been documented along the margins of marshes, as narrow bands of wetland-upland borders as a natural ecotones, and along levee tops and margins of marshes adjacent to zones intermittent flooding. In addition, stands have been documented along riparian floodplains. *Leymus triticoides* dominates the herbaceous layer but is rarely found without several introduced annual plants such as *Sonchus* spp., *Vulpia myuros, Polypogon monspeliensis, Lactuca serriola, Lolium perenne ssp. multiflorum (= Lolium multiflorum), Bromus diandrus*, or *Avena fatua*. Stands in valley bottoms may have a few emergent oak trees or elderberry, giving this grassland a savanna-like appearance.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Kingman (1) area of Pinnacles National Monument.

Globally

Once a widespread grassland of California on heavy soils and hillslopes, *Leymus triticoides* grasslands today are restricted to relict places in California's Central Valley and neighboring coastal and Sierra Nevada foothills, and has been documented along riparian areas in Nevada.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this herbaceous association occurs on a flat at an elevation of 320 m. It is dominated by *Lactuca serriola* and *Leymus triticoides* in the herbaceous layer. The emergent tree layer includes *Quercus agrifolia var. agrifolia* and *Quercus lobata*, and the emergent shrub layer includes *Baccharis pilularis* and *Rosa californica*.

Elevation: 320 m.
Aspect: Flat (1).
Slope: 0 degrees.
Macro Topography: Middle 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 0%.
Gravel Cover: 0%.
Cobble Cover: 0%.
Stone Cover: 0%.
Bedrock Cover: 0%.
Litter Cover: 95%.
Stem Basal Area Cover: 5%.
Water Cover: 0%.
Parent Material: Clayey alluvium (1).

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Soil Texture: Sandy Loam (1).

Globally
Once a widespread grassland of California on heavy soils and hillslopes, *Leymus triticoides* grasslands today are restricted to relict places in the Central Valley, valleys of southern California and neighboring coastal ranges and Sierra Nevada foothills (Hamilton 1997, Holstein 2001). It occurs on clay or clay loam soils and has been documented along the margins of marshes, as narrow bands of wetland-upland borders as a natural ecotones, and along levee tops and margins of marshes adjacent to zones intermittent flooding (Keeler-Wolf and Vaghti 2000). In addition, stands have been documented be along riparian floodplains (E. Peterson pers. comm. 2006).

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the herbaceous layer is dominated by *Lactuca serriola* and *Leymus triticoides*. Forbs include *Artemisia dracunculus, Asclepias fascicularis, Centaurea solstitialis, Croton setigerus (= Eremocarpus setigerus), Heliotropium curassavicum, Hemizonia lobbii, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Madia elegans ssp. elegans, Melilotus indicus, Rumex crispus*, and *Sonchus asper*. Other graminoids are *Agrostis exarata, Avena fatua, Bromus diandrus, Bromus hordeaceus, Distichlis spicata, Elymus glaucus ssp. glaucus, Juncus balticus, Juncus effusus var. pacificus, Juncus phaeocephalus var. paniculatus, Polypogon monspeliensis*, and *Vulpia myuros*.

Total Vegetation Cover: 38%.
Non-native Cover: 16%.
Low Cover (<0.5m): 14%.
Medium Cover (0.5-4.0m): 24%.
Tall Cover (>4.0m): 0%.
Species Richness: 29.

Globally
Leymus triticoides dominates the herbaceous layer but is rarely found without several introduced annual plants such as *Sonchus* spp., *Vulpia myuros, Polypogon monspeliensis, Lactuca serriola, Lolium perenne ssp. multiflorum (= Lolium multiflorum), Bromus diandrus*, or *Avena fatua*. Stands in valley bottoms may have a few emergent oak trees or elderberry, giving this grassland a savanna-like appearance.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Herb (field)	*Leymus triticoides*

Globally

Stratum	Species
Herb (field)	*Leymus triticoides*

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena fatua, Bromus diandrus, Centaurea solstitialis, Juncus phaeocephalus var. paniculatus, Lactuca serriola, Melilotus indicus, Polypogon monspeliensis, Rumex crispus, Sonchus asper, Sonchus oleraceus, Vulpia myuros

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: G4? (23-Feb-1994).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Data are not available.

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CLASSIFICATION CONFIDENCE: 2 - Moderate

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_942.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Blackburn et al. 1969a, Bourgeron and Engelking 1994, Driscoll et al. 1984, Evens and San 2004, Hamilton 1997, Holstein 2001, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Peterson pers. comm., Western Ecology Working Group n.d.

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Eleocharis macrostachya Herbaceous Vegetation
Page Spikerush Herbaceous Vegetation

CODE	CEGL005303
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*ELEOCHARIS (PALUSTRIS, MACROSTACHYA)* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1422)
	(Common Spikerush, Page Spikerush) Seasonally Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This wetland community is known throughout cismontane California from the Central Valley, Central and South Coast Ranges, to the upper montane in the Sierra Nevada. It is a small-patch wetland type that is often overlooked. It occurs on wet and saturated areas that do not dry out during the growing season, except in vernal pool situations. Stands are dominated by *Eleocharis macrostachya*. These are dense, low to moderately tall, forb and graminoid communities. Forb cover can be quite high, and a mixture of forbs will infrequently dominate the community. However, it is the cover of *Eleocharis macrostachya*, which typically exceeds 50%, that distinguishes this community from others with high forb cover.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Francis (1) area of Pinnacles National Monument.

Globally

This association is currently known only from California, from the central and southern coastal mountains, Central Valley, and the northern, central, southern and western slopes of the Sierra Nevada.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

One plot of this herbaceous association occurs on a gentle, southeast-facing slope at an elevation of 341 m. It is dominated by *Polygonum punctatum* and *Eleocharis macrostachya* in the herbaceous layer. The emergent tree layer includes *Quercus agrifolia var. agrifolia*, and the emergent shrub layer includes *Rubus ursinus*.

Elevation: 341 m.
Aspect: Southeast (1).
Slope: Mean 3 degrees.
Macro Topography: Lower to Upper 1/3 of slope (1).
Micro Topography: Mounded (1).

Fines Cover: 80%.
Gravel Cover: 0%.
Cobble Cover: 0%.
Stone Cover: 0%.
Bedrock Cover: 0%.
Litter Cover: 0.5%.
Stem Basal Area Cover: 10%.
Water Cover: 10%.
Parent Material: Clayey alluvium (1).
Soil Texture: Muck (1).

Globally

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Stands of this association occur in cismontane California. Most wetland meadow communities found at lower and middle elevations, although they occasionally occur on the margins and bottoms of shallow lakes and ponds in non-meadow conditions. Most sites are permanently flooded or permanently saturated, but occasionally they can be seasonally saturated or seasonally flooded. Water is characteristically supplied from surface sheeting or subsurface flows originating upstream or upslope from the site. The association occupies shallow lake margins and beds, ponds, and depressions in meadow systems where slopes usually average less than 1% and range between 0 and 2%. Most commonly the community is located in the bottom of broad to very broad valleys with shallow upland slopes and low valley bottom gradients.

Montane meadows in the Sierra Nevada containing this association are forested at the edge, and they are located adjacent to permanent streams as stringer meadows. A few sites are located in basin-type meadows. Only occasionally is this community found adjacent to streams. Most meadow sites are some distance from streams in depressions. In cases where the association does occur adjacent to streams, such streams are typically small, first-order channels less than 1.5 m (5 feet) wide, indicating their locations in the upper reaches of most drainages. Surfaces are linear to concave. Meadows containing this association are seasonally saturated on the surface from snowmelt, and surfaces may be covered with standing water during spring runoff. Early fall and late spring storms as well as summer thunderstorms may also saturate surfaces for short periods. Often these sites are classified as lotic or sunken concave, and they contain abundant moisture. They are characteristically located in wet to very wet habitats (Potter 2005).

VEGETATION DESCRIPTION

Pinnacles National Monument

In this association, the herbaceous layer is dominated by *Eleocharis macrostachya* and *Polygonum punctatum*. Additional forbs include *Berula erecta, Centaurea solstitialis, Euthamia occidentalis, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Hydrocotyle umbellata, Melilotus indicus, Mentha arvensis, Mimulus guttatus, Rorippa nasturtium-aquaticum, Sonchus asper (= ssp. asper), Stachys pycnantha*, and *Urtica dioica ssp. holosericea*; other graminoids are *Aira caryophyllea, Bromus arenarius, Bromus hordeaceus, Carex barbarae, Carex* sp., *Eleocharis rostellata, Juncus bufonius, Juncus effusus var. pacificus, Lemna minor, Lolium perenne ssp. multiflorum (= Lolium multiflorum), Polypogon monspeliensis, Schoenoplectus americanus (= Scirpus americanus)*, and *Vulpia myuros*.

Total Vegetation Cover: 50%.
Non-native Cover: 3%.
Low Cover (<0.5m): 45%.
Medium Cover (0.5-4.0m): 6%.
Tall Cover (>4.0m): 0%.
Species Richness: 29.

Globally

These are dense, moderately tall, forb and graminoid communities. Forb cover can be quite high, and a mixture of forbs will infrequently dominate the community. However, it is the cover of *Eleocharis macrostachya*, which typically exceeds 50%, that distinguishes this community from others with high forb cover. Forbs present include *Perideridia parishii, Symphyotrichum spathulatum (= Aster occidentalis), Polygonum bistortoides, Ranunculus californicus, Trifolium wormskioldii, Berula erecta, Centaurea solstitialis, Euthamia occidentalis, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Hydrocotyle umbellata, Melilotus indicus, Mentha arvensis, Mimulus guttatus, Rorippa nasturtium-aquaticum, Sonchus asper (= ssp. asper), Stachys pycnantha*, and *Urtica dioica ssp. holosericea*. In vernal pools and other seasonally flooded wetlands, other forbs include *Eryngium castrense* and/or *Eryngium vaseyi, Juncus* sp., *Plagiobothrys stipitatus var. micranthus*, and *Psilocarphus brevissimus var. brevissimus*. Graminoids present include the characteristic *Eleocharis macrostachya*, with *Eleocharis acicularis, Eleocharis rostellata, Aira caryophyllea, Bromus arenarius, Bromus hordeaceus, Carex barbarae, Carex nebrascensis, Carex* spp., *Juncus bufonius, Juncus nevadensis, Juncus effusus var. pacificus, Lemna minor, Lolium perenne ssp. multiflorum (= Lolium multiflorum), Polypogon monspeliensis, Schoenoplectus americanus (= Scirpus americanus)*, and *Vulpia myuros*.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Herb (field)	*Polygonum punctatum*

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Herb (field)	*Eleocharis macrostachya*

Globally

Stratum	Species
Herb (field)	*Eleocharis macrostachya*

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, Bromus arenarius, Centaurea solstitialis, Lolium perenne ssp. multiflorum, Melilotus indicus, Polypogon monspeliensis, Rorippa nasturtium-aquaticum, Sonchus asper, Vulpia myuros

Globally
Data are not available.

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (9-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Eleocharis macrostachya is closely related to *Eleocharis palustris*. The Jepson Manual (Hickman 1993) states that "*Eleocharis macrostachya* Britton is = to *Eleocharis palustris* (L.) Roemer & Schultes, in part." USDA Plants database (NRCS 2001a) and Kartesz (1999) list both species as valid names, both occurring in California. This community may be equivalent to *Eleocharis palustris* Herbaceous Vegetation (CEGL001833). Potter (2005) equates many authors' *Eleocharis palustris* communities to his *Eleocharis macrostachya* type. Further investigation is needed to determine if these two associations are the same. In addition, Andrea Pickart (pers. comm. 2006) also equates her *Eleocharis macrostachya* type to the *Eleocharis (palustris, macrostachya)* Seasonally Flooded Herbaceous Alliance (A.1422) in the USNVC.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_150.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Barbour et al. 2005, Evens et al. 2006, Hickman 1993, Klein and Evens 2006, Klein et al. 2007, Pickart 2006, Potter 2005, Western Ecology Working Group n.d.

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Juncus balticus Herbaceous Vegetation
Baltic Rush Herbaceous Vegetation

Baltic Rush Wet Meadow

CODE	CEGL001838
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial graminoid vegetation (V.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar grassland (V.A.5.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
FORMATION	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
ALLIANCE	*JUNCUS BALTICUS* SEASONALLY FLOODED HERBACEOUS ALLIANCE (A.1374) Baltic Rush Seasonally Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S): Inter-Mountain Basins Interdunal Swale Wetland (CES304.059)
Boreal Wet Meadow (CES103.873)
North American Arid West Emergent Marsh (CES300.729)
Northern Columbia Plateau Basalt Pothole Pond (CES304.058)
Western Great Plains Open Freshwater Depression Wetland (CES303.675)
Rocky Mountain Alpine-Montane Wet Meadow (CES306.812)
Temperate Pacific Subalpine-Montane Wet Meadow (CES200.998)
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland (CES306.821)

USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This Baltic rush community is found widely throughout the western United States and into western Canada. This herbaceous wet meadow occurs as small to extensive, open to typically dense patches on flat stream benches, along overflow channels, and near springs. Habitats are often alkaline meadows and may have long-term grazing disturbance. Soils are variable and range from poorly to well-drained, sandy clay loam to fine sand-textured and are usually mottled or gleyed. Stands are characterized by dense swards of *Juncus balticus*. In montane zones and the Great Basin, minor cover of *Carex* species, including *Carex aquatilis, Carex praegracilis, Carex nebrascensis*, or *Carex utriculata*, is often present; other common species include *Deschampsia caespitosa, Distichlis spicata, Glyceria striata, Hordeum jubatum, Muhlenbergia asperifolia, Pascopyrum smithii, Phleum alpinum*, and *Sporobolus airoides*. The introduced perennial sod grasses *Poa pratensis* or *Agrostis stolonifera* codominate some stands. Forb cover is generally low and includes wetland species such as *Caltha leptosepala, Rumex aquaticus*, and *Dodecatheon pulchellum*. *Iris missouriensis* can be common in heavily grazed stands. Shrubs are not common. This association is often considered to be a grazing-induced community since it increases with disturbance, though it can be a stable late-seral community.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Francis (1), Kingman (3), and Old Boundaries (2) areas of Pinnacles National Monument.

Globally

This Baltic rush wet meadow community is found widely throughout the western United States, ranging from South Dakota and Nebraska west to Washington, south to California, and east to New Mexico. It also occurs in western Canada.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This herbaceous association occurs on flat to gentle, southerly-facing slopes, at elevations between 305 and 426 m. It is dominated by *Juncus balticus* in the herbaceous layer. Most stands sampled have moderate to heavy grazing and competition from non-native plants. Stands occur in a variety of settings, including floodplains, adjacent to creeks, and in open wetland meadows.

Elevation: Mean 350.2 m, Range 305 - 426 m.
Aspect: Flat (4), Southeast (1), Southwest (1).

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Slope: Mean 0.5 degrees, Range 0 - 2 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (1), Lower to Upper 1/3 of slope (1), Middle 1/3 of slope (4).
Micro Topography: Linear or even (5), Other (1).

Fines Cover: Mean 1.9%, Range 0.5 - 3%.
Gravel Cover: Mean 0.5%, Range 0 - 1%.
Cobble Cover: Mean 0.1%, Range 0 - 0.5%.
Stone Cover: Mean 0.1%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 92.3%, Range 88 - 96%.
Stem Basal Area Cover: Mean 5.5%, Range 2 - 10%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Granitic (1), Sandy alluvium (1), Silty alluvium (4).
Soil Texture: Sand (2), Silt or Silt Loam (4).

Globally
This broadly defined and widespread herbaceous wetland community is found throughout western North America. Elevation ranges from 138 to 3500 m (454-11,475 feet). Far northern stands in the Boreal Plains are at about 800 m (2625 feet). Stands usually occur as small, dense patches on flat to gently sloping sites near seeps and streams. Stream channels are highly variable in size and type, ranging from narrow to moderately wide, and from deeply entrenched to very sinuous (Kittel et al. 1999b). In the boreal regions, this community occurs more commonly on gradual sandy shorelines. Soils are also variable and range from sandy well-drained to poorly drained silty clay loam or silty clay alluvium to organic muck; however, soils tend to be finer-textured, alkaline and may be saline (Brotherson and Barnes 1984, Padgett et al. 1989, Kittel et al. 1999b). Sites with sandy soils are usually saturated for part of the growing season or have high water tables. Cobbles and gravel are common on many sites, and gleyed and mottled horizons are often present because of flooding or high water tables (Kittel et al. 1999b).

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the herbaceous layer is dominated by *Juncus balticus*. Forbs present include *Centaurea solstitialis, Hirschfeldia incana, Rumex crispus, Melilotus indicus, Heliotropium curassavicum,* and *Lactuca serriola*. Graminoids present include *Bromus hordeaceus, Bromus diandrus, Hordeum brachyantherum, Leymus triticoides,* and *Lolium perenne ssp. multiflorum (= Lolium multiflorum).*

Total Vegetation Cover: Mean 37.5%, Range 26 - 47%.
Non-native Cover: Mean 10.2%, Range 5 - 15%.
Low Cover (<0.5m): Mean 30.3%, Range 7 - 44%.
Medium Cover (0.5-4.0m): Mean 9.0%, Range 2 - 23%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 18.8, Range 15 - 27.

Globally
This broadly defined association is characterized by a low (<50 cm), open to typically dense graminoid layer dominated by the rhizomatous perennial *Juncus balticus*. In montane zones and the Great Basin, minor cover of *Carex* species, including *Carex aquatilis, Carex praegracilis, Carex microptera, Carex nebrascensis,* or *Carex utriculata,* is often present. Other common graminoids include *Deschampsia caespitosa, Distichlis spicata, Glyceria striata, Hordeum brachyantherum, Hordeum jubatum, Muhlenbergia andina, Muhlenbergia asperifolia, Pascopyrum smithii, Poa nemoralis ssp. interior, Phleum alpinum,* and *Sporobolus airoides*. Forb cover is generally low but may include *Achillea millefolium, Artemisia ludoviciana, Caltha leptosepala, Cirsium scariosum (= Cirsium tioganum), Dodecatheon pulchellum, Glaux maritima, Iris missouriensis, Maianthemum stellatum, Rumex aquaticus, Polygonum bistortoides, Potentilla plattensis,* and *Solidago canadensis*. Many other forb species may be present, given the wide elevational amplitude and broad geographic spread of this type. Shrubs and dwarf-shrubs are not common; however, *Artemisia frigida* cover may be significant in some stands, and occasional *Artemisia cana, Artemisia tridentata ssp. tridentata, Dasiphora fruticosa ssp. floribunda, Ericameria nauseosa, Populus* spp., *Rosa woodsii, Salix* spp., or *Sarcobatus vermiculatus* shrubs may occur. Some stands may be codominated by the introduced perennial sod grasses *Poa pratensis, Bromus inermis,* or *Agrostis stolonifera*. Other introduced species, such as *Cirsium arvense, Cirsium vulgare,*

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Erodium cicutarium, Iva axillaris, Lactuca serriola, Phleum pratense, Taraxacum officinale, Thinopyrum intermedium, Trifolium spp., *Tragopogon dubius, Xanthium strumarium*, and others, may occur in disturbed stands.

MOST ABUNDANT SPECIES

Pinnacles National Monument

Stratum	Species
Herb (field)	*Juncus balticus*

Globally

Stratum	Species
Herb (field)	*Juncus balticus*

OTHER NOTEWORTHY SPECIES

Pinnacles National Monument

Bromus diandrus, Bromus madritensis, Centaurea solstitialis, Erodium cicutarium, Hirschfeldia incana, Hypochaeris radicata, Lactuca serriola, Lolium perenne, Lolium perenne ssp. multiflorum, Lolium temulentum, Medicago polymorpha, Melilotus indicus, Rumex crispus

Globally

Agrostis stolonifera, Bromus inermis, Cirsium arvense, Cirsium vulgare, Erodium cicutarium, Iva axillaris, Lactuca serriola, Phleum pratense, Poa pratensis, Taraxacum officinale, Thinopyrum intermedium, Tragopogon dubius, Xanthium strumarium

CONSERVATION STATUS RANK

Global Rank & Reasons: G5 (1-Feb-1996).

CLASSIFICATION COMMENTS

Pinnacles National Monument

Data are not available.

Globally

This association is often considered to be a grazing-induced community since it increases with grazing disturbance. Based on the extensive geographic and environmental range (from alpine meadows to sagebrush-dominated landscapes), it verges on astonishing that any number of *Juncus balticus* associations have not been recognized.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES

Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_151, PINN_175, PINN_182, PINN_652, PINN_885, PINN_948.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: J. Drake, mod. D. Faber-Langendoen, K.A. Schulz, L. Allen, G. Kittel

REFERENCES: ANHIC 2005, Baker 1984a, Bourgeron and Engelking 1994, Brotherson and Barnes 1984, Bunin 1985, Butler et al. 2002, CONHP unpubl. data 2003, Carsey et al. 2003a, Carsey et al. 2003b, Christy 2004, Cogan et al. 2004, Cowardin et al. 1979, Crowe and Clausnitzer 1997, Crowe et al. 2004, Donnelly et al. 2006, Driscoll et al. 1984, Evans 1989b, Evenden 1990, Faber-Langendoen 2001, Flowers 1962, Hall and Hansen 1997, Hansen et al. 1995, Henderson and McAllister 1983, Hess 1981, IDCDC 2005, Jankovsky-Jones et al. 1999, Jankovsky-Jones et al. 2001, Johnston 1987, Jones 1992b, Jones and Walford 1995, Kagan et al. 2000, Kartesz 1994a, Kierstead and Pogson 1976, Kittel and Lederer 1993, Kittel et al. 1997a, Kittel et al. 1999a, Kittel et al. 1999b, Klein et al. 2007, Komarkova 1986, Kovalchik 1987, Kunze 1994, MTNHP 2002b, Manning 1988, Manning and Padgett 1991, Manning and Padgett 1992, Muldavin et al. 2000a, Muldavin et al. 2003, Muldavin et al. 2006, Murray 2000, Mutel 1973, Mutz and Graham 1982, Olson and Gerhart 1982, Padgett 1981, Padgett 1982, Padgett et al. 1989, Rector 1979, Richard et al. 1996, Shupe et al. 1986, Stewart 1940, Taylor 1980, Taylor and Teare 1979a, Thompson and Hansen 2002, Titus and Christy 1996a, Tuhy and Jensen 1982, Volland 1976, WNHP unpubl. data, Wasser and Hess 1982, Western Ecology Working Group n.d., Youngblood et al. 1985a

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Eriogonum fasciculatum / *Selaginella bigelovii* Sparse Herbaceous Vegetation
California Wild Buckwheat / Bushy Spike-moss Sparse Herbaceous Vegetation

CODE	CEGL002886
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B.)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
FORMATION	Low temperate or subpolar perennial forb vegetation (V.B.2.N.b.)
ALLIANCE	*SELAGINELLA BIGELOVII* HERBACEOUS ALLIANCE (A.2665) Bushy Spike-moss Herbaceous Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Not applicable

CONCEPT SUMMARY

Globally

This herbaceous association occurs on flat to moderately steep and very steep slopes of variable aspect at low to high elevations between 81 and 923 m. It is dominated by *Selaginella bigelovii* in the low layer. *Eriogonum fasciculatum* is characteristically abundant the shrub layer, and *Quercus agrifolia*, *Schinus molle*, and *Eucalyptus* spp. are infrequently found in the tree layer at low cover.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Old Boundaries (27) and South Wilderness (8) areas of Pinnacles National Monument.

Globally

It is likely that this association and the *Selaginella bigelovii* alliance will prove to be fairly widespread in southern California along expansive rocky substrates, including on some of the offshore islands. For example, sampling in inland San Diego County found one stand on a south-facing granitoid rocky slope. Further anecdotal observation suggests that this association may occur in several places in coastal southern California such as the Santa Susana Mountains. It has been documented in the San Gabriel Mountains and in Pinnacles National Monument.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This herbaceous association occurs on flat to steep slopes on all aspects, with elevations between 326 and 923 m. It is dominated by *Selaginella bigelovii* and *Bromus rubens (= Bromus madritensis ssp. rubens)* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum*. Nonvascular taxa include a moss species. Stands occur in broad expanses on volcanic rocky substrates, along with the *Eriogonum fasciculatum* and *Adenostoma fasciculatum* alliances.

Elevation: Mean 676.0 m, Range 326 - 923 m.
Aspect: East (6), Flat (1), Northeast (1), Northwest (1), South (10), Southeast (6), Southwest (7), West (3).
Slope: Mean 26.6 degrees, Range 0 - 43 degrees.
Macro Topography: Lower to Middle 1/3 of slope (1), Middle 1/3 of slope to Ridgetop (8), Ridge top (3), Upper 1/3 of slope (7), Upper 1/3 of slope to Ridgetop (16).
Micro Topography: Concave or depression (2), Convex or rounded (4), Linear or even (10), Other (5), Undulating pattern (14).

Fines Cover: Mean 4.3%, Range 0.5 - 22%.
Gravel Cover: Mean 51.7%, Range 10 - 86%.
Cobble Cover: Mean 0.8%, Range 0 - 3%.
Stone Cover: Mean 0.5%, Range 0 - 3%.
Bedrock Cover: Mean 8.4%, Range 0 - 40%.
Litter Cover: Mean 15.6%, Range 0.5 - 50%.
Stem Basal Area Cover: Mean 18.7%, Range 3 - 50%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Ash (2), Breccia (volcanic) (12), General volcanic extrusives (5), Mixed igneous (1), Rhyolite (15).

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Soil Texture: Sand (3), Sandy Loam (22), Unknown (10).

Globally
This association is characteristically found on exposed rock outcrops that are usually somewhat steep to steep slopes and rarely flat areas, typically on volcanic substrates, and also of igneous or sedimentary parent material. Stands occur in broad expanses on rocky substrates, along with stands of the *Eriogonum fasciculatum* and *Adenostoma fasciculatum* alliances.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the herbaceous layer is dominated by *Selaginella bigelovii* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 47.1%, Range 21 - 83%.
Non-native Cover: Mean 3.8%, Range 0.5 - 38%.
Low Cover (<0.5m): Mean 45.5%, Range 21 - 82%.
Medium Cover (0.5-4.0m): Mean 3.7%, Range 0.5 - 35%.
Tall Cover (>4.0m): Mean 0.5%, Range 0.5 - 0.5%.
Species Richness: Mean 19.6, Range 10 - 36.

Globally
Stands contain *Selaginella bigelovii* usually as the dominant at cover more than 10%. Other cryptogams may be present, such as mosses and lichens. The herbaceous layer is diverse and can include many native and non-native species, including *Dudleya* spp., *Corethrogyne filaginifolia (= Lessingia filaginifolia), Phacelia* spp., *Bromus madritensis, Bromus rubens*, and *Avena* spp. Low woody shrubs and subshrubs are present but lower in cover (usually well under 10%) than the average *Selaginella* cover, with *Eriogonum fasciculatum* characteristically common in the shrub layer at low cover. Other shrubs may include *Yucca whipplei, Adenostoma fasciculatum*, and *Artemisia californica*.

MOST ABUNDANT SPECIES
Pinnacles National Monument

Stratum	Species
Shrub/sapling (tall & short)	*Eriogonum fasciculatum var. foliolosum*
Herb (field)	*Bromus rubens*
Herb (field)	*Selaginella bigelovii*

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Avena barbata, Bromus rubens, Dudleya lanceolata, Erodium cicutarium, Hypochaeris glabra, Hypochaeris radicata, Logfia gallica, Vulpia myuros

Globally
Calochortus catalinae, Delphinium parryi ssp. blochmaniae, Dudleya lanceolata, Eriogonum crocatum, Leptodactylon californicum ssp. tomentosum

CONSERVATION STATUS RANK
Global Rank & Reasons: G4 (10-Nov-2005).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

Globally
Other *Selaginella* alliances (e.g., *Selaginella (tortipila, rupestris)* Herbaceous Alliance (A.1985), *Sedum nuttallianum* Sparsely Vegetated Alliance (A.1846)) are known from the U.S. National Vegetation Classification. However, the *Selaginella bigelovii* Herbaceous Alliance (A.2665) is the first to be described from California.

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Selaginella hansenii occurs similarly on volcanic rocky substrates in the Sierra Nevada foothills of California (Klein et al. 2007), though typically with more characteristic presence and higher cover of native species, such as *Vulpia microstachys, Plantago erecta, Lasthenia californica, Lessingia virgata, Lupinus bicolor, Lupinus nanus, Sedella pumila (= Parvisedum pumilum), Trifolium* spp., and *Triphysaria eriantha ssp. eriantha*. These stands are placed into a herbaceous alliance with *Vulpia microstachys*.

CLASSIFICATION CONFIDENCE: 1 - Strong

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_047, PINN_050, PINN_051, PINN_052, PINN_054, PINN_067, PINN_068, PINN_069, PINN_070, PINN_540, PINN_622, PINN_623, PINN_624, PINN_625, PINN_627, PINN_637, PINN_753, PINN_754, PINN_766, PINN_798, PINN_809, PINN_810, PINN_812, PINN_813, PINN_814, PINN_815, PINN_831, PINN_852, PINN_853, PINN_860, PINN_863, PINN_867, PINN_871, PINN_872, PINN_873.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: T. Keeler-Wolf and J. Evens, mod. G. Kittel

REFERENCES: Evens and San 2006, Keeler-Wolf and Evens 2006, Western Ecology Working Group n.d.

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Mimulus guttatus - (*Mimulus* spp.) Herbaceous Vegetation
Seep Monkeyflower - (Monkeyflower species) Herbaceous Vegetation

CODE	CEGL005305
PHYSIOGNOMIC CLASS	Herbaceous Vegetation (V)
PHYSIOGNOMIC SUBCLASS	Perennial forb vegetation (V.B.)
PHYSIOGNOMIC GROUP	Temperate or subpolar perennial forb vegetation (V.B.2.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
FORMATION	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
ALLIANCE (A.2676)	*MIMULUS GUTTATUS* TEMPORARILY FLOODED HERBACEOUS ALLIANCE Seep Monkeyflower Temporarily Flooded Herbaceous Alliance

ECOLOGICAL SYSTEM(S):USFWS WETLAND SYSTEM: Palustrine

CONCEPT SUMMARY

Globally

This small community is known from California's Coast Ranges, Sierra Nevada below 1220 m (4000 feet) elevation, and northeastern California, as well as central and southern Utah and Colorado. *Mimulus guttatus* is a small, delicate herb growing within the splash zone of small first-order streams, seeps, springs and hanging gardens. It occurs from 300 to 2390 m (1000-7840 feet) in elevation. This community is often found in narrow linear strips, occasionally broadening into small hollows, often overlooked for sampling, but universally recognized. It can occur on very steep cascades and waterfalls, on flat to steep seeps, or along gentle streams and floodplains (3-5%). The floristic composition is variable; several different species of *Mimulus* (*Mimulus guttatus, Mimulus lewisii, Mimulus moschatus*) may be the most dominant present. Generally mosses are present, as well as several other water-dependent herbaceous plants such as *Stellaria media, Collinsia heterophylla, Cardamine* spp., *Eleocharis* spp., *Epilobium* spp., *Equisetum arvense, Carex* spp., *Salix* spp., *Juncus* spp., *Veronica americana, Rorippa nasturtium-aquaticum, Cardamine* spp., and *Rorippa* spp. (= *Nasturtium* spp.). Graminoid species are usually present as well, often less abundant than the forb component, but usually very mesic.

DISTRIBUTION

Pinnacles National Monument

This association was sampled in the Francis (1) and Old Boundaries (4) areas of Pinnacles National Monument.

Globally

This small community is known from California's Coast Ranges, Sierra Nevada below 1220 m (4000 feet) elevation, northeastern California, the Cascades of Oregon, central and southern Utah, and Colorado.

ENVIRONMENTAL DESCRIPTION

Pinnacles National Monument

This herbaceous association occurs on flats with variable aspects at elevations between 309 and 477 m. It is usually dominated by *Mimulus guttatus* and infrequently by *Mimetanthe pilosa (= Mimulus pilosus)* in the herbaceous layer. The emergent shrub layer includes *Baccharis salicifolia* and *Salix laevigata*. Stands typically occur along rocky riparian streambeds, in lower portions of floodplains, and in gentle to steeply sloping seeps. Water may be present through the growing season through capillary rise or from flooding.

Elevation: Mean 400.2 m, Range 309 - 477 m.
Aspect: Flat (1), Northeast (2), South (1), Southwest (1).
Slope: Mean 1.5 degrees, Range 0 - 5 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (3), Bottom to Upper 1/3 of slope (1), Lower to Upper 1/3 of slope (1).
Micro Topography: Concave or depression (2), Linear or even (3).

Fines Cover: Mean 33.2%, Range 3 - 83%.
Gravel Cover: Mean 22.3%, Range 0.5 - 75%.
Cobble Cover: Mean 8.4%, Range 0 - 30%.
Stone Cover: Mean 5.2%, Range 0 - 15%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.

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Litter Cover: Mean 22.0%, Range 5 - 49%.
Stem Basal Area Cover: Mean 4.0%, Range 2 - 10%.
Water Cover: Mean 5.0%, Range 0 - 23%.
Parent Material: (0), Granitic (1), Mixed alluvium (3).
Soil Texture: Muck (1), Sand (3), Unknown (1).

Globally
Mimulus guttatus is a small, delicate herb growing within the splash zone of small first-order streams, seeps, springs and hanging gardens. It occurs from 300 to 2390 m (1000-7840 feet) in elevation. This small community is often found in narrow linear strips, occasionally broadening into small hollows, often overlooked for sampling, but universally recognized. It can occur on very steep cascades and waterfalls, on flat to steep seeps, or along gentle streams and floodplains (3-5%) often bordered by a wet meadow community (graminoid- or forb-dominated). Substrates include mixed alluvium, serpentinite, and volcanics.

VEGETATION DESCRIPTION
Pinnacles National Monument
In this association, the herbaceous layer is dominated by *Mimulus guttatus* or *Mimetanthe pilosa (= Mimulus pilosus)*. Characteristic forbs include *Lactuca serriola, Melilotus indicus, Rumex crispus,* and *Sonchus asper (= ssp. asper),* and characteristic graminoids are *Bromus diandrus* and *Bromus hordeaceus*. The shrub layer includes *Baccharis salicifolia* and *Salix laevigata* at sparse cover.

Total Vegetation Cover: Mean 36.8%, Range 13 - 84%.
Non-native Cover: Mean 14.6%, Range 11 - 22%.
Low Cover (<0.5m): Mean 33.2%, Range 6 - 84%.
Medium Cover (0.5-4.0m): Mean 10.0%, Range 1 - 26%.
Tall Cover (>4.0m): Mean 1.5%, Range 1 - 2%.
Species Richness: Mean 37.4, Range 27 - 42.

Globally
The floristic composition is variable; several different species of *Mimulus* (*Mimulus guttatus, Mimulus lewisii, Mimulus moschatus*) may be the most dominant present. Generally, mosses are present, as well as several other water-dependent herbaceous plants such as *Stellaria media, Collinsia heterophylla, Cardamine* spp., *Eleocharis* spp., *Epilobium* spp., *Equisetum arvense, Carex* spp., *Salix* spp., *Juncus* spp., *Veronica americana, Rorippa nasturtium-aquaticum, Cardamine* spp., and *Rorippa* spp. (= *Nasturtium* spp.). Graminoid species are usually present as well, often less abundant than the forb component, but usually very mesic. Occasionally, the graminoid component may be more abundant, and the *Mimulus* spp. component serves as an indicator species to this community.

MOST ABUNDANT SPECIES
*Pinnacles National Monument*Data are not available.

Globally
Data are not available.

OTHER NOTEWORTHY SPECIES
Pinnacles National Monument
Aira caryophyllea, Anagallis arvensis, Bromus diandrus, Bromus rubens, Cerastium glomeratum, Hirschfeldia incana, Lactuca serriola, Medicago polymorpha, Melilotus indicus, Polypogon monspeliensis, Rorippa nasturtium-aquaticum, Rumex crispus, Rumex salicifolius, Sonchus asper, Sonchus oleraceus, Stellaria media, Vulpia myuros

Globally
Stellaria media

CONSERVATION STATUS RANK
Global Rank & Reasons: GNR (9-Mar-2007).

CLASSIFICATION COMMENTS
Pinnacles National Monument
Data are not available.

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Globally
Data are not available.

CLASSIFICATION CONFIDENCE:

ELEMENT SOURCES
Pinnacles National Monument Inventory Notes: Data are not available.
Pinnacles National Monument Plots: PINN_579, PINN_593, PINN_902, PINN_904, PINN_905.
Local Description Authors: J. Evens and G. Kittel, mod. M.J. Russo
Global Description Authors: G. Kittel and J. Evens

REFERENCES: Diaz and Mellen 1996, Klein et al. 2007, Padgett et al. 1989, Potter 2005, Smith 1998b, Western Ecology Working Group n.d.

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[Park Special] *Juniperus californica / Prunus ilicifolia* / Moss Woodland

California Juniper / Hollyleaf Cherry / Moss Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Juniperus californica* Wooded Shrubland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association occurs on somewhat steep to steep north and northeast-facing slopes with elevations between 473 and 596 m. The association is dominated by *Juniperus californica* in the overstory tree layer. The understory shrub layer includes *Prunus ilicifolia ssp. ilicifolia*, and the herbaceous layer may include *Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Melica torreyana*, and *Vulpia myuros*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the North Wilderness (1) and Old Boundaries (6) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association occurs on somewhat steep to steep north and northeast-facing slopes with elevations between 473 and 596 m.

Elevation: Mean 526.9 m, Range 473 - 596 m.
Aspect: North (4), Northeast (3).
Slope: Mean 26.6 degrees, Range 21 - 30 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (4), Upper 1/3 of slope (1), Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Concave or depression (2), Linear or even (4), Undulating pattern (1).

Fines Cover: Mean 18.9%, Range 7 - 46%.
Gravel Cover: Mean 8.6%, Range 2 - 28%.
Cobble Cover: Mean 0.9%, Range 0 - 3%.
Stone Cover: Mean 0.4%, Range 0 - 1%.
Bedrock Cover: Mean 1.3%, Range 0 - 5%.
Litter Cover: Mean 65.1%, Range 36 - 82%.
Stem Basal Area Cover: Mean 4.4%, Range 2 - 12%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (2), General volcanic extrusives (2), Rhyolite (3).
Soil Texture: Sandy Loam (5), Silt or Silt Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (3), light competition from exotics (1), moderate competition from exotics (2), heavy feral pig damage (1), light feral pig damage (2), and moderate feral pig damage (3).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Juniperus californica*. The understory shrub layer includes *Prunus ilicifolia ssp. ilicifolia*. The herbaceous layer may include the forbs *Galium aparine, Galium porrigens var. porrigens, Marah fabaceus*, and *Pentagramma triangularis ssp. triangularis*, and the graminoids *Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Melica torreyana*, and *Vulpia myuros*.

Total Vegetation Cover: Mean 76.3%, Range 60 - 92%.
Non-native Cover: Mean 5.5%, Range 1 - 12%.
Low Cover (<0.5m): Mean 31.3%, Range 10 - 55%.
Medium Cover (0.5-4.0m): Mean 23.9%, Range 6 - 41%.
Tall Cover (>4.0m): Mean 38.3%, Range 21 - 72%.

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Species Richness: Mean 39.7, Range 26 - 54.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	JUCA7-T	*Juniperus californica*	100	36.1	20	65	X	X	X
	JUCA7-M	*Juniperus californica*	100	8.71	0.5	25	X		
	JUCA7-L	*Juniperus californica*	85.7	0.42	0.5	0.5	X		
	QUDO-T	*Quercus douglasii*	28.5	1.14	1	7			
Shrub									
	PRILI	*Prunus ilicifolia ssp. ilicifolia*	100	7.78	1	15	X	X	X
	CEBE3	*Cercocarpus montanus var. glaber*	71.4	1.35	0.5	3.5			
	CLLA3	*Clematis lasiantha*	71.4	1.21	0.5	5			
	RHIL	*Rhamnus ilicifolia*	71.4	0.78	0.5	2			
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	57.1	0.5	0.5	1			
	FRDI2	*Fraxinus dipetala*	42.8	0.85	1	4			
	LOSUD	*Lonicera subspicata var. denudata*	42.8	0.21	0.5	0.5			
	ADFA	*Adenostoma fasciculatum*	28.5	0.85	1	5			
	HEAR5	*Heteromeles arbutifolia*	28.5	0.71	1	4			
Herb									
	MAFA3	*Marah fabaceus*	100	1.28	0.5	3	X		
	PETRT	*Pentagramma triangularis ssp. triangularis*	100	0.64	0.5	1	X		
	GAPOP	*Galium porrigens var. porrigens*	85.7	0.85	0.5	1.5	X		
	GAAP2	*Galium aparine*	85.7	0.42	0.5	0.5	X		
	CLUN	*Clarkia unguiculata*	71.4	0.57	0.5	1.5			
	PTDR	*Pterostegia drymarioides*	71.4	0.42	0.5	1			
	COHE	*Collinsia heterophylla*	71.4	0.35	0.5	0.5			
	PABR11	*Packera breweri*	71.4	0.35	0.5	0.5			
	ADJO	*Adiantum jordanii*	57.1	2.57	0.5	12			
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	57.1	1.42	0.5	8			
	PHAUA2	*Pholistoma auritum var. auritum*	57.1	0.78	0.5	3			
	SACR2	*Sanicula crassicaulis*	57.1	0.42	0.5	1			
	PEAN2	*Pellaea andromedifolia*	57.1	0.35	0.5	1			
	AMMEI2	*Amsinckia menziesii var. intermedia*	57.1	0.28	0.5	0.5			
	BOIN3	*Bowlesia incana*	57.1	0.28	0.5	0.5			
	PLECT	*Plectritis* sp.	57.1	0.28	0.5	0.5			
	DEPAP5	*Delphinium parryi ssp. parryi*	42.8	0.57	0.5	2			
	SABI2	*Sanicula bipinnata*	42.8	0.28	0.5	1			
	MADIA	*Madia* sp.	42.8	0.21	0.5	0.5			
	STPA13	*Stellaria media ssp. pallida*	42.8	0.21	0.5	0.5			
	THLA3	*Thysanocarpus laciniatus*	42.8	0.21	0.5	0.5			
	CLARK	*Clarkia* sp.	28.5	0.5	0.5	3			
	RAHE	*Ranunculus hebecarpus*	28.5	0.35	0.5	2			
	APAN	*Apiastrum angustifolium*	28.5	0.21	0.5	1			
	CLPAP	*Claytonia parviflora ssp. parviflora*	28.5	0.21	0.5	1			
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	28.5	0.21	0.5	1			
	BLCR	*Bloomeria crocea*	28.5	0.14	0.5	0.5			
	CEGL2	*Cerastium glomeratum*	28.5	0.14	0.5	0.5			
	DOCLP	*Dodecatheon clevelandii ssp. patulum*	28.5	0.14	0.5	0.5			
	ERCI6	*Erodium cicutarium*	28.5	0.14	0.5	0.5			
	LACA7	*Lasthenia californica*	28.5	0.14	0.5	0.5			

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	LAMI4	*Lasthenia microglossa*	28.5	0.14	0.5	0.5			
	LIHE	*Lithophragma heterophyllum*	28.5	0.14	0.5	0.5			
	NEMOP	*Nemophila* sp.	28.5	0.14	0.5	0.5			
	PHMA2	*Phacelia malvifolia*	28.5	0.14	0.5	0.5			
	TRWI3	*Trifolium willdenowii*	28.5	0.14	0.5	0.5			
	YAMI	*Yabea microcarpa*	28.5	0.14	0.5	0.5			
	ZIFR	*Zigadenus fremontii*	28.5	0.14	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	100	1.14	0.5	3	X		
	VUMY	*Vulpia myuros*	85.7	1.71	0.5	5	X		
	BRHO2	*Bromus hordeaceus*	85.7	1.07	0.5	3	X		
	BRDI3	*Bromus diandrus*	71.4	0.5	0.5	1			
	METO	*Melica torreyana*	57.1	1.78	0.5	8		X	
	VUMI	*Vulpia microstachys*	57.1	0.71	0.5	3			
	AICA	*Aira caryophyllea*	42.8	0.28	0.5	1			
	POSE	*Poa secunda*	42.8	0.21	0.5	0.5			
	MEIM	*Melica imperfecta*	28.5	0.5	0.5	3			
	AVBA	*Avena barbata*	28.5	0.14	0.5	0.5			
	POACXX	Poaceae sp.	28.5	0.14	0.5	0.5			
Nonvascular									
	MOSS	Moss sp.	85.7	16.2	0.5	50	X	X	X
	LICHEN	Lichen sp.	42.8	0.71	1	2			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_097, PINN_953, PINN_952, PINN_877, PINN_773, PINN_210, PINN_194

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Pinus sabiniana / Eriogonum fasciculatum* Alluvial Woodland

Foothill Pine / California Wild Buckwheat Alluvial Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Pinus sabiniana* Woodland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association occurs on flat to moderate slopes at all aspects with elevations between 272 and 417 m. The association is dominated by *Pinus sabiniana* in the overstory tree layer. The understory shrub layer includes *Eriogonum fasciculatum var. foliolosum, Adenostoma fasciculatum,* and *Lonicera subspicata var. denudata,* and the herbaceous layer may include *Artemisia douglasiana, Clarkia unguiculata, Dichelostemma capitatum ssp. capitatum, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Rumex crispus, Rumex salicifolius, Bromus diandrus, Aira caryophyllea, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Poa secunda (= ssp. secunda),* and *Vulpia myuros*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (5) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association occurs on flat to moderate slopes at all aspects with elevations between 272 and 417 m.

Elevation: Mean 369.0 m, Range 272 - 417 m.
Aspect: East (1), Flat (2), Northeast (1), South (1).
Slope: Mean 2.6 degrees, Range 0 - 10 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (3), Bottom to Mid 1/3 of slope (1), Middle 1/3 of slope (1).
Micro Topography: Convex or rounded (1), Linear or even (2), Undulating pattern (2).

Fines Cover: Mean 6.6%, Range 3 - 14%.
Gravel Cover: Mean 5.4%, Range 2 - 10%.
Cobble Cover: Mean 1.9%, Range 0.5 - 3%.
Stone Cover: Mean 2.1%, Range 0.5 - 7%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 78.6%, Range 70 - 82%.
Stem Basal Area Cover: Mean 5.6%, Range 3 - 12%.
Water Cover: Mean 0.1%, Range 0 - 0.5%.
Parent Material: Fanglomerate (1), Mixed alluvium (4).
Soil Texture: Sand (5).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (3), moderate competition from exotics (2), light feral pig damage (2), moderate feral pig damage (1), light foot traffic/trampling (1), moderate foot traffic/trampling (1), moderate grazing (1), and light road/trail construction/maintenance (3).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Pinus sabiniana*. The understory shrub layer includes *Eriogonum fasciculatum var. foliolosum, Adenostoma fasciculatum,* and *Lonicera subspicata var. denudata*. The herbaceous layer may include the forbs *Artemisia douglasiana, Clarkia unguiculata, Dichelostemma capitatum ssp. capitatum, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Rumex crispus,* and *Rumex salicifolius,* and the graminoids *Bromus diandrus, Aira caryophyllea, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Poa secunda (= ssp. secunda),* and *Vulpia myuros*.

Total Vegetation Cover: Mean 57.6%, Range 54 - 60%.

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Non-native Cover: Mean 18.0%, Range 10 - 30%.
Low Cover (<0.5m): Mean 22.6%, Range 16 - 35%.
Medium Cover (0.5-4.0m): Mean 13.2%, Range 5 - 21%.
Tall Cover (>4.0m): Mean 32.0%, Range 20 - 38%.
Species Richness: Mean 56.6, Range 35 - 67.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	PISA2-T	*Pinus sabiniana*	100	26.4	20	35	X	X	X
	PISA2-L	*Pinus sabiniana*	80	0.4	0.5	0.5	X		
	SALA3	*Salix laevigata*	60	1.1	0.5	4			
	PISA2-M	*Pinus sabiniana*	60	0.3	0.5	0.5			
	QUAGA-T	*Quercus agrifolia var. agrifolia*	40	2.6	6	7			
	QUDO-T	*Quercus douglasii*	40	2	3	7			
	QUAGA-M	*Quercus agrifolia var. agrifolia*	40	0.5	0.5	2			
	AECA-M	*Aesculus californica*	40	0.2	0.5	0.5			
	QUAGA-L	*Quercus agrifolia var. agrifolia*	40	0.2	0.5	0.5			
	QUDO-L	*Quercus douglasii*	40	0.2	0.5	0.5			
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	100	5.4	1	15	X	X	X
	ADFA	*Adenostoma fasciculatum*	100	2.5	0.5	10	X		
	LOSUD	*Lonicera subspicata var. denudata*	100	0.8	0.5	1.5	X		
	SALA6	*Salix lasiolepis*	60	0.9	0.5	3			
	MIAU	*Diplacus aurantiacus*	60	0.4	0.5	1			
	ROCA2	*Rosa californica*	60	0.4	0.5	1			
	BAPI	*Baccharis pilularis*	60	0.3	0.5	0.5			
	BASA4	*Baccharis salicifolia*	60	0.3	0.5	0.5			
	CECUC3	*Ceanothus cuneatus var. cuneatus*	40	0.4	0.5	1.5			
	TODI	*Toxicodendron diversilobum*	40	0.4	0.5	1.5			
	BRCA3	*Brickellia californica*	40	0.2	0.5	0.5			
	RHIL	*Rhamnus ilicifolia*	40	0.2	0.5	0.5			
Herb									
	LOPU3	*Lotus unifoliolatus var. unifoliolatus*	100	0.7	0.5	1	X		
	ARDO3	*Artemisia douglasiana*	80	0.9	0.5	3	X		
	CLUN	*Clarkia unguiculata*	80	0.4	0.5	0.5	X		
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	80	0.4	0.5	0.5	X		
	RUCR	*Rumex crispus*	80	0.4	0.5	0.5	X		
	RUSA	*Rumex salicifolius*	80	0.4	0.5	0.5	X		
	EPCAC2	*Epilobium canum ssp. canum*	60	0.6	0.5	1.5			
	HYGL2	*Hypochaeris glabra*	60	0.6	1	1			
	ARDR4	*Artemisia dracunculus*	60	0.4	0.5	1			
	GAPOP	*Galium porrigens var. porrigens*	60	0.4	0.5	1			
	LUBI	*Lupinus bicolor*	60	0.4	0.5	1			
	TRWI3	*Trifolium willdenowii*	60	0.4	0.5	1			
	VIPE3	*Viola pedunculata*	60	0.4	0.5	1			
	ANCA14	*Anthriscus caucalis*	60	0.3	0.5	0.5			
	CLPUQ	*Clarkia purpurea ssp. quadrivulnera*	60	0.3	0.5	0.5			
	COHE	*Collinsia heterophylla*	60	0.3	0.5	0.5			

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GNCAB2	*Pseudognaphalium canescens ssp. beneolens*	60	0.3	0.5	0.5			
LOSCS2	*Lotus scoparius var. scoparius*	60	0.3	0.5	0.5			
PETRT	*Pentagramma triangularis ssp. triangularis*	60	0.3	0.5	0.5			
PLECT	*Plectritis* sp.	60	0.3	0.5	0.5			
SOUM	*Solanum umbelliferum*	60	0.3	0.5	0.5			
SOAS	*Sonchus asper*	60	0.3	0.5	0.5			
THLA3	*Thysanocarpus laciniatus*	60	0.3	0.5	0.5			
ALCR5	*Allium crispum*	40	0.2	0.5	0.5			
CAOL	*Cardamine oligosperma*	40	0.2	0.5	0.5			
CEGL2	*Cerastium glomeratum*	40	0.2	0.5	0.5			
CLAYT	*Claytonia* sp.	40	0.2	0.5	0.5			
ERFOF	*Erigeron foliosus var. foliosus*	40	0.2	0.5	0.5			
ESCA2	*Eschscholzia californica*	40	0.2	0.5	0.5			
GAAP2	*Galium aparine*	40	0.2	0.5	0.5			
GAPA5	*Galium parisiense*	40	0.2	0.5	0.5			
HESEE2	*Heterotheca sessiliflora ssp. echioides*	40	0.2	0.5	0.5			
HIIN3	*Hirschfeldia incana*	40	0.2	0.5	0.5			
LASE	*Lactuca serriola*	40	0.2	0.5	0.5			
MEPO3	*Medicago polymorpha*	40	0.2	0.5	0.5			
MEIN2	*Melilotus indicus*	40	0.2	0.5	0.5			
MIGU	*Mimulus guttatus*	40	0.2	0.5	0.5			
STME2	*Stellaria media*	40	0.2	0.5	0.5			
TOAR	*Torilis arvensis*	40	0.2	0.5	0.5			
TROB2	*Trifolium obtusiflorum*	40	0.2	0.5	0.5			
URLI5	*Uropappus lindleyi*	40	0.2	0.5	0.5			
Graminoid								
BRDI3	*Bromus diandrus*	100	7.1	2	10	X	X	X
BRHO2	*Bromus hordeaceus*	100	5	2	10	X		
VUMY	*Vulpia myuros*	80	2.6	0.5	10	X		
BRMAR	*Bromus rubens*	80	1.3	0.5	4	X		
AICA	*Aira caryophyllea*	80	0.4	0.5	0.5	X		
POSE	*Poa secunda*	80	0.4	0.5	0.5	X		
ELGLG	*Elymus glaucus ssp. glaucus*	60	0.3	0.5	0.5			
MEIM	*Melica imperfecta*	60	0.3	0.5	0.5			
AVFA	*Avena fatua*	40	0.7	0.5	3			
AVBA	*Avena barbata*	40	0.3	0.5	1			
BRAR3	*Bromus arenarius*	40	0.2	0.5	0.5			
Nonvascular								
MOSS	Moss sp.	40	0.4	0.5	1.5			
XANTH7	*Xanthoparmelia* sp.	40	0.2	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 5) PINN_071, PINN_128, PINN_577, PINN_658, PINN_666

CLASSIFICATION CONFIDENCE: 3 - Weak

REFERENCES: Data are not available.

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[Park Special] *Pinus sabiniana / Ceanothus cuneatus - Rhamnus ilicifolia* Woodland

Foothill Pine / Sedgeleaf Buckbrush - Hollyleaf Redberry Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Pinus sabiniana* Woodland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association occurs on somewhat steep to steep north facing slopes with elevations between 357 and 644 m. The association is dominated by *Pinus sabiniana* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Quercus agrifolia var. agrifolia*. The understory shrub layer includes *Rhamnus ilicifolia* and *Ceanothus cuneatus var. cuneatus*, and the herbaceous layer may include *Amsinckia menziesii var. intermedia*, *Galium porrigens var. porrigens*, *Sanicula crassicaulis*, *Bromus diandrus*, and *Vulpia myuros*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Kingman (1), North Wilderness (1), and Old Boundaries (5) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association occurs on somewhat steep to steep north facing slopes with elevations between 357 and 644 m.

Elevation: Mean 507.7 m, Range 357 - 644 m.
Aspect: North (3), Northeast (3), Northwest (1).
Slope: Mean 30.1 degrees, Range 24 - 40 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (3), Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Concave or depression (1), Convex or rounded (2), Linear or even (3), Undulating pattern (1).

Fines Cover: Mean 8.1%, Range 0.5 - 30%.
Gravel Cover: Mean 15.9%, Range 0.5 - 76%.
Cobble Cover: Mean 0.8%, Range 0 - 3%.
Stone Cover: Mean 0.3%, Range 0 - 0.5%.
Bedrock Cover: Mean 3.3%, Range 0 - 12%.
Litter Cover: Mean 68.7%, Range 16 - 95%.
Stem Basal Area Cover: Mean 3.7%, Range 2 - 7%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (2), General volcanic extrusives (2), Granitic (1), Rhyolite (1), Sedimentary (1).
Soil Texture: Sand (1), Sandy Loam (5), Unknown (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (4), moderate competition from exotics (3), heavy feral pig damage (3), light feral pig damage (2), moderate feral pig damage (2), and light grazing (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Pinus sabiniana*. Abundant or characteristic trees present at lower cover may include *Quercus agrifolia var. agrifolia*. The understory shrub layer includes *Rhamnus ilicifolia* and *Ceanothus cuneatus var. cuneatus*. The herbaceous layer may include the forbs *Amsinckia menziesii var. intermedia*, *Galium porrigens var. porrigens*, and *Sanicula crassicaulis*, and the graminoids *Bromus diandrus* and *Vulpia myuros*.

Total Vegetation Cover: Mean 53.9%, Range 35 - 90%.
Non-native Cover: Mean 15.3%, Range 3 - 66%.
Low Cover (<0.5m): Mean 29.0%, Range 9 - 70%.
Medium Cover (0.5-4.0m): Mean 23.1%, Range 9 - 80%.

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Tall Cover (>4.0m): Mean 21.1%, Range 13 - 47%.
Species Richness: Mean 45.7, Range 28 - 63.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	PISA2-T	*Pinus sabiniana*	100	15.8	10	40	X	X	X
	QUAGA-T	*Quercus agrifolia var. agrifolia*	85.7	2.42	1	5	X		
	PISA2-M	*Pinus sabiniana*	85.7	0.57	0.5	1	X		
	QUDO-T	*Quercus douglasii*	71.4	3.07	0.5	8			
	PISA2-L	*Pinus sabiniana*	71.4	0.35	0.5	0.5			
	QUAGA-L	*Quercus agrifolia var. agrifolia*	57.1	0.35	0.5	1			
	QUDO-M	*Quercus douglasii*	42.8	0.35	0.5	1			
	QUAGA-M	*Quercus agrifolia var. agrifolia*	42.8	0.21	0.5	0.5			
	JUCA7-M	*Juniperus californica*	28.5	0.14	0.5	0.5			
Shrub									
	CECUC3	*Ceanothus cuneatus var. cuneatus*	100	3.21	0.5	6	X		
	RHIL	*Rhamnus ilicifolia*	85.7	13.5	1	75.5	X	X	X
	LOSUD	*Lonicera subspicata var. denudata*	57.1	0.57	0.5	2.5			
	PRILI	*Prunus ilicifolia ssp. ilicifolia*	42.8	0.5	1	1.5			
	TODI	*Toxicodendron diversilobum*	42.8	0.42	1	1			
	MIAU	*Diplacus aurantiacus*	42.8	0.28	0.5	1			
	ADFA	*Adenostoma fasciculatum*	28.5	0.42	1	2			
	HEAR5	*Heteromeles arbutifolia*	28.5	0.42	1	2			
	CEBE3	*Cercocarpus montanus var. glaber*	28.5	0.28	0.5	1.5			
	CLLA3	*Clematis lasiantha*	28.5	0.21	0.5	1			
	LUALA2	*Lupinus albifrons var. albifrons*	28.5	0.21	0.5	1			
	RICAC	*Ribes californicum var. californicum*	28.5	0.14	0.5	0.5			
Herb									
	GAPOP	*Galium porrigens var. porrigens*	100	1.42	0.5	2.5	X		
	AMMEI2	*Amsinckia menziesii var. intermedia*	85.7	1.78	0.5	10	X		
	SACR2	*Sanicula crassicaulis*	85.7	0.57	0.5	1.5	X		
	PETRT	*Pentagramma triangularis ssp. triangularis*	71.4	1	0.5	4			
	MAFA3	*Marah fabaceus*	71.4	0.85	0.5	2.5			
	MOVIV	*Monardella villosa ssp. villosa*	71.4	0.57	0.5	2			
	COHE	*Collinsia heterophylla*	71.4	0.42	0.5	1			
	GAAP2	*Galium aparine*	71.4	0.35	0.5	0.5			
	THLA3	*Thysanocarpus laciniatus*	71.4	0.35	0.5	0.5			
	ANCA14	*Anthriscus caucalis*	57.1	9.64	0.5	65			
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	57.1	2.92	0.5	10			
	CLARK	*Clarkia* sp.	57.1	1.21	0.5	4			
	ACMI2	*Achillea millefolium*	57.1	0.28	0.5	0.5			
	ALCR5	*Allium crispum*	57.1	0.28	0.5	0.5			
	BOIN3	*Bowlesia incana*	57.1	0.28	0.5	0.5			
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	57.1	0.28	0.5	0.5			
	DOCLP	*Dodecatheon clevelandii ssp. patulum*	42.8	0.42	0.5	2			
	CLUN	*Clarkia unguiculata*	42.8	0.35	0.5	1			
	LOSCS2	*Lotus scoparius var. scoparius*	42.8	0.28	0.5	1			
	PHAUA2	*Pholistoma auritum var. auritum*	42.8	0.28	0.5	1			
	BLCR	*Bloomeria crocea*	42.8	0.21	0.5	0.5			
	CEGL2	*Cerastium glomeratum*	42.8	0.21	0.5	0.5			
	ERFOF	*Erigeron foliosus var. foliosus*	42.8	0.21	0.5	0.5			

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	NEPAP	*Nemophila parviflora var. parviflora*	42.8	0.21	0.5	0.5			
	PABR11	*Packera breweri*	42.8	0.21	0.5	0.5			
	PLECT	*Plectritis* sp.	42.8	0.21	0.5	0.5			
	PTDR	*Pterostegia drymarioides*	42.8	0.21	0.5	0.5			
	RAHE	*Ranunculus hebecarpus*	42.8	0.21	0.5	0.5			
	SABI2	*Sanicula bipinnata*	42.8	0.21	0.5	0.5			
	SACA18	*Saxifraga californica*	42.8	0.21	0.5	0.5			
	STBU	*Stachys bullata*	28.5	0.5	0.5	3			
	LAVE2	*Lathyrus vestitus ssp. vestitus*	28.5	0.35	0.5	2			
	ADJO	*Adiantum jordanii*	28.5	0.28	1	1			
	DEPAP5	*Delphinium parryi ssp. parryi*	28.5	0.21	0.5	1			
	ERNU3	*Eriogonum nudum*	28.5	0.21	0.5	1			
	PLMA4	*Plectritis macrocera*	28.5	0.21	0.5	1			
	VIPE3	*Viola pedunculata*	28.5	0.21	0.5	1			
	APAN	*Apiastrum angustifolium*	28.5	0.14	0.5	0.5			
	CACA39	*Cardamine californica*	28.5	0.14	0.5	0.5			
	CIOCV	*Cirsium occidentale var. venustum*	28.5	0.14	0.5	0.5			
	DULA	*Dudleya lanceolata*	28.5	0.14	0.5	0.5			
	HETE5	*Hesperocnide tenella*	28.5	0.14	0.5	0.5			
	MADIA	*Madia* sp.	28.5	0.14	0.5	0.5			
	PEAN2	*Pellaea andromedifolia*	28.5	0.14	0.5	0.5			
	PHDI	*Phacelia distans*	28.5	0.14	0.5	0.5			
	PHMA2	*Phacelia malvifolia*	28.5	0.14	0.5	0.5			
	RACA	*Rafinesquia californica*	28.5	0.14	0.5	0.5			
	STME2	*Stellaria media*	28.5	0.14	0.5	0.5			
	TRIFO	*Trifolium* sp.	28.5	0.14	0.5	0.5			
	TRWI3	*Trifolium willdenowii*	28.5	0.14	0.5	0.5			
	URLI5	*Uropappus lindleyi*	28.5	0.14	0.5	0.5			
	WYHE	*Wyethia helenioides*	28.5	0.14	0.5	0.5			
Graminoid									
	VUMY	*Vulpia myuros*	85.7	1.21	0.5	4	X		
	BRDI3	*Bromus diandrus*	85.7	0.78	0.5	2	X		
	MEIM	*Melica imperfecta*	57.1	1.71	0.5	10			
	BRHO2	*Bromus hordeaceus*	57.1	1.64	0.5	10			
	BRMAR	*Bromus rubens*	57.1	0.71	0.5	3			
	VUMI	*Vulpia microstachys*	42.8	0.42	0.5	2			
	POSE	*Poa secunda*	42.8	0.21	0.5	0.5			
	AVBA	*Avena barbata*	28.5	0.57	1	3			
	METO	*Melica torreyana*	28.5	0.21	0.5	1			
Nonvascular									
	MOSS	Moss sp.	100	3.85	0.5	12	X	X	X

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_087, PINN_099, PINN_100, PINN_122, PINN_199, PINN_573, PINN_899

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Quercus agrifolia - Aesculus californica* Woodland

Coast Live Oak - California Buckeye Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Quercus agrifolia* Woodland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association occurs on gentle to moderate east and south-facing slopes with elevations between 338 and 526 m. The association is dominated by *Quercus agrifolia var. agrifolia* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Aesculus californica*. The understory shrub layer includes *Lonicera subspicata var. denudata* and *Toxicodendron diversilobum*, and the herbaceous layer may include *Anthriscus caucalis, Galium aparine, Galium porrigens var. porrigens, Sanicula crassicaulis*, and *Bromus diandrus*. Nonvascular taxa include several moss species.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the North Wilderness (1) and Old Boundaries (3) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association occurs on gentle to moderate east and south-facing slopes with elevations between 338 and 526 m.

Elevation: Mean 446.8 m, Range 338 - 526 m.
Aspect: East (3), South (1).
Slope: Mean 6.5 degrees, Range 3 - 12 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (1), Bottom to Upper 1/3 of slope (1), Lower to Upper 1/3 of slope (1), Middle 1/3 of slope (1).
Micro Topography: Concave or depression (2), Undulating pattern (2).

Fines Cover: Mean 3.3%, Range 1 - 5%.
Gravel Cover: Mean 1.1%, Range 0.5 - 2%.
Cobble Cover: Mean 3.0%, Range 2 - 5%.
Stone Cover: Mean 12.0%, Range 1 - 32%.
Bedrock Cover: Mean 0.1%, Range 0 - 0.5%.
Litter Cover: Mean 78.0%, Range 60 - 90%.
Stem Basal Area Cover: Mean 1.8%, Range 0 - 3%.
Water Cover: Mean 1.6%, Range 0 - 5%.
Parent Material: General volcanic extrusives (1), Mixed alluvium (3).
Soil Texture: Sand (2), Sandy Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (2), light competition from exotics (1), moderate competition from exotics (1), light road/trail construction/maintenance (1), and moderate woodcutting (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Quercus agrifolia var. agrifolia*. Abundant or characteristic trees present at lower cover may include *Aesculus californica*. The understory shrub layer includes *Lonicera subspicata var. denudata* and *Toxicodendron diversilobum*. The herbaceous layer may include the forbs *Anthriscus caucalis, Galium aparine, Galium porrigens var. porrigens,* and *Sanicula crassicaulis,* and the graminoid *Bromus diandrus*.

Total Vegetation Cover: Mean 55.5%, Range 45 - 70%.
Non-native Cover: Mean 4.3%, Range 3 - 7%.
Low Cover (<0.5m): Mean 12.3%, Range 8 - 17%.

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Medium Cover (0.5-4.0m): Mean 10.8%, Range 8 - 14%.
Tall Cover (>4.0m): Mean 41.3%, Range 28 - 52%.
Species Richness: Mean 51.3, Range 32 - 73.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	QUAGA-T	*Quercus agrifolia var. agrifolia*	100	22.5	10	33	X	X	X
	AECA-T	*Aesculus californica*	100	10.75	7	12	X		
	PISA2-T	*Pinus sabiniana*	75	4.5	5	7			
	QUDO-T	*Quercus douglasii*	50	1.25	2	3			
	SALA3	*Salix laevigata*	50	0.625	0.5	2			
	AECA-L	*Aesculus californica*	50	0.5	1	1			
	AECA-M	*Aesculus californica*	50	0.375	0.5	1			
	PISA2-L	*Pinus sabiniana*	50	0.25	0.5	0.5			
	QUAGA-L	*Quercus agrifolia var. agrifolia*	50	0.25	0.5	0.5			
	QUDO-L	*Quercus douglasii*	50	0.25	0.5	0.5			
	PLRA-T	*Platanus racemosa*	25	3	12	12			
	QUAGA-M	*Quercus agrifolia var. agrifolia*	25	0.5	2	2			
	QUDO-M	*Quercus douglasii*	25	0.25	1	1			
Shrub									
	TODI	*Toxicodendron diversilobum*	100	4.25	0.5	10.5	X		
	LOSUD	*Lonicera subspicata var. denudata*	100	0.5	0.5	0.5	X		
	HEAR5	*Heteromeles arbutifolia*	75	2	0.5	4.5			
	RHIL	*Rhamnus ilicifolia*	75	1	0.5	2			
	CECUC3	*Ceanothus cuneatus var. cuneatus*	75	0.75	0.5	2			
	CEBE3	*Cercocarpus montanus var. glaber*	75	0.5	0.5	1			
	RUUR	*Rubus ursinus*	50	1.5	1	5			
	ADFA	*Adenostoma fasciculatum*	50	0.625	0.5	2			
	CLLA3	*Clematis lasiantha*	50	0.375	0.5	1			
	BASA4	*Baccharis salicifolia*	50	0.25	0.5	0.5			
	PRILI	*Prunus ilicifolia ssp. ilicifolia*	50	0.25	0.5	0.5			
	ROCA2	*Rosa californica*	50	0.25	0.5	0.5			
	ARGL4	*Arctostaphylos glauca*	25	0.25	1	1			
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	25	0.25	1	1			
	SALA6	*Salix lasiolepis*	25	0.25	1	1			
	FRDI2	*Fraxinus dipetala*	25	0.125	0.5	0.5			
	MIAU	*Diplacus aurantiacus*	25	0.125	0.5	0.5			
	RICAC	*Ribes californicum var. californicum*	25	0.125	0.5	0.5			
	SAME5	*Sambucus mexicana*	25	0.125	0.5	0.5			
Herb									
	ANCA14	*Anthriscus caucalis*	100	0.875	0.5	2	X		
	GAAP2	*Galium aparine*	100	0.625	0.5	1	X		
	GAPOP	*Galium porrigens var. porrigens*	100	0.625	0.5	1	X		
	SACR2	*Sanicula crassicaulis*	100	0.625	0.5	1	X		
	MAFA3	*Marah fabaceus*	75	0.5	0.5	1			
	CLUN	*Clarkia unguiculata*	75	0.375	0.5	0.5			
	COHE	*Collinsia heterophylla*	75	0.375	0.5	0.5			
	EPCAC2	*Epilobium canum ssp. canum*	75	0.375	0.5	0.5			
	MADIA	*Madia* sp.	75	0.375	0.5	0.5			
	PEAN2	*Pellaea andromedifolia*	75	0.375	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	75	0.375	0.5	0.5			
	RUSA	*Rumex salicifolius*	75	0.375	0.5	0.5			
	STBU	*Stachys bullata*	75	0.375	0.5	0.5			

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URDIH	*Urtica dioica ssp. holosericea*	75	0.375	0.5	0.5	
ARDO3	*Artemisia douglasiana*	50	0.375	0.5	1	
CLPEP	*Claytonia perfoliata ssp. perfoliata*	50	0.375	0.5	1	
RONA2	*Rorippa nasturtium-aquaticum*	50	0.375	0.5	1	
ADJO	*Adiantum jordanii*	50	0.25	0.5	0.5	
ANAR	*Anagallis arvensis*	50	0.25	0.5	0.5	
CAOL	*Cardamine oligosperma*	50	0.25	0.5	0.5	
GNCAB2	*Pseudognaphalium canescens ssp. beneolens*	50	0.25	0.5	0.5	
HYRA3	*Hypochaeris radicata*	50	0.25	0.5	0.5	
LASE	*Lactuca serriola*	50	0.25	0.5	0.5	
LAVE2	*Lathyrus vestitus ssp. vestitus*	50	0.25	0.5	0.5	
LOPU3	*Lotus unifoliolatus var. unifoliolatus*	50	0.25	0.5	0.5	
MEPO3	*Medicago polymorpha*	50	0.25	0.5	0.5	
MIGU	*Mimulus guttatus*	50	0.25	0.5	0.5	
PHME3	*Pholistoma membranaceum*	50	0.25	0.5	0.5	
PLECT	*Plectritis* sp.	50	0.25	0.5	0.5	
RUCR	*Rumex crispus*	50	0.25	0.5	0.5	
SOAS	*Sonchus asper*	50	0.25	0.5	0.5	
STME2	*Stellaria media*	50	0.25	0.5	0.5	
TRWI3	*Trifolium willdenowii*	50	0.25	0.5	0.5	
CAPY2	*Carduus pycnocephalus*	25	0.25	1	1	
CLAYT	*Claytonia* sp.	25	0.25	1	1	
PABR11	*Packera breweri*	25	0.25	1	1	
ALCR5	*Allium crispum*	25	0.125	0.5	0.5	
AMMEI2	*Amsinckia menziesii var. intermedia*	25	0.125	0.5	0.5	
ARDR4	*Artemisia dracunculus*	25	0.125	0.5	0.5	
ASFA	*Asclepias fascicularis*	25	0.125	0.5	0.5	
CACOV	*Calystegia collina ssp. venusta*	25	0.125	0.5	0.5	
CASUS2	*Calystegia subacaulis ssp. subacaulis*	25	0.125	0.5	0.5	
CEME2	*Centaurea melitensis*	25	0.125	0.5	0.5	
CEGL2	*Cerastium glomeratum*	25	0.125	0.5	0.5	
DAGL2	*Datisca glomerata*	25	0.125	0.5	0.5	
DEPAP5	*Delphinium parryi ssp. parryi*	25	0.125	0.5	0.5	
DEPAP7	*Delphinium patens ssp. patens*	25	0.125	0.5	0.5	
DICAC5	*Dichelostemma capitatum ssp. capitatum*	25	0.125	0.5	0.5	
EPILO	*Epilobium* sp.	25	0.125	0.5	0.5	
MEIN2	*Melilotus indicus*	25	0.125	0.5	0.5	
PECA14	*Perideridia californica*	25	0.125	0.5	0.5	
POFOF4	*Potamogeton foliosus var.*	25	0.125	0.5	0.5	
PTDR	*Pterostegia drymarioides*	25	0.125	0.5	0.5	
RAHE	*Ranunculus hebecarpus*	25	0.125	0.5	0.5	
RORIP	*Rorippa* sp.	25	0.125	0.5	0.5	
SOOL	*Sonchus oleraceus*	25	0.125	0.5	0.5	
STPA13	*Stellaria media ssp. pallida*	25	0.125	0.5	0.5	
TOAR	*Torilis arvensis*	25	0.125	0.5	0.5	
TRMI4	*Trifolium microcephalum*	25	0.125	0.5	0.5	
URUR	*Urtica urens*	25	0.125	0.5	0.5	
VELA	*Verbena lasiostachys*	25	0.125	0.5	0.5	
WOFI	*Woodwardia fimbriata*	25	0.125	0.5	0.5	
WYHE	*Wyethia helenioides*	25	0.125	0.5	0.5	
Graminoid						
BRDI3	*Bromus diandrus*	100	1	0.5	2	X

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	BRMAR	*Bromus rubens*	75	0.625	0.5	1	
	AVBA	*Avena barbata*	75	0.375	0.5	0.5	
	BRHO2	*Bromus hordeaceus*	75	0.375	0.5	0.5	
	ELGLG	*Elymus glaucus ssp. glaucus*	75	0.375	0.5	0.5	
	VUMY	*Vulpia myuros*	50	0.375	0.5	1	
	ELMA5	*Eleocharis macrostachya*	50	0.25	0.5	0.5	
	MEIM	*Melica imperfecta*	50	0.25	0.5	0.5	
	POSE	*Poa secunda*	25	0.5	2	2	
	AICA	*Aira caryophyllea*	25	0.125	0.5	0.5	
	BRAR3	*Bromus arenarius*	25	0.125	0.5	0.5	
	CABA4	*Carex barbarae*	25	0.125	0.5	0.5	
	JUEFP	*Juncus effusus var. pacificus*	25	0.125	0.5	0.5	
	JUXI	*Juncus xiphioides*	25	0.125	0.5	0.5	
	LETR5	*Leymus triticoides*	25	0.125	0.5	0.5	
	POLYP2	*Polypogon* sp.	25	0.125	0.5	0.5	
Nonvascular							
	MOSS	Moss sp.	75	3.375	1	10	X
	LICHEN	Lichen sp.	75	0.5	0.5	1	

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 4) PINN_644, PINN_664, PINN_896, PINN_897

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Quercus douglasii / Juniperus californica* Woodland

Blue Oak / California Juniper Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Quercus douglasii* Woodland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association occurs on moderate to steep slopes with east to northwest-facing aspects at elevations between 380 and 536 m. The association is dominated by *Juniperus californica* and *Quercus douglasii* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Pinus sabiniana*. The understory shrub layer includes *Ceanothus cuneatus var. cuneatus* and *Rhamnus ilicifolia*, and the herbaceous layer may include *Galium porrigens var. porrigens*, *Packera breweri*, *Vulpia myuros*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (5) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association occurs on moderate to steep slopes with east to northwest-facing aspects at elevations between 380 and 536 m.

Elevation: Mean 437.8 m, Range 380 - 536 m.
Aspect: East (1), North (1), Northeast (2), Northwest (1).
Slope: Mean 19.4 degrees, Range 8 - 33 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1), Middle to Upper 1/3 of slope (1), Ridge top (1), Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Convex or rounded (2), Linear or even (2), Undulating pattern (1).

Fines Cover: Mean 8.0%, Range 2 - 14%.
Gravel Cover: Mean 13.4%, Range 1 - 32%.
Cobble Cover: Mean 0.6%, Range 0 - 1%.
Stone Cover: Mean 0.3%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.5%, Range 0 - 2%.
Litter Cover: Mean 71.8%, Range 60 - 88%.
Stem Basal Area Cover: Mean 5.6%, Range 2 - 10%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: General volcanic extrusives (2), Rhyolite (3).
Soil Texture: Sand (2), Sandy Loam (3).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (2), light competition from exotics (1), moderate competition from exotics (2), heavy feral pig damage (1), light feral pig damage (2), moderate feral pig damage (2), heavy foot traffic/trampling (1), and heavy grazing (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Juniperus californica* and *Quercus douglasii*. Abundant or characteristic trees present at lower cover may include *Pinus sabiniana*. The understory shrub layer includes *Ceanothus cuneatus var. cuneatus* and *Rhamnus ilicifolia*. The herbaceous layer may include the forbs *Galium porrigens var. porrigens* and *Packera breweri*, and the graminoids *Vulpia myuros* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 57.6%, Range 43 - 73%.
Non-native Cover: Mean 9.6%, Range 1 - 23%.

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Low Cover (<0.5m): Mean 27.2%, Range 3 - 65%.
Medium Cover (0.5-4.0m): Mean 10.2%, Range 5 - 19%.
Tall Cover (>4.0m): Mean 35.6%, Range 21 - 53%.
Species Richness: Mean 40.0, Range 32 - 53.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	QUDO-T	*Quercus douglasii*	100	13.6	2	40	X	X	X
	JUCA7-M	*Juniperus californica*	100	5.8	0.5	15	X		
	PISA2-T	*Pinus sabiniana*	100	3.5	0.5	9	X		
	JUCA7-L	*Juniperus californica*	100	0.5	0.5	0.5	X		
	JUCA7-T	*Juniperus californica*	80	18.4	12	35	X	X	X
	QUDO-M	*Quercus douglasii*	60	0.5	0.5	1			
	PISA2-L	*Pinus sabiniana*	60	0.3	0.5	0.5			
	QUDO-L	*Quercus douglasii*	60	0.3	0.5	0.5			
Shrub									
	RHIL	*Rhamnus ilicifolia*	100	0.7	0.5	1	X		
	CECUC3	*Ceanothus cuneatus var. cuneatus*	80	0.4	0.5	0.5	X		
	LOSUD	*Lonicera subspicata var. denudata*	60	0.4	0.5	1			
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	40	0.4	0.5	1.5			
	CEBE3	*Cercocarpus montanus var. glaber*	40	0.2	0.5	0.5			
	PHVI9	*Phoradendron villosum*	40	0.2	0.5	0.5			
Herb									
	GAPOP	*Galium porrigens var. porrigens*	100	0.5	0.5	0.5	X		
	PABR11	*Packera breweri*	80	0.5	0.5	1	X		
	VIPE3	*Viola pedunculata*	60	7.3	0.5	32			
	CLARK	*Clarkia* sp.	60	0.9	0.5	3			
	CLUN	*Clarkia unguiculata*	60	0.4	0.5	1			
	AMMEI2	*Amsinckia menziesii var. intermedia*	60	0.3	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	60	0.3	0.5	0.5			
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	40	2.6	1	12			
	PHME3	*Pholistoma membranaceum*	40	1.8	2	7			
	DEPAP5	*Delphinium parryi ssp. parryi*	40	0.7	0.5	3			
	MAFA3	*Marah fabaceus*	40	0.5	0.5	2			
	PLMA4	*Plectritis macrocera*	40	0.4	1	1			
	BLCR	*Bloomeria crocea*	40	0.3	0.5	1			
	CLPAP	*Claytonia parviflora ssp. parviflora*	40	0.3	0.5	1			
	GAAP2	*Galium aparine*	40	0.3	0.5	1			
	GILIA	*Gilia* sp.	40	0.3	0.5	1			
	STELL	*Stellaria* sp.	40	0.3	0.5	1			
	TRWI3	*Trifolium willdenowii*	40	0.3	0.5	1			
	ACMI2	*Achillea millefolium*	40	0.2	0.5	0.5			
	APOC	*Aphanes arvensis*	40	0.2	0.5	0.5			
	APAN	*Apiastrum angustifolium*	40	0.2	0.5	0.5			
	ATPU	*Athysanus pusillus*	40	0.2	0.5	0.5			
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	40	0.2	0.5	0.5			
	HETE5	*Hesperocnide tenella*	40	0.2	0.5	0.5			
	LICY3	*Lithophragma cymbalaria*	40	0.2	0.5	0.5			
	LODA	*Lomatium dasycarpum*	40	0.2	0.5	0.5			
	MICAC2	*Micropus californicus var. californicus*	40	0.2	0.5	0.5			

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	NAVAR	*Navarretia* sp.	40	0.2	0.5	0.5			
	RACA2	*Ranunculus californicus*	40	0.2	0.5	0.5			
	SABI2	*Sanicula bipinnata*	40	0.2	0.5	0.5			
	SACR2	*Sanicula crassicaulis*	40	0.2	0.5	0.5			
Graminoid									
	VUMY	*Vulpia myuros*	100	5.6	0.5	20	X	X	X
	BRMAR	*Bromus rubens*	80	0.9	0.5	2	X		
	POSE	*Poa secunda*	60	0.5	0.5	1			
	BRHO2	*Bromus hordeaceus*	40	0.5	0.5	2			
	VUMI	*Vulpia microstachys*	40	0.3	0.5	1			
Nonvascular									
	MOSS	Moss sp.	80	3.2	0.5	10.5	X	X	X
	RAMAL2	*Ramalina* sp.	40	3.3	6.5	10			
	LICHEN	Lichen sp.	40	0.6	1	2			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 5) PINN_096, PINN_804, PINN_819, PINN_849, PINN_890

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Quercus wislizeni - Pinus sabiniana* / Mixed Herbaceous Woodland

Interior Live Oak - Foothill Pine / Mixed Herbaceous Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Quercus wislizeni* Woodland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association occurs on moderate to somewhat steep slopes with east and southeast-aspects at elevations between 402 and 425 m. The association is dominated by *Quercus wislizeni var. wislizeni* in the overstory tree layer and often contains other abundant or characteristic tree species at lower cover such as *Pinus sabiniana*. The understory shrub layer includes *Rhamnus ilicifolia* and *Toxicodendron diversilobum*, and the herbaceous layer may include *Anthriscus caucalis, Bowlesia incana, Cardamine californica, Claytonia perfoliata ssp. perfoliata, Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Sanicula crassicaulis, Thysanocarpus laciniatus, Bromus diandrus, Bromus hordeaceus, Elymus glaucus ssp. glaucus*, and *Melica torreyana*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (2) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association occurs on moderate to somewhat steep slopes with east and southeast-aspects at elevations between 402 and 425 m.

Elevation: Mean 413.5 m, Range 402 - 425 m.
Aspect: East (1), Southeast (1).
Slope: Mean 16.5 degrees, Range 7 - 26 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1), Middle to Upper 1/3 of slope (1).
Micro Topography: Convex or rounded (1), Other (1).

Fines Cover: Mean 3.0%, Range 2 - 4%.
Gravel Cover: Mean 26.5%, Range 3 - 50%.
Cobble Cover: Mean 0.5%, Range 0.5 - 0.5%.
Stone Cover: Mean 0.3%, Range 0 - 0.5%.
Bedrock Cover: Mean 1.3%, Range 0.5 - 2%.
Litter Cover: Mean 66.5%, Range 45 - 88%.
Stem Basal Area Cover: Mean 3.0%, Range 1 - 5%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Rhyolite (1).
Soil Texture: Sand (1), Sandy Loam (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (1), light competition from exotics (1), moderate erosion/runoff (1), and heavy foot traffic/trampling (2).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Quercus wislizeni var. wislizeni*. Other trees present at lower cover include *Pinus sabiniana*. The understory shrub layer includes *Rhamnus ilicifolia* and *Toxicodendron diversilobum*. The herbaceous layer may include the forbs *Anthriscus caucalis, Bowlesia incana, Cardamine californica, Claytonia perfoliata ssp. perfoliata, Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Sanicula crassicaulis*, and *Thysanocarpus laciniatus*, and the graminoids *Bromus diandrus, Bromus hordeaceus, Elymus glaucus ssp. glaucus*, and *Melica torreyana*.

Total Vegetation Cover: Mean 55.0%, Range 46 - 64%.

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Non-native Cover: Mean 2.5%, Range 1 - 4%.
Low Cover (<0.5m): Mean 8.5%, Range 7 - 10%.
Medium Cover (0.5-4.0m): Mean 4.0%, Range 2 - 6%.
Tall Cover (>4.0m): Mean 49.0%, Range 41 - 57%.
Species Richness: Mean 45.5, Range 43 - 48.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	QUWIW-T	*Quercus wislizeni var. wislizeni*	100	42.5	30	55	X	X	X
	PISA2-T	*Pinus sabiniana*	100	2	2	2	X		
	QUWIW-L	*Quercus wislizeni var. wislizeni*	100	0.5	0.5	0.5	X		
	QUAGA-T	*Quercus agrifolia var. agrifolia*	50	6	12	12			
	AECA-T	*Aesculus californica*	50	4.5	9	9			
	QUWIW-M	*Quercus wislizeni var. wislizeni*	50	1	2	2			
	AECA-M	*Aesculus californica*	50	0.5	1	1			
	PISA2-M	*Pinus sabiniana*	50	0.5	1	1			
	JUCA7-M	*Juniperus californica*	50	0.25	0.5	0.5			
	PISA2-L	*Pinus sabiniana*	50	0.25	0.5	0.5			
	QUAGA-L	*Quercus agrifolia var. agrifolia*	50	0.25	0.5	0.5			
Shrub									
	TODI	*Toxicodendron diversilobum*	100	1.75	0.5	3	X		
	RHIL	*Rhamnus ilicifolia*	100	1.25	1	1.5	X	X	X
	CEBE3	*Cercocarpus montanus var. glaber*	50	0.5	1	1			
	LOSUD	*Lonicera subspicata var. denudata*	50	0.5	1	1			
	MIAU	*Diplacus aurantiacus*	50	0.5	1	1			
	ADFA	*Adenostoma fasciculatum*	50	0.25	0.5	0.5			
	ARPU5	*Arctostaphylos pungens*	50	0.25	0.5	0.5			
	CECUC3	*Ceanothus cuneatus var. cuneatus*	50	0.25	0.5	0.5			
	CLLA3	*Clematis lasiantha*	50	0.25	0.5	0.5			
	PRILI	*Prunus ilicifolia ssp. ilicifolia*	50	0.25	0.5	0.5			
Herb									
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	100	1.75	0.5	3	X		
	ANCA14	*Anthriscus caucalis*	100	0.75	0.5	1	X		
	GAPOP	*Galium porrigens var. porrigens*	100	0.75	0.5	1	X		
	MAFA3	*Marah fabaceus*	100	0.75	0.5	1	X		
	BOIN3	*Bowlesia incana*	100	0.5	0.5	0.5	X		
	CACA39	*Cardamine californica*	100	0.5	0.5	0.5	X		
	GAAP2	*Galium aparine*	100	0.5	0.5	0.5	X		
	PETRT	*Pentagramma triangularis ssp. triangularis*	100	0.5	0.5	0.5	X		
	SACR2	*Sanicula crassicaulis*	100	0.5	0.5	0.5	X		
	THLA3	*Thysanocarpus laciniatus*	100	0.5	0.5	0.5	X		
	LOSCS2	*Lotus scoparius var. scoparius*	50	0.5	1	1			
	AMMEI2	*Amsinckia menziesii var. intermedia*	50	0.25	0.5	0.5			
	ARDR4	*Artemisia dracunculus*	50	0.25	0.5	0.5			
	ASTEXX	Asteraceae sp.	50	0.25	0.5	0.5			
	CABU2	*Capsella bursa-pastoris*	50	0.25	0.5	0.5			
	CAOL	*Cardamine oligosperma*	50	0.25	0.5	0.5			
	CEME2	*Centaurea melitensis*	50	0.25	0.5	0.5			
	CEGL2	*Cerastium glomeratum*	50	0.25	0.5	0.5			
	CHSU5	*Matricaria discoidea*	50	0.25	0.5	0.5			
	CIOCV	*Cirsium occidentale var. venustum*	50	0.25	0.5	0.5			
	CLARK	*Clarkia* sp.	50	0.25	0.5	0.5			
	COHE	*Collinsia heterophylla*	50	0.25	0.5	0.5			

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	DEPAP7	*Delphinium patens ssp. patens*	50	0.25	0.5	0.5			
	DRVE2	*Draba verna*	50	0.25	0.5	0.5			
	EPILO	*Epilobium* sp.	50	0.25	0.5	0.5			
	ERCI6	*Erodium cicutarium*	50	0.25	0.5	0.5			
	LAAM	*Lamium amplexicaule*	50	0.25	0.5	0.5			
	LIAF	*Lithophragma affine*	50	0.25	0.5	0.5			
	NEPAP	*Nemophila parviflora var. parviflora*	50	0.25	0.5	0.5			
	OSBR	*Osmorhiza brachypoda*	50	0.25	0.5	0.5			
	PEAN2	*Pellaea andromedifolia*	50	0.25	0.5	0.5			
	PHME3	*Pholistoma membranaceum*	50	0.25	0.5	0.5			
	PLCIC	*Plectritis ciliosa ssp. ciliosa*	50	0.25	0.5	0.5			
	POCA12	*Polypodium californicum*	50	0.25	0.5	0.5			
	RAHE	*Ranunculus hebecarpus*	50	0.25	0.5	0.5			
	RUCR	*Rumex crispus*	50	0.25	0.5	0.5			
	RUSA	*Rumex salicifolius*	50	0.25	0.5	0.5			
	SCCAF2	*Scrophularia californica ssp. floribunda*	50	0.25	0.5	0.5			
	SESP	*Sedum spathulifolium*	50	0.25	0.5	0.5			
	SONCH	*Sonchus* sp.	50	0.25	0.5	0.5			
	STBU	*Stachys bullata*	50	0.25	0.5	0.5			
	STME2	*Stellaria media*	50	0.25	0.5	0.5			
	TRIFO	*Trifolium* sp.	50	0.25	0.5	0.5			
	VELA	*Verbena lasiostachys*	50	0.25	0.5	0.5			
	VIPE3	*Viola pedunculata*	50	0.25	0.5	0.5			
	YAMI	*Yabea microcarpa*	50	0.25	0.5	0.5			
Graminoid									
	BRDI3	*Bromus diandrus*	100	2.25	0.5	4	X	X	X
	ELGLG	*Elymus glaucus ssp. glaucus*	100	0.75	0.5	1	X		
	BRHO2	*Bromus hordeaceus*	100	0.5	0.5	0.5	X		
	METO	*Melica torreyana*	100	0.5	0.5	0.5	X		
	VUMY	*Vulpia myuros*	50	0.5	1	1			
	AVBA	*Avena barbata*	50	0.25	0.5	0.5			
	BRMA3	*Bromus rubens*	50	0.25	0.5	0.5			
	POSE	*Poa secunda*	50	0.25	0.5	0.5			
	VULPI	*Vulpia* sp.	50	0.25	0.5	0.5			
Nonvascular									
	MOSS	Moss sp.	100	2.25	2	2.5	X	X	X
	LICHEN	Lichen sp.	50	0.75	1.5	1.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 2) PINN_844, PINN_878

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]: *Platanus racemosa - Salix laevigata / Rubus ursinus* Woodland

California Sycamore - Polished Willow / California Blackberry Woodland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Platanus racemosa* Temporarily Flooded Woodland Alliance

PINNACLES LOCAL SUMMARY

This woodland/forest association was sampled once on a flat area at 320 m elevation. The association is dominated by *Platanus racemosa* and *Salix laevigata* in the overstory tree layer. *Quercus agrifolia var. agrifolia* is also present. The understory shrub layer includes *Rubus ursinus, Baccharis pilularis, Diplacus aurantiacus (= Mimulus aurantiacus), Rosa californica, Salix lasiolepis, Sambucus mexicana*, and *Toxicodendron diversilobum*, and the herbaceous layer may include *Artemisia douglasiana, Anthriscus caucalis, Artemisia dracunculus, Chenopodium californicum, Galium porrigens var. porrigens, Hirschfeldia incana, Marrubium vulgare, Phacelia ramosissima var. ramosissima, Solanum umbelliferum, Trifolium microcephalum, Bromus diandrus*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This woodland/forest association was sampled only once along a flat area at 320 m elevation.

Elevation: Mean 320.0 m,
Aspect: Flat (1).
Slope: Mean 0.0 degrees,.
Macro Topography: Middle 1/3 of slope (1).
Micro Topography: Linear or even (1).

Fines Cover: 0.5%,
Gravel Cover: 0.0%
Cobble Cover: 0.0%
Stone Cover: 0.0%,
Bedrock Cover: 0.0%
Litter Cover: 95.0%
Stem Basal Area Cover: Mean 5.0%
Water Cover: Mean 0.0%
Parent Material: Clayey alluvium.
Soil Texture: Silt or Silt Loam.

PINNACLES LOCAL SITE IMPACTS

Impacts observed in this association include light competition from exotics.

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory tree layer is dominated by *Platanus racemosa* and *Salix laevigata*. *Quercus agrifolia* is also present. The understory shrub layer includes *Rubus ursinus, Baccharis pilularis, Diplacus aurantiacus (= Mimulus aurantiacus), Rosa californica, Salix lasiolepis, Sambucus mexicana*, and *Toxicodendron diversilobum*. The herbaceous layer may include the forbs *Artemisia douglasiana, Anthriscus caucalis, Artemisia dracunculus, Chenopodium californicum, Galium porrigens var. porrigens, Hirschfeldia incana, Marrubium vulgare, Phacelia ramosissima var. ramosissima, Solanum umbelliferum*, and *Trifolium microcephalum*, and the graminoids *Bromus diandrus* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: 90.0%
Non-native Cover: 3.0%
Low Cover (<0.5m): 11.0%

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Medium Cover (0.5-4.0m): 41.0%
Tall Cover (>4.0m): 57.0%
Species Richness: 22.0

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	PLRA-T	*Platanus racemosa*	100	50	50	50	X	X	X
	SALA3	*Salix laevigata*	100	10	10	10	X		
	PLRA-M	*Platanus racemosa*	100	0.5	0.5	0.5	X		
	QUAGA-L	*Quercus agrifolia var. agrifolia*	100	0.5	0.5	0.5	X		
Shrub									
	RUUR	*Rubus ursinus*	100	25	25	25	X	X	X
	ROCA2	*Rosa californica*	100	5	5	5	X		
	SALA6	*Salix lasiolepis*	100	5	5	5	X		
	TODI	*Toxicodendron diversilobum*	100	4	4	4	X		
	BAPI	*Baccharis pilularis*	100	1	1	1	X		
	MIAU	*Diplacus aurantiacus*	100	0.5	0.5	0.5	X		
	SAME5	*Sambucus mexicana*	100	0.5	0.5	0.5	X		
Herb									
	ARDO3	*Artemisia douglasiana*	100	5	5	5	X	X	X
	ANCA14	*Anthriscus caucalis*	100	2	2	2	X		
	PHRAR	*Phacelia ramosissima var. ramosissima*	100	1	1	1	X		
	ARDR4	*Artemisia dracunculus*	100	0.5	0.5	0.5	X		
	CHCA3	*Chenopodium californicum*	100	0.5	0.5	0.5	X		
	GAPOP	*Galium porrigens var. porrigens*	100	0.5	0.5	0.5	X		
	HIIN3	*Hirschfeldia incana*	100	0.5	0.5	0.5	X		
	MAVU	*Marrubium vulgare*	100	0.5	0.5	0.5	X		
	SOUM	*Solanum umbelliferum*	100	0.5	0.5	0.5	X		
	TRMI4	*Trifolium microcephalum*	100	0.5	0.5	0.5	X		
Graminoid									
	BRDI3	*Bromus diandrus*	100	0.5	0.5	0.5	X	X	X
	BRMAR	*Bromus rubens*	100	0.5	0.5	0.5	X	X	X

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 1) PINN_937

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Adenostoma fasciculatum - Arctostaphylos pungens* Shrubland

Common Chamise - Mexican Manzanita Shrubland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Adenostoma fasciculatum* Shrubland Alliance

PINNACLES LOCAL SUMMARY

This shrubland association occurs on moderate to steep slopes with north aspects at elevations between 506 and 729 m. The overstory shrub layer is dominated by *Adenostoma fasciculatum Arctostaphylos glauca* and *Arctostaphylos pungens*. The understory herbaceous layer may include *Pedicularis densiflora*. Nonvascular taxa includes a lichen species.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (9) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This shrubland association occurs on moderate to steep slopes with north aspects at elevations between 506 and 729 m.

Elevation: Mean 632.4 m, Range 506 - 729 m.
Aspect: North (4), Northeast (1), Northwest (4).
Slope: Mean 17.8 degrees, Range 7 - 27 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1), Ridgetop (2), Upper 1/3 of slope to Ridgetop (6).
Micro Topography: Convex or rounded (2), Linear or even (7).

Fines Cover: Mean 2.9%, Range 1 - 8%.
Gravel Cover: Mean 5.0%, Range 2 - 8%.
Cobble Cover: Mean 0.4%, Range 0 - 0.5%.
Stone Cover: Mean 0.2%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.3%, Range 0 - 2%.
Litter Cover: Mean 86.2%, Range 70 - 94%.
Stem Basal Area Cover: Mean 5.0%, Range 1 - 20%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: General volcanic extrusives (3), Rhyolite (6).
Soil Texture: Clay or Clay Loam (1), Sandy Loam (8).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include light competition from exotics (3) and light feral pig damage (2).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory shrub layer is dominated by *Adenostoma fasciculatum, Arctostaphylos glauca* and *Arctostaphylos pungens*. The understory herbaceous layer may include the forb *Pedicularis densiflora*.

Total Vegetation Cover: Mean 56.3%, Range 40 - 80%.
Non-native Cover: Mean 1.0%, Range 0.5 - 2%.
Low Cover (<0.5m): Mean 3.6%, Range 0.5 - 15%.
Medium Cover (0.5-4.0m): Mean 55.3%, Range 40 - 79%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 13.8, Range 6 - 28.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	ADFA	*Adenostoma fasciculatum*	100	32.2	20	75	X	X	X

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	ARPU5	*Arctostaphylos pungens*	100	16.1	3	30	X		
	ARGL4	*Arctostaphylos glauca*	100	7.94	1	20	X		
	DERI	*Dendromecon rigida*	66.6	0.55	0.5	2			
	CECUC3	*Ceanothus cuneatus var. cuneatus*	44.4	1.33	0.5	10			
Herb									
	PEDE	*Pedicularis densiflora*	88.8	2.77	0.5	12	X	X	X
	GAPOP	*Galium porrigens var. porrigens*	44.4	0.22	0.5	0.5			
	MAFA3	*Marah fabaceus*	44.4	0.22	0.5	0.5			
	CEGL2	*Cerastium glomeratum*	33.3	0.16	0.5	0.5			
	FIGA	*Logfia gallica*	33.3	0.16	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	33.3	0.16	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	33.3	0.16	0.5	0.5			
Graminoid									
	VUMY	*Vulpia myuros*	33.3	0.16	0.5	0.5			
Nonvascular									
	LICHEN	Lichen sp.	55.5	0.72	1	2		X	
	MOSS	Moss sp.	44.4	0.44	0.5	2			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 9) PINN_018, PINN_025, PINN_026, PINN_603, PINN_604, PINN_605, PINN_765, PINN_795, PINN_837

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Adenostoma fasciculatum / Selaginella bigelovii* Shrubland

Common Chamise / Bushy Spike-moss Shrubland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Adenostoma fasciculatum* Shrubland Alliance

PINNACLES LOCAL SUMMARY

This shrubland association occurs on somewhat steep to steep slopes with east, south and south west aspects at elevations between 333 and 636 m. The overstory shrub layer is dominated by *Adenostoma fasciculatum*. The emergent tree layer includes *Pinus sabiniana*. The understory herbaceous layer may include *Selaginella bigelovii, Dichelostemma capitatum ssp. capitatum, Erodium cicutarium, Filago californica, Logfia gallica (= Filago gallica), Pellaea mucronata ssp. mucronata, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Marion Canyon (1), Old Boundaries (5), and South Wilderness (1) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This shrubland association occurs on somewhat steep to steep slopes with east, south and south west aspects at elevations between 333 and 636 m.

Elevation: Mean 465.4 m, Range 333 - 636 m.
Aspect: East (2), South (3), Southwest (1), West (1).
Slope: Mean 25.4 degrees, Range 20 - 33 degrees.
Macro Topography: Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (4).
Micro Topography: Convex or rounded (2), Linear or even (5).

Fines Cover: Mean 23.1%, Range 10 - 46%.
Gravel Cover: Mean 26.4%, Range 21 - 35%.
Cobble Cover: Mean 0.6%, Range 0 - 1%.
Stone Cover: Mean 0.4%, Range 0 - 1%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 27.6%, Range 16 - 40%.
Stem Basal Area Cover: Mean 22.0%, Range 15 - 30%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (6), General volcanic extrusives (1).
Soil Texture: Sandy Loam (6), Unknown (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (2), light competition from exotics (2), moderate competition from exotics (3), light feral pig damage (3), and moderate foot traffic/trampling (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory shrub layer is dominated by *Adenostoma fasciculatum*. The emergent tree layer includes *Pinus sabiniana*. The understory herbaceous layer may include the ferns/fern allies *Selaginella bigelovii* and *Pellaea mucronata ssp. mucronata*, the forbs *Dichelostemma capitatum ssp. capitatum, Erodium cicutarium, Filago californica*, and *Logfia gallica (= Filago gallica)*, and the graminoids *Bromus rubens (= Bromus madritensis ssp. rubens)* and *Vulpia myuros*.

Total Vegetation Cover: Mean 57.7%, Range 37 - 70%.
Non-native Cover: Mean 4.9%, Range 0.5 - 21%.
Low Cover (<0.5m): Mean 43.1%, Range 24 - 60%.
Medium Cover (0.5-4.0m): Mean 39.1%, Range 30 - 45%.

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Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 24.6, Range 18 - 40.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	PISA2-L	*Pinus sabiniana*	57.1	0.28	0.5	0.5		X	
Shrub									
	ADFA	*Adenostoma fasciculatum*	100	37.8	30	45	X	X	X
Herb									
	SEBI	*Selaginella bigelovii*	100	36.7	17	55	X	X	X
	PEMUM	*Pellaea mucronata ssp. mucronata*	100	0.71	0.5	2	X		
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	100	0.5	0.5	0.5	X		
	ERCI6	*Erodium cicutarium*	100	0.5	0.5	0.5	X		
	FICA2	*Filago californica*	100	0.5	0.5	0.5	X		
	FIGA	*Logfia gallica*	100	0.5	0.5	0.5	X		
	LOST4	*Lotus strigosus*	71.4	0.57	0.5	2			
	HYGL2	*Hypochaeris glabra*	71.4	0.42	0.5	1			
	URLI5	*Uropappus lindleyi*	71.4	0.42	0.5	1			
	CRCO34	*Crassula connata*	71.4	0.35	0.5	0.5			
	MAFA3	*Marah fabaceus*	71.4	0.35	0.5	0.5			
	LUCO	*Lupinus concinnus*	57.1	0.28	0.5	0.5			
	SACO6	*Salvia columbariae*	57.1	0.28	0.5	0.5			
	HYRA3	*Hypochaeris radicata*	42.8	0.35	0.5	1			
	CRMU2	*Cryptantha muricata*	42.8	0.21	0.5	0.5			
	ERNO2	*Eriogonum nortonii*	42.8	0.21	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	42.8	0.21	0.5	0.5			
	PLTE	*Plagiobothrys tenellus*	42.8	0.21	0.5	0.5			
	CAFO2	*Castilleja foliolosa*	28.5	0.21	0.5	1			
	APAN	*Apiastrum angustifolium*	28.5	0.14	0.5	0.5			
	CAAT25	*Castilleja attenuata*	28.5	0.14	0.5	0.5			
	CHME2	*Chorizanthe membranacea*	28.5	0.14	0.5	0.5			
	EMPEP	*Emmenanthe penduliflora var. penduliflora*	28.5	0.14	0.5	0.5			
	LOSAS	*Lotus salsuginosus var. salsuginosus*	28.5	0.14	0.5	0.5			
	LOSCS2	*Lotus scoparius var. scoparius*	28.5	0.14	0.5	0.5			
	PTDR	*Pterostegia drymarioides*	28.5	0.14	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	100	3.78	0.5	20	X	X	X
	VUMY	*Vulpia myuros*	71.4	0.57	0.5	2		X	
	MEIM	*Melica imperfecta*	28.5	0.21	0.5	1			
	BRHO2	*Bromus hordeaceus*	28.5	0.14	0.5	0.5			
	POSE	*Poa secunda*	28.5	0.14	0.5	0.5			
Nonvascular									
	LICHEN	Lichen sp.	42.8	1.42	1	5			
	MOSS	Moss sp.	42.8	0.85	0.5	5			
	CR_CRUST	Cryptobiotic Crust	28.5	0.85	1	5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_006, PINN_501, PINN_503, PINN_504, PINN_755, PINN_769, PINN_782

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Lupinus albifrons - Senecio flaccidus* var. *douglasii* Shrubland

Silver Lupine - Douglas's Ragwort Shrubland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Lupinus albifrons* Shrubland Alliance

PINNACLES LOCAL SUMMARY

This shrubland association occurs on gentle to moderate slopes at all aspects at elevations between 358 and 560 m. The overstory shrub layer is dominated by *Lupinus albifrons var. albifrons*. The understory herbaceous layer may include *Clarkia* sp., *Eriogonum elegans, Erodium cicutarium, Heterotheca sessiliflora ssp. echioides, Senecio flaccidus var. douglasii, Bromus hordeaceus, Bromus diandrus,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Kingman (5), McCabe Canyon (2), and Old Boundaries (2) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This shrubland association occurs on gentle to moderate slopes at all aspects at elevations between 358 and 560 m.

Elevation: Mean 423.1 m, Range 358 - 560 m.
Aspect: East (3), Northeast (1), Southeast (2), Southwest (1), West (2).
Slope: Mean 4.2 degrees, Range 1 - 10 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (2), Middle 1/3 of slope (7).
Micro Topography: Linear or even (6), Undulating pattern (3).

Fines Cover: Mean 24.1%, Range 1 - 60%.
Gravel Cover: Mean 39.4%, Range 12 - 75%.
Cobble Cover: Mean 0.9%, Range 0.5 - 4%.
Stone Cover: Mean 0.1%, Range 0 - 0.5%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 34.1%, Range 4 - 84%.
Stem Basal Area Cover: Mean 1.7%, Range 0.5 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Fanglomerate (1), Granitic (2), Mixed alluvium (1), Sandy alluvium (5).
Soil Texture: Sand (9).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (8), light competition from exotics (1), heavy feral pig damage (1), light feral pig damage (1), moderate feral pig damage (4), heavy grazing (4), light grazing (2), moderate grazing (1), and light other disturbance (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory shrub layer is dominated by *Lupinus albifrons var. albifrons*. The understory herbaceous layer may include the forbs *Clarkia* sp., *Eriogonum elegans, Erodium cicutarium, Heterotheca sessiliflora ssp. echioides*, and *Senecio flaccidus var. douglasii*, and the graminoids *Bromus hordeaceus, Bromus diandrus,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Total Vegetation Cover: Mean 28.2%, Range 17 - 45%.
Non-native Cover: Mean 5.3%, Range 1 - 9%.
Low Cover (<0.5m): Mean 11.3%, Range 4 - 18%.
Medium Cover (0.5-4.0m): Mean 19.3%, Range 10 - 36%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.
Species Richness: Mean 26.4, Range 20 - 34.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	LUALA2	*Lupinus albifrons var. albifrons*	100	14.9	7.5	25.5	X	X	X
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	66.6	1.77	1	5			
Herb									
	SEFLD	*Senecio flaccidus var. douglasii*	100	2.77	0.5	8	X		
	HESEE2	*Heterotheca sessiliflora ssp. echioides*	100	1.66	1	5	X		
	ERCI6	*Erodium cicutarium*	100	0.72	0.5	2	X		
	CLARK	*Clarkia* sp.	88.8	1.11	0.5	4	X		
	EREL8	*Eriogonum elegans*	77.7	0.38	0.5	0.5	X		
	CHGL	*Chaenactis glabriuscula*	66.6	0.5	0.5	1			
	HYPOC	*Hypochaeris* sp.	44.4	0.5	0.5	3			
	ESCA2	*Eschscholzia californica*	44.4	0.33	0.5	1			
	MACA6	*Malacothrix californica*	44.4	0.33	0.5	1			
	ERDE2	*Eriastrum densifolium*	44.4	0.27	0.5	1			
	AMMEI2	*Amsinckia menziesii var. intermedia*	44.4	0.22	0.5	0.5			
	CACO34	*Camissonia contorta*	44.4	0.22	0.5	0.5			
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	44.4	0.22	0.5	0.5			
	FIGA	*Logfia gallica*	44.4	0.22	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	33.3	0.5	0.5	3			
	ERBR14	*Erodium brachycarpum*	33.3	0.27	0.5	1			
	PHDI	*Phacelia distans*	33.3	0.27	0.5	1			
	CRYPT	*Cryptantha* sp.	33.3	0.16	0.5	0.5			
	GAPOP	*Galium porrigens var. porrigens*	33.3	0.16	0.5	0.5			
	LOSCS2	*Lotus scoparius var. scoparius*	33.3	0.16	0.5	0.5			
	LOST4	*Lotus strigosus*	33.3	0.16	0.5	0.5			
	MAFA3	*Marah fabaceus*	33.3	0.16	0.5	0.5			
	PLNO	*Plagiobothrys nothofulvus*	33.3	0.16	0.5	0.5			
	URLI5	*Uropappus lindleyi*	33.3	0.16	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	100	1.66	0.5	6	X		
	BRDI3	*Bromus diandrus*	88.8	0.61	0.5	1	X		
	BRHO2	*Bromus hordeaceus*	77.7	1.61	0.5	3	X	X	X
	VUMY	*Vulpia myuros*	44.4	0.55	0.5	3			
	BRAR3	*Bromus arenarius*	44.4	0.22	0.5	0.5			
	AVBA	*Avena barbata*	33.3	0.22	0.5	1			
Nonvascular									
	LICHEN	Lichen sp.	44.4	0.38	0.5	1			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 9) PINN_617, PINN_618, PINN_632, PINN_847, PINN_848, PINN_870, PINN_874, PINN_875, PINN_876

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Quercus berberidifolia - Cercocarpus montanus* var. *glaber* Shrubland

California Scrub Oak - Birchleaf Mountain-mahogany Shrubland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Quercus berberidifolia* Shrubland Alliance

PINNACLES LOCAL SUMMARY

This shrubland association occurs on somewhat steep to steep north and northeast-facing slopes at elevations between 367 and 432 m. The overstory shrub layer is dominated by *Quercus berberidifolia* and *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides).* The shrub layer includes, *Lonicera subspicata var. denudata, Quercus berberidifolia*, and *Rhamnus ilicifolia*. The emergent tree layer includes *Juniperus californica* at low cover. The understory herbaceous layer may include *Anthriscus caucalis, Clarkia unguiculata, Galium porrigens var. porrigens, Madia* sp., *Marah fabaceus, Plectritis* sp., *Stachys bullata, Melica torreyana, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Vulpia microstachys*, and *Vulpia myuros*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (3) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This shrubland association occurs on somewhat steep to steep north and northeast-facing slopes at elevations between 367 and 432 m.

Elevation: Mean 406.3 m, Range 367 - 432 m.
Aspect: North (2), Northeast (1).
Slope: Mean 30.0 degrees, Range 26 - 36 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1), Upper 1/3 of slope (2).
Micro Topography: Linear or even (3).

Fines Cover: Mean 31.7%, Range 10 - 70%.
Gravel Cover: Mean 9.3%, Range 3 - 20%.
Cobble Cover: Mean 2.8%, Range 0.5 - 5%.
Stone Cover: Mean 0.7%, Range 0 - 1%.
Bedrock Cover: Mean 1.5%, Range 0 - 4%.
Litter Cover: Mean 52.3%, Range 25 - 73%.
Stem Basal Area Cover: Mean 2.3%, Range 2 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: General volcanic extrusives (2), Rhyolite (1).
Soil Texture: Clay or Clay Loam (2), Sandy Loam (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (3), heavy feral pig damage (2), and moderate feral pig damage (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory shrub layer is dominated by *Quercus berberidifolia*. Characteristic shrubs at lower cover include *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides), Lonicera subspicata var. denudata*, and *Rhamnus ilicifolia*. The emergent tree layer includes *Juniperus californica*. The understory herbaceous layer may include the forbs *Anthriscus caucalis, Clarkia unguiculata, Galium porrigens var. porrigens, Madia* sp., *Marah fabaceus, Plectritis* sp., and *Stachys bullata*, and the graminoids *Melica torreyana, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Vulpia microstachys*, and *Vulpia myuros*.

Total Vegetation Cover: Mean 61.0%, Range 43 - 75%.
Non-native Cover: Mean 5.0%, Range 2 - 10%.

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Low Cover (<0.5m): Mean 19.3%, Range 9 - 28%.
Medium Cover (0.5-4.0m): Mean 31.7%, Range 26 - 42%.
Tall Cover (>4.0m): Mean 18.7 %, Range 2 - 37%.
Species Richness: Mean 40.3, Range 37 - 46.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	JUCA7-M	*Juniperus californica*	66.6	2.16	0.5	6		X	
	QUDO-T	*Quercus douglasii*	33.3	3.33	10	10			
	PISA2-T	*Pinus sabiniana*	33.3	0.66	2	2			
	QUDO-M	*Quercus douglasii*	33.3	0.66	2	2			
	JUCA7-L	*Juniperus californica*	33.3	0.16	0.5	0.5			
	PISA2-L	*Pinus sabiniana*	33.3	0.16	0.5	0.5			
	QUAGA-M	*Quercus agrifolia var. agrifolia*	33.3	0.16	0.5	0.5			
	QUDO-L	*Quercus douglasii*	33.3	0.16	0.5	0.5			
Shrub									
	QUBE5-M	*Quercus berberidifolia*	100	15	10	20	X	X	X
	CEBE3	*Cercocarpus montanus var. glaber*	100	3.5	2	4.5	X		
	RHIL	*Rhamnus ilicifolia*	100	2.33	1	3	X		
	LOSUD	*Lonicera subspicata var. denudata*	100	0.5	0.5	0.5	X		
	QUBE5-T	*Quercus berberidifolia*	66.6	13.3	5	35		X	
	PRILI	*Prunus ilicifolia ssp. ilicifolia*	66.6	7.16	10.5	11			
	CLLA3	*Clematis lasiantha*	66.6	2.5	3.5	4			
	CECUC3	*Ceanothus cuneatus var. cuneatus*	66.6	1.5	1	3.5			
	SYMO	*Symphoricarpos mollis*	66.6	0.83	0.5	2			
	HEAR5	*Heteromeles arbutifolia*	33.3	0.33	1	1			
	QUBE5-L	*Quercus berberidifolia*	33.3	0.16	0.5	0.5			
Herb									
	ANCA14	*Anthriscus caucalis*	100	3	0.5	8	X		
	STBU	*Stachys bullata*	100	2.16	0.5	4	X		
	MADIA	*Madia* sp.	100	1.83	0.5	4	X		
	MAFA3	*Marah fabaceus*	100	1.66	0.5	3	X		
	GAPOP	*Galium porrigens var. porrigens*	100	0.66	0.5	1	X		
	CLUN	*Clarkia unguiculata*	100	0.5	0.5	0.5	X		
	PLECT	*Plectritis* sp.	100	0.5	0.5	0.5	X		
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	66.6	2	1	5			
	ACMI2	*Achillea millefolium*	66.6	0.5	0.5	1			
	GAAP2	*Galium aparine*	66.6	0.5	0.5	1			
	BOIN3	*Bowlesia incana*	66.6	0.33	0.5	0.5			
	COHE	*Collinsia heterophylla*	66.6	0.33	0.5	0.5			
	DEPAP5	*Delphinium parryi ssp. parryi*	66.6	0.33	0.5	0.5			
	DOCLP	*Dodecatheon clevelandii ssp. patulum*	66.6	0.33	0.5	0.5			
	PABR11	*Packera breweri*	66.6	0.33	0.5	0.5			
	PEAN2	*Pellaea andromedifolia*	66.6	0.33	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	66.6	0.33	0.5	0.5			
	PHDI	*Phacelia distans*	66.6	0.33	0.5	0.5			
	SACR2	*Sanicula crassicaulis*	66.6	0.33	0.5	0.5			
	PHAUA2	*Pholistoma auritum var. auritum*	33.3	0.66	2	2			
	ERCOC12	*Eriophyllum confertiflorum var. confertiflorum*	33.3	0.33	1	1			
	MOVIV	*Monardella villosa ssp. villosa*	33.3	0.33	1	1			
	ADJO	*Adiantum jordanii*	33.3	0.16	0.5	0.5			
	AMMEI2	*Amsinckia menziesii var.*	33.3	0.16	0.5	0.5			

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		intermedia							
	APAN	*Apiastrum angustifolium*	33.3	0.16	0.5	0.5			
	ATPU	*Athysanus pusillus*	33.3	0.16	0.5	0.5			
	BLCR	*Bloomeria crocea*	33.3	0.16	0.5	0.5			
	CASUS2	*Calystegia subacaulis ssp. subacaulis*	33.3	0.16	0.5	0.5			
	CAPY2	*Carduus pycnocephalus*	33.3	0.16	0.5	0.5			
	CLARK	*Clarkia* sp.	33.3	0.16	0.5	0.5			
	DECAI	*Delphinium californicum ssp. interius*	33.3	0.16	0.5	0.5			
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	33.3	0.16	0.5	0.5			
	DODEC	*Dodecatheon* sp.	33.3	0.16	0.5	0.5			
	ERFOF	*Erigeron foliosus var. foliosus*	33.3	0.16	0.5	0.5			
	FILAG	*Filago* sp.	33.3	0.16	0.5	0.5			
	HYPOC	*Hypochaeris* sp.	33.3	0.16	0.5	0.5			
	LUBI	*Lupinus bicolor*	33.3	0.16	0.5	0.5			
	MICAC2	*Micropus californicus var. californicus*	33.3	0.16	0.5	0.5			
	NEMOP	*Nemophila* sp.	33.3	0.16	0.5	0.5			
	PHMA2	*Phacelia malvifolia*	33.3	0.16	0.5	0.5			
	RAHE	*Ranunculus hebecarpus*	33.3	0.16	0.5	0.5			
	SABI2	*Sanicula bipinnata*	33.3	0.16	0.5	0.5			
	STME2	*Stellaria media*	33.3	0.16	0.5	0.5			
	TRWI3	*Trifolium willdenowii*	33.3	0.16	0.5	0.5			
	VIPE3	*Viola pedunculata*	33.3	0.16	0.5	0.5			
Graminoid									
	METO	*Melica torreyana*	100	2.5	0.5	5	X	X	X
	BRHO2	*Bromus hordeaceus*	100	1.66	0.5	4	X		
	VUMI	*Vulpia microstachys*	100	1.16	0.5	2	X		
	BRMAR	*Bromus rubens*	100	0.66	0.5	1	X		
	VUMY	*Vulpia myuros*	100	0.66	0.5	1	X		
	BRDI3	*Bromus diandrus*	66.6	0.5	0.5	1			
	AVBA	*Avena barbata*	66.6	0.33	0.5	0.5			
	POSE	*Poa secunda*	66.6	0.33	0.5	0.5			
	AVFA	*Avena fatua*	33.3	0.33	1	1			
	BRLA3	*Bromus laevipes*	33.3	0.16	0.5	0.5			
Nonvascular									
	MOSS	Moss sp.	33.3	3.33	10	10			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 3) PINN_201, PINN_203, PINN_891

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]: *Rhamnus ilicifolia - Clematis lasiantha* Shrubland

Hollyleaf Redberry - Pipestem Virgin's-bower Shrubland

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Rhamnus ilicifolia* Shrubland Alliance

PINNACLES LOCAL SUMMARY

This shrubland association occurs on steep northeast-facing slopes at elevations between 730 and 738 m. The overstory shrub layer is dominated by *Clematis lasiantha* and *Rhamnus ilicifolia*, and often contains the abundant or characteristic shrubs *Heteromeles arbutifolia, Lepechinia calycina, Diplacus aurantiacus (= Mimulus aurantiacus),* and *Prunus ilicifolia ssp. ilicifolia*. The understory herbaceous layer may include *Apiastrum angustifolium, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Phacelia malvifolia, Pterostegia drymarioides, Solanum umbelliferum,* and *Zigadenus fremontii*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (2) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This shrubland association occurs on steep northeast-facing slopes at elevations between 730 and 738 m.

Elevation: Mean 734.0 m, Range 730 - 738 m.
Aspect: Northeast (2).
Slope: Mean 21.5 degrees, Range 19 - 24 degrees.
Macro Topography: Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Linear or even (2).

Fines Cover: Mean 15.0%, Range 10 - 20%.
Gravel Cover: Mean 18.5%, Range 2 - 35%.
Cobble Cover: Mean 1.5%, Range 1 - 2%.
Stone Cover: Mean 0.5%, Range 0.5 - 0.5%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 52.5%, Range 35 - 70%.
Stem Basal Area Cover: Mean 12.5%, Range 8 - 17%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Rhyolite (2).
Soil Texture: Sandy Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include the following: light competition from exotics (1), light feral pig damage (1), moderate feral pig damage (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the overstory shrub layer is dominated by *Clematis lasiantha* and *Rhamnus ilicifolia*. Characteristic shrubs at lower cover include *Heteromeles arbutifolia, Lepechinia calycina, Diplacus aurantiacus (= Mimulus aurantiacus)* and *Prunus ilicifolia ssp. ilicifolia*. The understory herbaceous layer may include the forbs *Apiastrum angustifolium, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Phacelia malvifolia, Pterostegia drymarioides, Solanum umbelliferum,* and *Zigadenus fremontii*.

Total Vegetation Cover: Mean 70.5%, Range 68 - 73%.
Non-native Cover: Mean 0.5%, Range 0.5 - 0.5%.
Low Cover (<0.5m): Mean 5.5%, Range 3 - 8%.
Medium Cover (0.5-4.0m): Mean 67.5%, Range 65 - 70%.
Tall Cover (>4.0m): Mean 0.0 %, Range 0 - 0%.

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Species Richness: Mean 24.0, Range 23 - 25.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	RHIL	*Rhamnus ilicifolia*	100	42.5	30	55	X	X	X
	CLLA3	*Clematis lasiantha*	100	34.25	25.5	43	X	X	X
	MIAU	*Diplacus aurantiacus*	100	2.5	1	4	X		
	HEAR5	*Heteromeles arbutifolia*	100	2	2	2	X		
	LECA3	*Lepechinia calycina*	100	1.5	1	2	X		
	PRILI	*Prunus ilicifolia ssp. ilicifolia*	100	0.75	0.5	1	X		
	DERI	*Dendromecon rigida*	50	0.25	0.5	0.5			
	RICAC	*Ribes californicum var. californicum*	50	0.25	0.5	0.5			
Herb									
	APAN	*Apiastrum angustifolium*	100	0.75	0.5	1	X		
	GAPOP	*Galium porrigens var. porrigens*	100	0.75	0.5	1	X		
	MAFA3	*Marah fabaceus*	100	0.75	0.5	1	X		
	PTDR	*Pterostegia drymarioides*	100	0.75	0.5	1	X		
	ZIFR	*Zigadenus fremontii*	100	0.75	0.5	1	X		
	PETRT	*Pentagramma triangularis ssp. triangularis*	100	0.5	0.5	0.5	X		
	PHMA2	*Phacelia malvifolia*	100	0.5	0.5	0.5	X		
	SOUM	*Solanum umbelliferum*	100	0.5	0.5	0.5	X		
	SCTU2	*Scutellaria tuberosa*	50	0.5	1	1			
	APIAXX	Apiaceae sp.	50	0.25	0.5	0.5			
	BOIN3	*Bowlesia incana*	50	0.25	0.5	0.5			
	CHCA3	*Chenopodium californicum*	50	0.25	0.5	0.5			
	CLARK	*Clarkia* sp.	50	0.25	0.5	0.5			
	CLPAP	*Claytonia parviflora ssp. parviflora*	50	0.25	0.5	0.5			
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	50	0.25	0.5	0.5			
	CRMU2	*Cryptantha muricata*	50	0.25	0.5	0.5			
	CRYPT	*Cryptantha* sp.	50	0.25	0.5	0.5			
	EUCHC	*Eucrypta chrysanthemifolia var. chrysanthemifolia*	50	0.25	0.5	0.5			
	GALIU	*Galium* sp.	50	0.25	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	50	0.25	0.5	0.5			
	MIMUL	*Mimulus* sp.	50	0.25	0.5	0.5			
	PEDE	*Pedicularis densiflora*	50	0.25	0.5	0.5			
	PHDI	*Phacelia distans*	50	0.25	0.5	0.5			
	SANIC	*Sanicula* sp.	50	0.25	0.5	0.5			
	STNI	*Stellaria nitens*	50	0.25	0.5	0.5			
Graminoid									
	VUMY	*Vulpia myuros*	50	0.25	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 2) PINN_510, PINN_511

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *(Artemisia dracunculus) - Gnaphalium canescens* Herbaceous Vegetation

Dragon Wormwood - Wright's Cudweed Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Artemisia dracunculus* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on flat to gentle slopes with east and southeast-facing aspects at elevations between 258 and 305 m. It is dominated by *Gnaphalium canescens ssp. beneolens (=Pseudognaphalium canescens ssp. beneolens)* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum*. *Artemisia dracunculus* is listed in parentheses because most of the sampled stands occurred in a matrix of *Artemisia dracunculus* dominated area, the plots appear to be small openings.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (7) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on flat to gentle slopes with east and southeast-facing aspects at elevations between 258 and 305 m.

Elevation: Mean 280.3 m, Range 258 - 305 m.
Aspect: East (1), Flat (2), Southeast (4).
Slope: Mean 1.1 degrees, Range 0 - 3 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (2), Bottom to Mid 1/3 of slope (2), Middle 1/3 of slope (3).
Micro Topography: Convex or rounded (1), Linear or even (3), Undulating pattern (3).

Fines Cover: Mean 13.9%, Range 1 - 31%.
Gravel Cover: Mean 64.6%, Range 27 - 88%.
Cobble Cover: Mean 10.7%, Range 1 - 33%.
Stone Cover: Mean 0.4%, Range 0 - 1%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 9.9%, Range 1 - 25%.
Stem Basal Area Cover: Mean 0.9%, Range 0.5 - 2%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Gravelly alluvium (3), Mixed alluvium (4).
Soil Texture: Sand (6), Unknown (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include light channelization (human-caused) (1), heavy competition from exotics (1), light competition from exotics (2), moderate competition from exotics (4), light feral pig damage (1), light foot traffic/trampling (1), light rip-rap, bank protection (1), and light road/trail construction/maintenance.

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Gnaphalium canescens ssp. beneolens (=Pseudognaphalium canescens ssp. beneolens)*. Characteristic forbs include *Eschscholzia californica, Hirschfeldia incana*, and *Lupinus bicolor*, and characteristic graminoids are *Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*. The shrub layer includes *Eriogonum fasciculatum var. foliolosum* at sparse cover.

Total Vegetation Cover: Mean 10.3%, Range 3 - 17%.
Non-native Cover: Mean 1.3%, Range 1 - 2%.
Low Cover (<0.5m): Mean 8.6%, Range 3 - 16%.
Medium Cover (0.5-4.0m): Mean 2.3%, Range 0.5 - 9%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.

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Species Richness: Mean 17.7, Range 12 - 25.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	PISA2-L	*Pinus sabiniana*	42.8	0.21	0.5	0.5			
	QUAGA-L	*Quercus agrifolia var. agrifolia*	28.5	0.14	0.5	0.5			
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	57.1	0.35	0.5	1		X	
Herb									
	GNCAB2	*Pseudognaphalium canescens ssp. beneolens*	100	8	1	15	X	X	X
	HIIN3	*Hirschfeldia incana*	100	0.71	0.5	1	X		
	LUBI	*Lupinus bicolor*	100	0.57	0.5	1	X		
	ESCA2	*Eschscholzia californica*	85.7	0.5	0.5	1	X		
	LOSCS2	*Lotus scoparius var. scoparius*	71.4	0.57	0.5	1			
	ARDR4	*Artemisia dracunculus*	71.4	0.42	0.5	1			
	HYGL2	*Hypochaeris glabra*	57.1	0.28	0.5	0.5			
	FIGA	*Logfia gallica*	42.8	0.28	0.5	1			
	CHGL	*Chaenactis glabriuscula*	42.8	0.21	0.5	0.5			
	GAPA5	*Galium parisiense*	42.8	0.21	0.5	0.5			
	STVIP	*Stephanomeria virgata ssp. pleurocarpa*	28.5	0.21	0.5	1			
	CLARK	*Clarkia* sp.	28.5	0.14	0.5	0.5			
	HYPOC	*Hypochaeris* sp.	28.5	0.14	0.5	0.5			
	SEFLD	*Senecio flaccidus var. douglasii*	28.5	0.14	0.5	0.5			
Graminoid									
	VUMY	*Vulpia myuros*	100	0.64	0.5	1	X		
	BRMAR	*Bromus rubens*	100	0.5	0.5	0.5	X		
	BRHO2	*Bromus hordeaceus*	85.7	0.42	0.5	0.5	X		
	BRDI3	*Bromus diandrus*	57.1	0.28	0.5	0.5			
	AICA	*Aira caryophyllea*	42.8	0.21	0.5	0.5			
	BRAR3	*Bromus arenarius*	42.8	0.21	0.5	0.5			
	AVBA	*Avena barbata*	28.5	0.21	0.5	1			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_131, PINN_154, PINN_155, PINN_156, PINN_578, PINN_581, PINN_583

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Artemisia dracunculus* Alluvial Fan Herbaceous Vegetation

Dragon Wormwood Alluvial Fan Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Artemisia dracunculus* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on flat to moderate slopes at all aspects at elevations between 288 and 415 m. It is dominated by *Artemisia dracunculus* and *Bromus diandrus* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Francis (1), McCabe Canyon (2), and Old Boundaries (8) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on flat to moderate slopes at all aspects at elevations between 288 and 415 m.

Elevation: Mean 367.8 m, Range 288 - 415 m.
Aspect: East (2), Flat (1), North (3), South (3), Southeast (1), West (1).
Slope: Mean 27.4 degrees, Range 0 - 28 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (4), Bottom to Mid 1/3 of slope (1), Middle 1/3 of slope (5), Middle to Upper 1/3 of slope (1).
Micro Topography: Concave or depression (1), Linear or even (9), Other (1).

Fines Cover: Mean 20.4%, Range 0.5 - 67%.
Gravel Cover: Mean 12.3%, Range 0.5 - 61%.
Cobble Cover: Mean 2.3%, Range 0 - 10%.
Stone Cover: Mean 1.3%, Range 0 - 10%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 59.2%, Range 10 - 98%.
Stem Basal Area Cover: Mean 2.7%, Range 1 - 6%.
Water Cover: Mean 1.8%, Range 0 - 20%.
Parent Material: Mixed alluvium (7), Sandy alluvium (3), Silty alluvium (1).
Soil Texture: Sand (9), Silt or Silt Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (9), light competition from exotics (1), moderate competition from exotics (1), light feral pig damage (2), moderate foot traffic/trampling (2), heavy grazing (1), light grazing (1), moderate grazing (2), and light road/trail construction/maintenance.

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Artemisia dracunculus* and *Bromus diandrus*. Characteristic graminoids are *Bromus hordeaceus* and *Vulpia myuros*. The shrub layer includes *Eriogonum fasciculatum var. foliolosum* at sparse cover.

Total Vegetation Cover: Mean 41.0%, Range 15 - 63%.
Non-native Cover: Mean 13.4%, Range 3 - 38%.
Low Cover (<0.5m): Mean 16.0%, Range 7 - 37%.
Medium Cover (0.5-4.0m): Mean 27.9%, Range 2 - 55%.
Tall Cover (>4.0m): Mean 0.5%, Range 0.5 - 0.5%.
Species Richness: Mean 22.6, Range 15 - 35.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Tree									
	PISA2-L	*Pinus sabiniana*	27.2	0.13	0.5	0.5			
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	63.6	1.59	0.5	10.5		X	
	MIAU	*Diplacus aurantiacus*	27.2	0.13	0.5	0.5			
Herb									
	ARDR4	*Artemisia dracunculus*	100	25.5	1	55.5	X	X	X
	HIIN3	*Hirschfeldia incana*	72.7	1	0.5	5.5			
	LOPU3	*Lotus unifoliolatus var. unifoliolatus*	63.6	0.31	0.5	0.5			
	CLPUQ	*Clarkia purpurea ssp. quadrivulnera*	54.5	0.36	0.5	1			
	AMMEI2	*Amsinckia menziesii var. intermedia*	54.5	0.31	0.5	1			
	CLUN	*Clarkia unguiculata*	54.5	0.31	0.5	1			
	HYRA3	*Hypochaeris radicata*	54.5	0.31	0.5	1			
	ARDO3	*Artemisia douglasiana*	45.4	0.40	0.5	2			
	CEME2	*Centaurea melitensis*	45.4	0.31	0.5	1			
	ERCI6	*Erodium cicutarium*	45.4	0.22	0.5	0.5			
	LOSCS2	*Lotus scoparius var. scoparius*	36.3	0.36	0.5	2.5			
	RUSA	*Rumex salicifolius*	36.3	0.27	0.5	1			
	GNCAB2	*Pseudognaphalium canescens ssp. beneolens*	36.3	0.18	0.5	0.5			
	ANCA14	*Anthriscus caucalis*	27.2	0.59	0.5	5			
	ESCA2	*Eschscholzia californica*	27.2	0.22	0.5	1			
	SEFLD	*Senecio flaccidus var. douglasii*	27.2	0.22	0.5	1.5			
	LASE	*Lactuca serriola*	27.2	0.18	0.5	1			
	EREL8	*Eriogonum elegans*	27.2	0.13	0.5	0.5			
	MEIN2	*Melilotus indicus*	27.2	0.13	0.5	0.5			
	SOUM	*Solanum umbelliferum*	27.2	0.13	0.5	0.5			
Graminoid									
	BRDI3	*Bromus diandrus*	100	5.18	0.5	25	X	X	X
	BRHO2	*Bromus hordeaceus*	100	2.90	0.5	10	X		
	VUMY	*Vulpia myuros*	81.8	1.22	0.5	5	X		
	BRAR3	*Bromus arenarius*	63.6	1	0.5	3			
	BRMAR	*Bromus rubens*	63.6	0.86	0.5	4			
	POSE	*Poa secunda*	27.2	0.13	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 11) PINN_132, PINN_134, PINN_136, PINN_591, PINN_667, PINN_668, PINN_825, PINN_907, PINN_918, PINN_919, PINN_920

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Avena fatua - (Nassella pulchra - Plantago erecta)* Herbaceous Vegetation

Wild Oats - (Purple Needlegrass - Erect Plantain) Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Avena (barbata, fatua)* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on moderate to somewhat steep slopes at all aspects at elevations between 417 and 630 m. It is dominated by *Avena fatua* in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (8) and South Wilderness (2) areas of Pinnacles National Monument. This disturbed exotic grassland is likely to occur throughout California, but it has not been documented quantitatively.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on moderate to somewhat steep slopes at all aspects at elevations between 417 and 630 m.

Elevation: Mean 547.7 m, Range 417 - 630 m.
Aspect: Northeast (1), South (3), Southeast (5), Southwest (1).
Slope: Mean 18.8 degrees, Range 12 - 25 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (2), Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (5).
Micro Topography: Concave or depression (2), Convex or rounded (2), Linear or even (2), Undulating pattern (4).

Fines Cover: Mean 17.6%, Range 2 - 50%.
Gravel Cover: Mean 19.2%, Range 2 - 40%.
Cobble Cover: Mean 0.6%, Range 0 - 1%.
Stone Cover: Mean 0.5%, Range 0 - 2%.
Bedrock Cover: Mean 3.1%, Range 0 - 22%.
Litter Cover: Mean 53.3%, Range 20 - 91%.
Stem Basal Area Cover: Mean 6.3%, Range 0 - 10%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Rhyolite (10).
Soil Texture: Clay or Clay Loam (2), Sand (3), Sandy Loam (3), Silt or Silt Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (10), heavy feral pig damage (1), light feral pig damage (3), moderate feral pig damage (3), and moderate grazing (2).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Avena fatua*. Characteristic forbs include *Clarkia purpurea ssp. quadrivulnera*, *Dichelostemma capitatum ssp. capitatum*, *Erodium cicutarium*, *Plagiobothrys nothofulvus*, and *Plantago erecta*, and characteristic graminoids are *Bromus hordeaceus* and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 35.3%, Range 21 - 65%.
Non-native Cover: Mean 28.9%, Range 10 - 64%.
Low Cover (<0.5m): Mean 21.2%, Range 4 - 46%.
Medium Cover (0.5-4.0m): Mean 15.5%, Range 1 - 60%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 24.7, Range 14 - 34.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	30	0.15	0.5	0.5			
Herb									
	PLER3	*Plantago erecta*	80	1.95	0.5	8	X		
	CLPUQ	*Clarkia purpurea ssp. quadrivulnera*	80	0.55	0.5	1	X		
	ERCI6	*Erodium cicutarium*	80	0.5	0.5	1	X		
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	80	0.4	0.5	0.5	X		
	PLNO	*Plagiobothrys nothofulvus*	80	0.4	0.5	0.5	X		
	HYRA3	*Hypochaeris radicata*	70	1.15	0.5	8			
	HYGL2	*Hypochaeris glabra*	60	4.7	0.5	40			
	LOHU2	*Lotus humistratus*	60	0.3	0.5	0.5			
	SEBI	*Selaginella bigelovii*	50	0.7	1	2			
	CAVE3	*Calochortus venustus*	50	0.25	0.5	0.5			
	FIGA	*Logfia gallica*	50	0.25	0.5	0.5			
	LOWR2	*Lotus wrangelianus*	40	0.25	0.5	1			
	LODA	*Lomatium dasycarpum*	40	0.2	0.5	0.5			
	TRAL5	*Trifolium albopurpureum var. albopurpureum*	40	0.2	0.5	0.5			
	TRGRG	*Trifolium gracilentum var. gracilentum*	40	0.2	0.5	0.5			
	URLI5	*Uropappus lindleyi*	40	0.2	0.5	0.5			
	BLCR	*Bloomeria crocea*	30	0.3	0.5	2			
	MIPI8	*Mimetanthe pilosa*	30	0.25	0.5	1			
	CEME2	*Centaurea melitensis*	30	0.2	0.5	1			
	CRCO34	*Crassula connata*	30	0.2	0.5	1			
	TRMI4	*Trifolium microcephalum*	30	0.2	0.5	1			
	ASTEXX	Asteraceae sp.	30	0.15	0.5	0.5			
	ASGA	*Astragalus gambelianus*	30	0.15	0.5	0.5			
	LOST4	*Lotus strigosus*	30	0.15	0.5	0.5			
	ZIFR	*Zigadenus fremontii*	30	0.15	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	90	2.1	0.5	10	X		
	BRHO2	*Bromus hordeaceus*	90	1.2	0.5	3	X		
	AVFA	*Avena fatua*	80	11.85	4.5	21	X	X	X
	NAPU4	*Nassella pulchra*	70	1.1	0.5	4.5			
	BRDI3	*Bromus diandrus*	60	0.55	0.5	2			
	VUMY	*Vulpia myuros*	50	0.3	0.5	1			
	AVBA	*Avena barbata*	40	7.35	1	60			
	VUMI	*Vulpia microstachys*	30	0.25	0.5	1			
Nonvascular									
	MOSS	Moss sp.	50	0.45	0.5	2			
	LICHEN	Lichen sp.	40	0.6	0.5	4			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 10) PINN_056, PINN_057, PINN_058, PINN_059, PINN_060, PINN_061, PINN_062, PINN_537, PINN_539, PINN_817

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Eriogonum elongatum* Herbaceous Vegetation

Longstem Wild Buckwheat Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Eriogonum elongatum* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on steep slopes at all aspects except north facing, at elevations between 328 and 595 m. It is dominated by *Eriogonum elongatum* in the herbaceous layer. The emergent shrub layer includes *Eriodictyon tomentosum* and *Eriogonum fasciculatum var. foliolosum*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (5) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on steep slopes at all aspects except north facing, at elevations between 328 and 595 m.

Elevation: Mean 490.2 m, Range 328 - 595 m.
Aspect: East (1), South (2), West (2).
Slope: Mean 26.2 degrees, Range 20 - 33 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (5).
Micro Topography: Concave or depression (1), Linear or even (3), Undulating pattern (1).

Fines Cover: Mean 1.9%, Range 0.5 - 5%.
Gravel Cover: Mean 26.1%, Range 0.5 - 82%.
Cobble Cover: Mean 9.8%, Range 0 - 48%.
Stone Cover: Mean 0.4%, Range 0 - 2%.
Bedrock Cover: Mean 1.4%, Range 0 - 7%.
Litter Cover: Mean 57.2%, Range 2 - 94%.
Stem Basal Area Cover: Mean 3.6%, Range 0 - 6%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Granitic (1), Rhyolite (3).
Soil Texture: Sandy Loam (3), Unknown (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (4), moderate competition from exotics (1), light feral pig damage (2), moderate feral pig damage (1), and light grazing (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Eriogonum elongatum*. A characteristic forb includes *Clarkia* sp. The shrub layer includes *Eriodictyon tomentosum* and *Eriogonum fasciculatum var. foliolosum* at sparse cover.

Total Vegetation Cover: Mean 29.6%, Range 13 - 45%.
Non-native Cover: Mean 10.8%, Range 1 - 28%.
Low Cover (<0.5m): Mean 26.0%, Range 10 - 40%.
Medium Cover (0.5-4.0m): Mean 3.8%, Range 1 - 7%.
Tall Cover (>4.0m): Mean 2.0%, Range 2 - 2%.
Species Richness: Mean 22.2, Range 15 - 33.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									

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	ERTO	*Eriodictyon tomentosum*	60	1.5	0.5	5		X	
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	60	1.2	1	4		X	
	LUALA2	*Lupinus albifrons var. albifrons*	40	0.5	0.5	2			
Herb									
	EREL6	*Eriogonum elongatum*	100	13.4	1	30	X	X	X
	CLARK	*Clarkia* sp.	80	1.5	0.5	6	X		
	LOSCS2	*Lotus scoparius var. scoparius*	60	0.9	0.5	3			
	AMMEI2	*Amsinckia menziesii var. intermedia*	60	0.4	0.5	1			
	ERCI6	*Erodium cicutarium*	60	0.4	0.5	1			
	PLNO	*Plagiobothrys nothofulvus*	60	0.3	0.5	0.5			
	THLA3	*Thysanocarpus laciniatus*	60	0.3	0.5	0.5			
	ESCA	*Eschscholzia caespitosa*	40	0.3	0.5	1			
	BLCR	*Bloomeria crocea*	40	0.2	0.5	0.5			
	CEME2	*Centaurea melitensis*	40	0.2	0.5	0.5			
	CLUN	*Clarkia unguiculata*	40	0.2	0.5	0.5			
	CUSCU	*Cuscuta* sp.	40	0.2	0.5	0.5			
	GAAP2	*Galium aparine*	40	0.2	0.5	0.5			
	GAPOP	*Galium porrigens var. porrigens*	40	0.2	0.5	0.5			
	TRWI3	*Trifolium willdenowii*	40	0.2	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	60	6.6	3	20		X	
	AVENA	*Avena* sp.	60	2.3	0.5	6			
	BRDI3	*Bromus diandrus*	40	0.6	1	2			
	VUMY	*Vulpia myuros*	40	0.3	0.5	1			
	BRHO2	*Bromus hordeaceus*	40	0.2	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 5) PINN_084, PINN_168, PINN_609, PINN_790, PINN_840

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Erodium brachycarpum - Bromus hordeaceus - Bromus madritensis* Herbaceous Vegetation

Short-fruit Stork's-bill - Soft Brome - Compact Brome Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Bromus (diandrus, hordeaceus, madritensis)* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on gentle to somewhat steep slopes at all aspects at elevations between 305 and 593 m. It is dominated by *Erodium brachycarpum* and *Bromus hordeaceus* in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (9) and South Wilderness (3) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on gentle to somewhat steep slopes at all aspects at elevations between 305 and 593 m.

Elevation: Mean 526.5 m, Range 305 - 593 m.
Aspect: East (1), North (2), Northeast (1), Northwest (2), South (1), Southeast (1), Southwest (1), West (3).
Slope: Mean 6.0 degrees, Range 1 - 20 degrees.
Macro Topography: Middle 1/3 of slope (8), Middle 1/3 of slope to Ridgetop (3), Upper 1/3 of slope (1).
Micro Topography: Concave or depression (2), Linear or even (9), Undulating pattern (1).

Fines Cover: Mean 8.0%, Range 0 - 30%.
Gravel Cover: Mean 6.5%, Range 0 - 39%.
Cobble Cover: Mean 0.3%, Range 0 - 1%.
Stone Cover: Mean 0.3%, Range 0 - 1%.
Bedrock Cover: Mean 1.4%, Range 0 - 10%.
Litter Cover: Mean 77.0%, Range 40 - 95%.
Stem Basal Area Cover: Mean 6.6%, Range 3 - 15%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Granitic (9), Rhyolite (3).
Soil Texture: Sand (2), Sandy Loam (10).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (12), light feral pig damage (1), moderate feral pig damage (6), heavy grazing (2), moderate grazing (1), and light road/trail construction/maintenance (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Erodium brachycarpum* and *Bromus hordeaceus*. A characteristic graminoid is *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 55.4%, Range 28 - 83%.
Non-native Cover: Mean 50.1%, Range 27 - 80%.
Low Cover (<0.5m): Mean 53.3%, Range 14 - 72%.
Medium Cover (0.5-4.0m): Mean 7.1%, Range 0.5 - 20%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 20.4, Range 11 - 33.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Herb									
	ERBR14	*Erodium brachycarpum*	100	16.4	0.5	40	X	X	X
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	66.6	0.33	0.5	0.5			
	LUBI	*Lupinus bicolor*	58.3	0.41	0.5	2			
	ERCI6	*Erodium cicutarium*	50	5.20	0.5	60			
	AMMEI2	*Amsinckia menziesii var. intermedia*	50	0.25	0.5	0.5			
	CLARK	*Clarkia* sp.	50	0.25	0.5	0.5			
	TRGRG	*Trifolium gracilentum var. gracilentum*	50	0.25	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	41.6	0.33	0.5	2			
	PLNO	*Plagiobothrys nothofulvus*	41.6	0.25	0.5	1			
	CLPUQ	*Clarkia purpurea ssp. quadrivulnera*	41.6	0.20	0.5	0.5			
	CRCO34	*Crassula connata*	33.3	0.41	0.5	3			
	ASTEXX	Asteraceae sp.	33.3	0.20	0.5	1			
	LOWR2	*Lotus wrangelianus*	33.3	0.20	0.5	1			
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	33.3	0.16	0.5	0.5			
	FIGA	*Logfia gallica*	33.3	0.16	0.5	0.5			
	HYRA3	*Hypochaeris radicata*	33.3	0.16	0.5	0.5			
	LASE	*Lactuca serriola*	33.3	0.16	0.5	0.5			
	TRMI4	*Trifolium microcephalum*	33.3	0.16	0.5	0.5			
	SEBI	*Selaginella bigelovii*	25	0.5	1	4			
	PLER3	*Plantago erecta*	25	0.45	0.5	3			
	ALLAM2	*Allium lacunosum var. micranthum*	25	0.20	0.5	1			
	HESEE2	*Heterotheca sessiliflora ssp. echioides*	25	0.16	0.5	1			
	LENIN	*Lepidium nitidum var. nitidum*	25	0.16	0.5	1			
	LODA	*Lomatium dasycarpum*	25	0.16	0.5	1			
	DOCLP	*Dodecatheon clevelandii ssp. patulum*	25	0.125	0.5	0.5			
	SACR2	*Sanicula crassicaulis*	25	0.125	0.5	0.5			
	THCU	*Thysanocarpus curvipes*	25	0.125	0.5	0.5			
	TRVA	*Trifolium variegatum*	25	0.125	0.5	0.5			
	URLI5	*Uropappus lindleyi*	25	0.125	0.5	0.5			
Graminoid									
	BRHO2	*Bromus hordeaceus*	100	12	1	35	X	X	X
	BRMAR	*Bromus rubens*	100	4.125	0.5	10	X		
	VUBR	*Vulpia bromoides*	66.6	4.5	0.5	50			
	BRDI3	*Bromus diandrus*	58.3	3.75	0.5	15.5			
	AVBA	*Avena barbata*	41.6	0.75	0.5	6			
	HOMUL	*Hordeum murinum ssp. leporinum*	41.6	0.45	0.5	2			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 12) PINN_039, PINN_048, PINN_049, PINN_063, PINN_064, PINN_065, PINN_066, PINN_538, PINN_545, PINN_546, PINN_547, PINN_655

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Eschscholzia californica* Herbaceous Vegetation

California Poppy Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Eschscholzia californica* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on flat to gentle slopes at all aspects at elevations between 287 and 448 m. It is dominated by *Eschscholzia californica* and *Bromus hordeaceus* in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Kingman (1), McCabe Canyon (1), and Old Boundaries (5) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on flat to gentle slopes at all aspects at elevations between 287 and 448 m.

Elevation: Mean 358.6 m, Range 287 - 448 m.
Aspect: Flat (3), North (1), Northwest (1), South (1), Southeast (1).
Slope: Mean 1.1 degrees, Range 0 - 2 degrees.
Macro Topography: Bottom to Lower 1/3 of slope (2), Middle 1/3 of slope (4), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Linear or even (5), Undulating pattern (2).

Fines Cover: Mean 13.9%, Range 1 - 76%.
Gravel Cover: Mean 35.1%, Range 0.5 - 81%.
Cobble Cover: Mean 3.6%, Range 0 - 10%.
Stone Cover: Mean 0.6%, Range 0 - 3%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 45.1%, Range 2 - 94%.
Stem Basal Area Cover: Mean 2.1%, Range 0.5 - 5%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Granitic (2), Gravelly alluvium (2), Mixed alluvium (1), Sandy alluvium (2).
Soil Texture: Sand (6), Sandy Loam (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy altered flood/tidal regime (1), heavy competition from exotics (3), moderate competition from exotics (4), heavy dam/inundation (1), moderate development (1), light foot traffic/trampling (1), moderate foot traffic/trampling (1), and heavy grazing (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Eschscholzia californica* and *Bromus hordeaceus*. Characteristic graminoids are *Bromus diandrus*, *Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Vulpia myuros*.

Total Vegetation Cover: Mean 26.9%, Range 11 - 40%.
Non-native Cover: Mean 8.3%, Range 1 - 30%.
Low Cover (<0.5m): Mean 26.1%, Range 11 - 39%.
Medium Cover (0.5-4.0m): Mean 1.2%, Range 0.5 - 3%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 16.4, Range 10 - 29.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D

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Tree									
	PISA2-L	*Pinus sabiniana*	28.5	0.14	0.5	0.5			
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	28.5	0.14	0.5	0.5			
Herb									
	ESCA2	*Eschscholzia californica*	100	16.5	9	33	X	X	X
	HIIN3	*Hirschfeldia incana*	71.4	0.57	0.5	1.5			
	ERCI6	*Erodium cicutarium*	71.4	0.42	0.5	1			
	CLUN	*Clarkia unguiculata*	57.1	0.28	0.5	0.5			
	EREL8	*Eriogonum elegans*	57.1	0.28	0.5	0.5			
	AMMEI2	*Amsinckia menziesii var. intermedia*	42.8	0.28	0.5	1			
	LOPU3	*Lotus unifoliolatus var. unifoliolatus*	42.8	0.28	0.5	1			
	HYRA3	*Hypochaeris radicata*	42.8	0.21	0.5	0.5			
	ERBR14	*Erodium brachycarpum*	28.5	1.07	0.5	7			
	HYPOC	*Hypochaeris* sp.	28.5	0.35	0.5	2			
	LUBI	*Lupinus bicolor*	28.5	0.35	0.5	2			
	CEME2	*Centaurea melitensis*	28.5	0.21	0.5	1			
	HYGL2	*Hypochaeris glabra*	28.5	0.21	0.5	1			
	ARDR4	*Artemisia dracunculus*	28.5	0.14	0.5	0.5			
	CESO3	*Centaurea solstitialis*	28.5	0.14	0.5	0.5			
	CHGL	*Chaenactis glabriuscula*	28.5	0.14	0.5	0.5			
	RUSA	*Rumex salicifolius*	28.5	0.14	0.5	0.5			
Graminoid									
	BRDI3	*Bromus diandrus*	100	1.35	0.5	5	X		
	BRHO2	*Bromus hordeaceus*	85.7	2.92	0.5	15	X	X	X
	VUMY	*Vulpia myuros*	85.7	1.5	0.5	8	X		
	BRMAR	*Bromus rubens*	85.7	0.57	0.5	1	X		
	AVBA	*Avena barbata*	42.8	0.28	0.5	1			
	BRAR3	*Bromus arenarius*	42.8	0.21	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_159, PINN_166, PINN_619, PINN_651, PINN_924, PINN_931, PINN_941

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Heterotheca sessiliflora* ssp. *echioides* Herbaceous Vegetation

Sessileflower False Goldenaster Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Heterotheca sessiliflora* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on flat to steep slopes at all aspects at elevations between 295 and 521 m. It is dominated by *Heterotheca sessiliflora ssp. echioides* and *Bromus hordeaceus* in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Kingman (1), McCabe Canyon (2), and Old Boundaries (5) areas of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on flat to steep slopes at all aspects at elevations between 295 and 521 m.

Elevation: Mean 378.1 m, Range 295 - 521 m.
Aspect: East (1), Flat (1), North (1), Northwest (1), South (1), Southeast (1), Southwest (1), West (1).
Slope: Mean 7.1 degrees, Range 0 - 28 degrees.
Macro Topography: Bottom to Mid 1/3 of slope (1), Middle 1/3 of slope (4), Middle 1/3 of slope to Ridgetop (2), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Linear or even (8).

Fines Cover: Mean 35.3%, Range 2 - 77%.
Gravel Cover: Mean 12.0%, Range 2 - 30%.
Cobble Cover: Mean 0.3%, Range 0 - 0.5%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 49.9%, Range 9 - 91%.
Stem Basal Area Cover: Mean 2.8%, Range 1 - 5%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Granitic (1), Mixed alluvium (6), Sandy alluvium (1).
Soil Texture: Sand (6), Sandy Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include light altered flood/tidal regime (1), heavy competition from exotics (8), light feral pig damage (2), moderate feral pig damage (1), moderate foot traffic/trampling (2), heavy grazing (2), moderate grazing (1), and moderate road/trail construction/maintenance (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Heterotheca sessiliflora ssp. echioides* and *Bromus hordeaceus*.

Total Vegetation Cover: Mean 30.0%, Range 19 - 45%.
Non-native Cover: Mean 13.4%, Range 2 - 30%.
Low Cover (<0.5m): Mean 28.9%, Range 13 - 45%.
Medium Cover (0.5-4.0m): Mean 1.2%, Range 0.5 - 3%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 17.1, Range 13 - 23.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D

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Tree									
	PISA2-L	*Pinus sabiniana*	25	0.125	0.5	0.5			
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	50	0.25	0.5	0.5			
Herb									
	HESEE2	*Heterotheca sessiliflora ssp. echioides*	100	13.75	7	25	X	X	X
	CLPUQ	*Clarkia purpurea ssp. quadrivulnera*	62.5	0.43	0.5	1			
	HYGL2	*Hypochaeris glabra*	50	0.68	0.5	4			
	ERCI6	*Erodium cicutarium*	50	0.43	0.5	2			
	HYRA3	*Hypochaeris radicata*	50	0.25	0.5	0.5			
	ERBR14	*Erodium brachycarpum*	37.5	2.625	1	15			
	PECE2	*Penstemon centranthifolius*	37.5	0.43	0.5	2.5			
	EREL8	*Eriogonum elegans*	37.5	0.25	0.5	1			
	CHOCO	*Chamaesyce ocellata ssp.*	37.5	0.18	0.5	0.5			
	PLNO	*Plagiobothrys nothofulvus*	37.5	0.18	0.5	0.5			
	CACOV	*Calystegia collina ssp. venusta*	25	0.56	0.5	4			
	LOPU3	*Lotus unifoliolatus var. unifoliolatus*	25	0.31	0.5	2			
	CUCA	*Cuscuta californica*	25	0.18	0.5	1			
	FIGA	*Logfia gallica*	25	0.18	0.5	1			
	CAEXE	*Castilleja exserta ssp. exserta*	25	0.125	0.5	0.5			
	CLARK	*Clarkia* sp.	25	0.125	0.5	0.5			
	ESCA2	*Eschscholzia californica*	25	0.125	0.5	0.5			
	LOSQS	*Loeflingia squarrosa ssp. squarrosa*	25	0.125	0.5	0.5			
	LUBI	*Lupinus bicolor*	25	0.125	0.5	0.5			
	ORCAJ	*Orobanche californica ssp. jepsonii*	25	0.125	0.5	0.5			
	PLER3	*Plantago erecta*	25	0.125	0.5	0.5			
	STVIP	*Stephanomeria virgata ssp. pleurocarpa*	25	0.125	0.5	0.5			
Graminoid									
	BRHO2	*Bromus hordeaceus*	87.5	5.68	0.5	20	X	X	X
	AVBA	*Avena barbata*	75	0.43	0.5	1			
	BRMAR	*Bromus rubens*	62.5	1.18	0.5	5			
	BRDI3	*Bromus diandrus*	62.5	1.125	0.5	5			
	VUMY	*Vulpia myuros*	50	1.18	0.5	5			
	BRAR3	*Bromus arenarius*	37.5	0.18	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 8) PINN_137, PINN_548, PINN_590, PINN_653, PINN_672, PINN_824, PINN_922, PINN_926

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Sedum spathulifolium* - Moss - Bedrock Herbaceous Vegetation

Pacific Stonecrop - Moss - Bedrock Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Sedum spathulifolium* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on steep slopes with all aspects at elevations between 365 and 488 m. It is dominated by *Sedum spathulifolium* and in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (7) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on steep slopes at all aspects at elevations between 365 and 488 m.

Elevation: Mean 425.7 m, Range 365 - 488 m.
Aspect: East (1), North (1), Northeast (2), Northwest (2), West (1).
Slope: Mean 56.7 degrees, Range 41 - 73 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (4), Upper 1/3 of slope (2), Upper 1/3 of slope to Ridgetop (1).
Micro Topography: Convex or rounded (2), Linear or even (4), Undulating pattern (1).

Fines Cover: Mean 15.9%, Range 1 - 56%.
Gravel Cover: Mean 5.3%, Range 0 - 20%.
Cobble Cover: Mean 0.1%, Range 0 - 0.5%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 54.1%, Range 20 - 90%.
Litter Cover: Mean 23.1%, Range 1 - 50%.
Stem Basal Area Cover: Mean 1.7%, Range 1 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (7).
Soil Texture: Unknown (7).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include light competition from exotics (5), light foot traffic/trampling (1), moderate foot traffic/trampling (1), and light road/trail construction/maintenance (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Sedum spathulifolium*.

Total Vegetation Cover: Mean 85.1%, Range 67 - 98%.
Non-native Cover: Mean 0.6%, Range 0.5 - 1%.
Low Cover (<0.5m): Mean 84.9%, Range 67 - 97%.
Medium Cover (0.5-4.0m): Mean 0.7%, Range 0.5 - 1%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 9.9, Range 3 - 18.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	HEAR5	*Heteromeles arbutifolia*	28.5	0.21	0.5	1			
Herb									
	SESP	*Sedum spathulifolium*	100	39.5	35	45	X	X	X

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	PETRT	*Pentagramma triangularis ssp. triangularis*	57.1	0.35	0.5	1			
	POCA12	*Polypodium californicum*	57.1	0.35	0.5	1			
	CLARK	*Clarkia* sp.	42.8	0.21	0.5	0.5			
	DULA	*Dudleya lanceolata*	42.8	0.21	0.5	0.5			
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	28.5	0.14	0.5	0.5			
	ERPEP4	*Erigeron petrophilus var. petrophilus*	28.5	0.14	0.5	0.5			
	GAAP2	*Galium aparine*	28.5	0.14	0.5	0.5			
	GAPOP	*Galium porrigens var. porrigens*	28.5	0.14	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	71.4	0.5	0.5	1		X	
	METO	*Melica torreyana*	42.8	0.21	0.5	0.5			
Nonvascular									
	MOSS	Moss sp.	100	57.1	45	75	X	X	X
	LICHEN	Lichen sp.	57.1	0.28	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_101, PINN_102, PINN_103, PINN_104, PINN_111, PINN_112, PINN_113

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]*: Avena barbata - Melica imperfecta* Herbaceous Vegetation

Barbed Oats - Coast Range MelicgrassHerbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	Not Applicable

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on steep slopes facing southwest and west at elevations between 866 and 878 m. It is dominated by *Avena barbata* in the herbaceous layer. The emergent tree layer includes *Pinus sabiniana*, and the emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum*. Nonvascular taxa include *Caloplaca* sp.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (3) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on steep slopes facing southwest and west at elevations between 866 and 878 m.

Elevation: Mean 872.0 m, Range 866 - 878 m.
Aspect: Southwest (1), West (2).
Slope: Mean 27.7 degrees, Range 25 - 30 degrees.
Macro Topography: Upper 1/3 of slope (1), Upper 1/3 of slope to Ridgetop (2).
Micro Topography: Concave or depression (1), Convex or rounded (1), Linear or even (1).

Fines Cover: Mean 3.0%, Range 3 - 3%.
Gravel Cover: Mean 72.0%, Range 63 - 79%.
Cobble Cover: Mean 0.7%, Range 0.5 - 1%.
Stone Cover: Mean 1.0%, Range 0.5 - 2%.
Bedrock Cover: Mean 0.7%, Range 0.5 - 1%.
Litter Cover: Mean 21.0%, Range 12 - 31%.
Stem Basal Area Cover: Mean 2.3%, Range 2 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (1), Mixed igneous (1), Rhyolite (1).
Soil Texture: Sand (2), Silt or Silt Loam (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (3), light feral pig damage (2), heavy grazing (1), and moderate grazing (2).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Avena barbata*. Characteristic forbs include *Dichelostemma capitatum ssp. capitatum* and *Galium porrigens var. porrigens*, and characteristic graminoids are *Bromus hordeaceus*, *Bromus rubens (= Bromus madritensis ssp. rubens)*, and *Melica imperfecta*. The tree layer includes *Pinus sabiniana* as sparse emergents.

Total Vegetation Cover: Mean 24.0%, Range 17 - 37%.
Non-native Cover: Mean 14.0%, Range 13 - 15%.
Low Cover (<0.5m): Mean 24.3%, Range 17 - 38%.
Medium Cover (0.5-4.0m): Mean 0.8%, Range 0.5 - 1%.
Tall Cover (>4.0m): Mean 1.0%, Range 1 - 1%.
Species Richness: Mean 28.7, Range 21 - 43.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D

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Tree									
	PISA2-M	*Pinus sabiniana*	66.6	0.5	0.5	1		X	
	PISA2-L	*Pinus sabiniana*	66.6	0.33	0.5	0.5			
	PISA2-T	*Pinus sabiniana*	33.3	0.33	1	1			
Shrub									
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	100	0.66	0.5	1	X	X	X
	CEBE3	*Cercocarpus montanus var. glaber*	66.6	0.33	0.5	0.5			
	ERTO	*Eriodictyon tomentosum*	66.6	0.33	0.5	0.5			
	CECUC3	*Ceanothus cuneatus var. cuneatus*	33.3	0.16	0.5	0.5			
	LOSUD	*Lonicera subspicata var. denudata*	33.3	0.16	0.5	0.5			
	RHIL	*Rhamnus ilicifolia*	33.3	0.16	0.5	0.5			
	TODI	*Toxicodendron diversilobum*	33.3	0.16	0.5	0.5			
Herb									
	GAPOP	*Galium porrigens var. porrigens*	100	0.83	0.5	1	X		
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	100	0.5	0.5	0.5	X		
	MOVIV	*Monardella villosa ssp. villosa*	66.6	1.16	0.5	3			
	SEBI	*Selaginella bigelovii*	66.6	1	1	2			
	ERCI6	*Erodium cicutarium*	66.6	0.5	0.5	1			
	AMMEI2	*Amsinckia menziesii var. intermedia*	66.6	0.33	0.5	0.5			
	CLARK	*Clarkia* sp.	66.6	0.33	0.5	0.5			
	CRYPT	*Cryptantha* sp.	66.6	0.33	0.5	0.5			
	GAAP2	*Galium aparine*	66.6	0.33	0.5	0.5			
	LOSCS2	*Lotus scoparius var. scoparius*	66.6	0.33	0.5	0.5			
	PHIMI	*Phacelia imbricata ssp. imbricata*	66.6	0.33	0.5	0.5			
	SOUM	*Solanum umbelliferum*	66.6	0.33	0.5	0.5			
	THLA3	*Thysanocarpus laciniatus*	66.6	0.33	0.5	0.5			
	GAANA2	*Galium angustifolium ssp. angustifolium*	33.3	2.66	8	8			
	EREL6	*Eriogonum elongatum*	33.3	1	3	3			
	ERCOC12	*Eriophyllum confertiflorum var. confertiflorum*	33.3	0.66	2	2			
	ACMI2	*Achillea millefolium*	33.3	0.33	1	1			
	HESEE2	*Heterotheca sessiliflora ssp. echioides*	33.3	0.33	1	1			
	CAPUP2	*Calystegia purpurata ssp. purpurata*	33.3	0.16	0.5	0.5			
	CIOCV	*Cirsium occidentale var. venustum*	33.3	0.16	0.5	0.5			
	CLPUQ	*Clarkia purpurea ssp. quadrivulnera*	33.3	0.16	0.5	0.5			
	COHE	*Collinsia heterophylla*	33.3	0.16	0.5	0.5			
	DEPAP7	*Delphinium patens ssp. patens*	33.3	0.16	0.5	0.5			
	ERCAC	*Erysimum capitatum var. capitatum*	33.3	0.16	0.5	0.5			
	FIGA	*Logfia gallica*	33.3	0.16	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	33.3	0.16	0.5	0.5			
	PEAN2	*Pellaea andromedifolia*	33.3	0.16	0.5	0.5			
	PEMUM	*Pellaea mucronata ssp. mucronata*	33.3	0.16	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	33.3	0.16	0.5	0.5			
	PLNO	*Plagiobothrys nothofulvus*	33.3	0.16	0.5	0.5			
	PTDR	*Pterostegia drymarioides*	33.3	0.16	0.5	0.5			
	SACO6	*Salvia columbariae*	33.3	0.16	0.5	0.5			
	THCU	*Thysanocarpus curvipes*	33.3	0.16	0.5	0.5			
	TRAL5	*Trifolium albopurpureum var.*	33.3	0.16	0.5	0.5			

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		albopurpureum							
	TRWI3	*Trifolium willdenowii*	33.3	0.16	0.5	0.5			
	URLI5	*Uropappus lindleyi*	33.3	0.16	0.5	0.5			
Graminoid									
	AVBA	*Avena barbata*	100	9.33	8	10	X	X	X
	BRMAR	*Bromus rubens*	100	2.33	1	3	X		
	MEIM	*Melica imperfecta*	100	2.16	0.5	5	X		
	BRHO2	*Bromus hordeaceus*	100	1.16	0.5	2	X		
	VUMY	*Vulpia myuros*	66.6	0.5	0.5	1			
	AVFA	*Avena fatua*	33.3	0.16	0.5	0.5			
	ELYMU	*Elymus* sp.	33.3	0.16	0.5	0.5			
Nonvascular									
	CALOP7	*Caloplaca* sp.	66.6	0.33	0.5	0.5		X	
	CR_CRUST	Cryptobiotic Crust	33.3	0.16	0.5	0.5			
	LICHEN	Lichen sp.	33.3	0.16	0.5	0.5			
	UMBIL2	*Umbilicaria* sp.	33.3	0.16	0.5	0.5			
	XANTH7	*Xanthoparmelia* sp.	33.3	0.16	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 3) PINN_626, PINN_630, PINN_631

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]: *Epilobium canum* Herbaceous Vegetation

Hummingbird Trumpet Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	Not Applicable

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on a very steep northwest-facing slope at an elevation of 299 m. It is dominated by *Epilobium canum ssp. canum* and *Vulpia myuros* in the herbaceous layer. The emergent shrub layer includes *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides)* and *Toxicodendron diversilobum.* Nonvascular taxa include a liverwort species.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (1) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on a very steep northwest-facing slope at an elevation of 299 m.

Elevation: Mean 299.0 m, Range 299 - 299 m.
Aspect: Northwest (1).
Slope: Mean 52.0 degrees, Range 52 - 52 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1).
Micro Topography: Linear or even (1).

Fines Cover: Mean 55.0%, Range 55 - 55%.
Gravel Cover: Mean 5.0%, Range 5 - 5%.
Cobble Cover: Mean 2.0%, Range 2 - 2%.
Stone Cover: Mean 1.0%, Range 1 - 1%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 35.0%, Range 35 - 35%.
Stem Basal Area Cover: Mean 2.0%, Range 2 - 2%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Granitic (1).
Soil Texture: Sandy Loam (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (1) and moderate erosion/runoff (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Epilobium canum ssp. canum* and *Vulpia myuros*. Characteristic forbs include *Bloomeria crocea, Clarkia unguiculata, Lupinus bicolor, Plectritis* sp., and *Trifolium willdenowii*, and characteristic graminoids are *Bromus arenarius, Bromus diandrus, Bromus rubens (= Bromus madritensis ssp. rubens),* and *Poa secunda (= ssp. secunda). Pentagramma triangularis ssp. triangularis* is a characteristic fern.

Total Vegetation Cover: Mean 28.0%, Range 28 - 28%.
Non-native Cover: Mean 7.0%, Range 7 - 7%.
Low Cover (<0.5m): Mean 27.0%, Range 27 - 27%.
Medium Cover (0.5-4.0m): Mean 1.0%, Range 1 - 1%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 17.0, Range 17 - 17.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	CEBE3	*Cercocarpus montanus var. glaber*	100	0.5	0.5	0.5	X	X	X
	TODI	*Toxicodendron diversilobum*	100	0.5	0.5	0.5	X	X	X
Herb									
	EPCAC2	*Epilobium canum ssp. canum*	100	20	20	20	X	X	X
	TRWI3	*Trifolium willdenowii*	100	1	1	1	X		
	BLCR	*Bloomeria crocea*	100	0.5	0.5	0.5	X		
	CLUN	*Clarkia unguiculata*	100	0.5	0.5	0.5	X		
	LUBI	*Lupinus bicolor*	100	0.5	0.5	0.5	X		
	PETRT	*Pentagramma triangularis ssp. triangularis*	100	0.5	0.5	0.5	X		
	PLECT	*Plectritis* sp.	100	0.5	0.5	0.5	X		
Graminoid									
	VUMY	*Vulpia myuros*	100	5	5	5	X	X	X
	BRAR3	*Bromus arenarius*	100	1	1	1	X		
	POSE	*Poa secunda*	100	1	1	1	X		
	BRDI3	*Bromus diandrus*	100	0.5	0.5	0.5	X		
	BRMAR	*Bromus rubens*	100	0.5	0.5	0.5	X		
Nonvascular									
	LICHEN	Lichen sp.	100	2	2	2	X	X	X
	MOSS	Moss sp.	100	2	2	2	X	X	X
	LIVER	Liverwort sp.	100	0.5	0.5	0.5	X		

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 1) PINN_138

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]*: Eriogonum nudum* Herbaceous Vegetation

Naked Wild Buckwheat Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Eriogonum nudum* Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on a flat north-facing slope at an elevation of 465 m. It is dominated by *Eriogonum nudum*, *Avena fatua*, and *Bromus rubens (= Bromus madritensis ssp. rubens)* in the herbaceous layer. The emergent shrub layer includes *Prunus ilicifolia ssp. ilicifolia*, *Heteromeles arbutifolia*, and *Toxicodendron diversilobum*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (1) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on a flat north-facing slope at an elevation of 465 m.

Elevation: Mean 465.0 m, Range 465 - 465 m.
Aspect: North (1).
Slope: Mean 0.5 degrees, Range 0.5 - 0.5 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (1).
Micro Topography: Undulating pattern (1).

Fines Cover: Mean 0.5%, Range 0.5 - 0.5%.
Gravel Cover: Mean 64.0%, Range 64 - 64%.
Cobble Cover: Mean 15.0%, Range 15 - 15%.
Stone Cover: Mean 15.0%, Range 15 - 15%.
Bedrock Cover: Mean 3.0%, Range 3 - 3%.
Litter Cover: Mean 2.0%, Range 2 - 2%.
Stem Basal Area Cover: Mean 1.0%, Range 1 - 1%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Rhyolite (1).
Soil Texture: Unknown (1).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include light competition from exotics (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Eriogonum nudum*, *Avena fatua*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*. Characteristic forbs include *Clarkia unguiculata*, *Delphinium* sp., *Galium aparine*, *Marah fabaceus*, *Orobanche uniflora*, and *Phacelia distans*, and a characteristic fern is *Pentagramma triangularis ssp. triangularis*. The shrub layer includes *Heteromeles arbutifolia* and *Toxicodendron diversilobum* at sparse cover.

Total Vegetation Cover: Mean 38.0%, Range 38 - 38%.
Non-native Cover: Mean 0.5%, Range 0.5 - 0.5%.
Low Cover (<0.5m): Mean 11.0%, Range 11 - 11%.
Medium Cover (0.5-4.0m): Mean 28.0%, Range 28 - 28%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 14.0, Range 14 - 14.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									

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	PRILI	*Prunus ilicifolia ssp. ilicifolia*	100	3	3	3	X	X	X
	HEAR5	*Heteromeles arbutifolia*	100	0.5	0.5	0.5	X		
	TODI	*Toxicodendron diversilobum*	100	0.5	0.5	0.5	X		
Herb									
	ERNU3	*Eriogonum nudum*	100	26	26	26	X	X	X
	PHDI	*Phacelia distans*	100	7	7	7	X		
	CLUN	*Clarkia unguiculata*	100	0.5	0.5	0.5	X		
	DELPH	*Delphinium* sp.	100	0.5	0.5	0.5	X		
	GAAP2	*Galium aparine*	100	0.5	0.5	0.5	X		
	MAFA3	*Marah fabaceus*	100	0.5	0.5	0.5	X		
	ORUN	*Orobanche uniflora*	100	0.5	0.5	0.5	X		
	PETRT	*Pentagramma triangularis ssp. triangularis*	100	0.5	0.5	0.5	X		
Graminoid									
	AVFA	*Avena fatua*	100	0.5	0.5	0.5	X	X	X
	BRMAR	*Bromus rubens*	100	0.5	0.5	0.5	X	X	X
Nonvascular									
	MOSS	Moss sp.	100	2	2	2	X	X	X

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 1) PINN_211

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]: *Vulpia bromoides - Deiandra lobbii* Herbaceous Vegetation

Brome Six-weeks Grass - Threeray Tarweed Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Vulpia bromoides* - Mixed Forb Herbaceous Alliance

PINNACLES LOCAL SUMMARY

This herbaceous association occurs on gentle east to southeast-facing slopes at elevations between 589 and 598 m. It is dominated by *Hemizonia lobbii* and *Vulpia bromoides* in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (3) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This herbaceous association occurs on gentle east to southeast-facing slopes at elevations between 589 and 598 m.

Elevation: Mean 594.7 m, Range 589 - 598 m.
Aspect: East (2), Southeast (1).
Slope: Mean 2.7 degrees, Range 2 - 3 degrees.
Macro Topography: Middle 1/3 of slope (2), Upper 1/3 of slope (1).
Micro Topography: Concave or depression (1), Linear or even (1), Mounded (1).

Fines Cover: Mean 23.3%, Range 15 - 35%.
Gravel Cover: Mean 0.5%, Range 0.5 - 0.5%.
Cobble Cover: Mean 0.0%, Range 0 - 0%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 71.7%, Range 60 - 80%.
Stem Basal Area Cover: Mean 5.0%, Range 5 - 5%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Unknown (3).
Soil Texture: Clay or Clay Loam (1), Silt or Silt Loam (2).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (2), moderate competition from exotics (1), heavy feral pig damage (3), and light foot traffic/trampling (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the herbaceous layer is dominated by *Hemizonia lobbii* and *Vulpia bromoides*.

Total Vegetation Cover: Mean 65.3%, Range 61 - 71%.
Non-native Cover: Mean 28.7%, Range 18 - 41%.
Low Cover (<0.5m): Mean 63.0%, Range 57 - 71%.
Medium Cover (0.5-4.0m): Mean 2.7%, Range 0.5 - 7%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 13.0, Range 12 - 14.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Herb									
	HELO4	*Hemizonia lobbii*	100	30	30	30	X	X	X
	ERBR14	*Erodium brachycarpum*	100	3	2	4	X		
	CLPUQ	*Clarkia purpurea ssp.*	100	1	0.5	1.5	X		

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		quadrivulnera							
	CRCO34	*Crassula connata*	100	0.5	0.5	0.5	X		
	CEGL2	*Cerastium glomeratum*	66.6	0.33	0.5	0.5			
	PLAGI	*Plagiobothrys* sp.	33.3	2.66	8	8			
	AMMEI2	*Amsinckia menziesii var. intermedia*	33.3	0.33	1	1			
	CLPEP	*Claytonia perfoliata ssp. perfoliata*	33.3	0.16	0.5	0.5			
	ERSE3	*Croton setigerus*	33.3	0.16	0.5	0.5			
	LASE	*Lactuca serriola*	33.3	0.16	0.5	0.5			
	LUBI	*Lupinus bicolor*	33.3	0.16	0.5	0.5			
	MOFO	*Montia fontana*	33.3	0.16	0.5	0.5			
	RUCR	*Rumex crispus*	33.3	0.16	0.5	0.5			
	SEVU	*Senecio vulgaris*	33.3	0.16	0.5	0.5			
	STPA13	*Stellaria media ssp. pallida*	33.3	0.16	0.5	0.5			
	TRMI4	*Trifolium microcephalum*	33.3	0.16	0.5	0.5			
	TRIFO	*Trifolium* sp.	33.3	0.16	0.5	0.5			
Graminoid									
	VUBR	*Vulpia bromoides*	100	16.6	10	25	X	X	X
	BRHO2	*Bromus hordeaceus*	100	8.5	5	10.5	X		
	BRDI3	*Bromus diandrus*	100	1.66	0.5	2.5	X		
	HOBRC2	*Hordeum brachyantherum ssp. californicum*	66.6	1.83	0.5	5			
	BRMAR	*Bromus rubens*	33.3	0.5	1.5	1.5			
	JUBU	*Juncus bufonius*	33.3	0.16	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 3) PINN_192, PINN_193, PINN_195

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Unclassified]: *Vulpia bromoides - Plagiobothrys canescens - Amsinckia menziesii* Herbaceous Vegetation

Brome Six-weeks Grass - Valley Popcornflower - Menzies' Fiddleneck Herbaceous Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	*Vulpia bromoides* - Mixed Forb Herbaceous Alliance

PINNACLES LOCAL SUMMARY
This herbaceous association occurs on gentle northwest-facing slopes at elevations between 335 and 340 m. It is dominated by *Plagiobothrys canescens* and *Vulpia bromoides* in the herbaceous layer.

PINNACLES LOCAL DISTRIBUTION
This association was sampled in the Kingman (2) area of Pinnacles National Monument.

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION
This herbaceous association occurs on gentle northwest-facing slopes at elevations between 335 and 340 m.

Elevation: Mean 337.5 m, Range 335 - 340 m.
Aspect: Northwest (2).
Slope: Mean 2.0 degrees, Range 2 - 2 degrees.
Macro Topography: Middle 1/3 of slope (2).
Micro Topography: Linear or even (2).

Fines Cover: Mean 4.0%, Range 3 - 5%.
Gravel Cover: Mean 0.5%, Range 0.5 - 0.5%.
Cobble Cover: Mean 0.0%, Range 0 - 0%.
Stone Cover: Mean 0.0%, Range 0 - 0%.
Bedrock Cover: Mean 0.0%, Range 0 - 0%.
Litter Cover: Mean 93.5%, Range 92 - 95%.
Stem Basal Area Cover: Mean 2.0%, Range 2 - 2%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Granitic (2).
Soil Texture: Sand (2).

PINNACLES LOCAL SITE IMPACTS
Impacts observed in plots of this association include heavy competition from exotics (2), heavy development (1), light development (1), and heavy grazing (2).

PINNACLES LOCAL VEGETATION DESCRIPTION
In this association, the herbaceous layer is dominated by *Plagiobothrys canescens* and *Vulpia bromoides*. Characteristic forbs include *Amsinckia menziesii var. menziesii, Centaurea solstitialis, Erodium cicutarium,* and *Lupinus bicolor*, and characteristic graminoids are *Bromus diandrus, Bromus hordeaceus*, and *Hordeum murinum ssp. leporinum*.

Total Vegetation Cover: Mean 68.5%, Range 67 - 70%.
Non-native Cover: Mean 41.0%, Range 34 - 48%.
Low Cover (<0.5m): Mean 63.5%, Range 59 - 68%.
Medium Cover (0.5-4.0m): Mean 5.5%, Range 2 - 9%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 14.0, Range 13 - 15.

STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D

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Herb									
	PLCA2	*Plagiobothrys canescens*	100	22	13	31	X	X	X
	AMMEM2	*Amsinckia menziesii var.*	100	5.75	2	9.5	X		
	ERCI6	*Erodium cicutarium*	100	2	2	2	X		
	CESO3	*Centaurea solstitialis*	100	1.25	0.5	2	X		
	LUBI	*Lupinus bicolor*	100	0.5	0.5	0.5	X		
	ESCA2	*Eschscholzia californica*	50	2.5	5	5			
	CACO34	*Camissonia contorta*	50	0.25	0.5	0.5			
	CAEXE	*Castilleja exserta ssp. exserta*	50	0.25	0.5	0.5			
	ERBR14	*Erodium brachycarpum*	50	0.25	0.5	0.5			
	GICAS3	*Gilia capitata ssp. staminea*	50	0.25	0.5	0.5			
	GILIA	*Gilia* sp.	50	0.25	0.5	0.5			
	HIIN3	*Hirschfeldia incana*	50	0.25	0.5	0.5			
	PLNO	*Plagiobothrys nothofulvus*	50	0.25	0.5	0.5			
	TRGR5	*Tropidocarpum gracile*	50	0.25	0.5	0.5			
Graminoid									
	VUBR	*Vulpia bromoides*	100	26	20	32	X	X	X
	BRDI3	*Bromus diandrus*	100	9.5	9	10	X		
	HOMUL	*Hordeum murinum ssp. leporinum*	100	2.5	2	3	X		
	BRHO2	*Bromus hordeaceus*	100	0.5	0.5	0.5	X		
	HOVU	*Hordeum vulgare*	50	0.25	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 2) PINN_124, PINN_125

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Collinsia heterophylla* - Lichen Sparse Vegetation

Harlequin Blue-eyed Mary - Lichen Sparse Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	Rock-Cobble-Gravel Lichen Sparsely Vegetated Alliance

PINNACLES LOCAL SUMMARY

This sparse association occurs on somewhat steep to steep north- and east-facing slopes at elevations between 309 and 879 m. It occurs on rock outcrops and is dominated by lichen and moss species. Herbaceous vascular species may be present at low cover and include *Amsinckia menziesii var. intermedia, Collinsia heterophylla, Cryptantha* sp., *Dichelostemma capitatum ssp. capitatum*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (10) areas of Pinnacles National Monument, within the USDA Ecological Section(s) and Subsection(s).

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This sparse association occurs on somewhat steep to steep north- and east-facing slopes at elevations between 309 and 879 m.

Elevation: Mean 511.3 m, Range 309 - 879 m.
Aspect: East (1), North (4), Northeast (3), Northwest (2).
Slope: Mean 27.8 degrees, Range 20 - 35 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (4), Ridge top (1), Upper 1/3 of slope (5).
Micro Topography: Convex or rounded (1), Linear or even (7), Undulating pattern (2).

Fines Cover: Mean 1.0%, Range 0.5 - 2%.
Gravel Cover: Mean 87.7%, Range 75 - 98%.
Cobble Cover: Mean 4.2%, Range 0.5 - 20%.
Stone Cover: Mean 0.7%, Range 0 - 3%.
Bedrock Cover: Mean 1.6%, Range 0 - 7%.
Litter Cover: Mean 4.7%, Range 0.5 - 20%.
Stem Basal Area Cover: Mean 0.9%, Range 0 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Ash (1), Breccia (volcanic) (2), General volcanic extrusives (1), Rhyolite (6).
Soil Texture: Sandy Loam (1), Unknown (9).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (4), light competition from exotics (2), moderate competition from exotics (4), heavy erosion/runoff (1), heavy feral pig damage (1), light feral pig damage (1), moderate feral pig damage (1), heavy foot traffic/trampling (1), light foot traffic/trampling.

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the nonvascular layer is dominated by lichen and moss species. Herbaceous vascular plants may be present at low cover and include *Amsinckia menziesii var. intermedia, Collinsia heterophylla, Cryptantha* sp., *Dichelostemma capitatum ssp. capitatum*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

Total Vegetation Cover: Mean 10.5%, Range 1 - 40%.
Non-native Cover: Mean 2.2%, Range 0.5 - 10%.
Low Cover (<0.5m): Mean 9.5%, Range 0.5 - 32%.
Medium Cover (0.5-4.0m): Mean 3.3%, Range 0.5 - 14%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 28.0, Range 16 - 51.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	CEBE3	*Cercocarpus betuloides var. betuloides*	30	0.2	0.5	1			
Herb									
	COHE	*Collinsia heterophylla*	80	1.9	0.5	15	X		
	AMMEI2	*Amsinckia menziesii var. intermedia*	80	0.4	0.5	0.5	X		
	CRYPT	*Cryptantha* sp.	80	0.4	0.5	0.5	X		
	DICAC5	*Dichelostemma capitatum ssp. capitatum*	80	0.4	0.5	0.5	X		
	DEPAP5	*Delphinium parryi ssp. parryi*	70	0.35	0.5	0.5			
	MADIA	*Madia* sp.	60	0.3	0.5	0.5			
	PETRT	*Pentagramma triangularis ssp. triangularis*	60	0.3	0.5	0.5			
	SATU	*Sanicula tuberosa*	60	0.3	0.5	0.5			
	THLA3	*Thysanocarpus laciniatus*	60	0.3	0.5	0.5			
	TRWI3	*Trifolium willdenowii*	60	0.3	0.5	0.5			
	URLI5	*Uropappus lindleyi*	60	0.3	0.5	0.5			
	PHIMI	*Phacelia imbricata ssp. imbricata*	50	0.4	0.5	2			
	CLBR	*Clarkia breweri*	40	0.2	0.5	0.5			
	CLARK	*Clarkia* sp.	40	0.2	0.5	0.5			
	DUCY	*Dudleya cymosa*	40	0.2	0.5	0.5			
	YAMI	*Yabea microcarpa*	40	0.2	0.5	0.5			
	ERCI6	*Erodium cicutarium*	30	0.15	0.5	0.5			
	GAAP2	*Galium aparine*	30	0.15	0.5	0.5			
	GIACA	*Gilia achilleifolia ssp. achilleifolia*	30	0.15	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	30	0.15	0.5	0.5			
	LERE7	*Lewisia rediviva*	30	0.15	0.5	0.5			
	MAFA3	*Marah fabaceus*	30	0.15	0.5	0.5			
	PEAN2	*Pellaea andromedifolia*	30	0.15	0.5	0.5			
	PHAUA2	*Pholistoma auritum var. auritum*	30	0.15	0.5	0.5			
	PLCIC	*Plectritis ciliosa ssp. ciliosa*	30	0.15	0.5	0.5			
	THCU	*Thysanocarpus curvipes*	30	0.15	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	90	0.5	0.5	1	X		
	VUMI	*Vulpia microstachys*	70	0.85	0.5	5			
	AVBA	*Avena barbata*	70	0.5	0.5	2			
	BRHO2	*Bromus hordeaceus*	70	0.4	0.5	1			
	MEIM	*Melica imperfecta*	50	0.3	0.5	1			
	VUMY	*Vulpia myuros*	40	1.05	0.5	5			
	BRDI3	*Bromus diandrus*	40	0.2	0.5	0.5			
Nonvascular									
	MOSS	Moss sp.	70	0.95	0.5	5		X	
	XANTH7	*Xanthoparmelia* sp.	50	0.5	0.5	3			
	UMBIL2	*Umbilicaria* sp.	50	0.25	0.5	0.5			
	LICHEN	Lichen sp.	40	0.65	0.5	4			

OTHER NOTEWORTHY SPECIES:

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SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 10) PINN_188, PINN_628, PINN_633, PINN_634, PINN_635, PINN_636, PINN_638, PINN_767, PINN_854, PINN_865

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] *Eriogonum wrightii* - Lichen Sparse Vegetation

Bastard-sage - Lichen Sparse Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	Rock-Cobble-Gravel Lichen Sparsely Vegetated Alliance

PINNACLES LOCAL SUMMARY

This sparse association occurs on steep slopes on all aspects at elevations between 733 and 911 m. It occurs on rock outcrops and gravel patches below steep slopes. It is dominated by lichen and moss species. Vascular plant species present include the shrub *Eriogonum wrightii var. subscaposum* and herbaceous species such as *Allium fimbriatum var. fimbriatum, Dudleya cymosa, Avena barbata,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (7) areas of Pinnacles National Monument, within the USDA Ecological Section(s) and Subsection(s).

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This sparse association occurs on steep slopes on all aspects at elevations between 733 and 911 m.

Elevation: Mean 823.1 m, Range 733 - 911 m.
Aspect: North (1), Northwest (1), Southwest (2), West (3).
Slope: Mean 26.9 degrees, Range 21 - 31 degrees.
Macro Topography: Upper 1/3 of slope (3), Upper 1/3 of slope to Ridgetop (4).
Micro Topography: Convex or rounded (2), Linear or even (5).

Fines Cover: Mean 1.1%, Range 0.5 - 2%.
Gravel Cover: Mean 91.4%, Range 80 - 98%.
Cobble Cover: Mean 1.6%, Range 0.5 - 4%.
Stone Cover: Mean 0.2%, Range 0 - 1%.
Bedrock Cover: Mean 4.6%, Range 0.5 - 10%.
Litter Cover: Mean 1.4%, Range 0.5 - 3%.
Stem Basal Area Cover: Mean 0.9%, Range 0.5 - 3%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Breccia (volcanic) (2), General volcanic extrusives (3), Mixed igneous (2).
Soil Texture: Unknown (7).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include heavy competition from exotics (1), light competition from exotics (1), moderate competition from exotics (5), light foot traffic/trampling (2), light grazing (1), and moderate grazing (1).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the nonvascular layer is dominated by *Umbilicaria* sp. and *Xanthoparmelia* sp. The herbaceous layer may include low cover of the forbs *Allium fimbriatum var. fimbriatum* and *Dudleya cymosa*, and the graminoids *Avena barbata* and *Bromus rubens (= Bromus madritensis ssp. rubens).*

Total Vegetation Cover: Mean 7.7%, Range 4 - 18%.
Non-native Cover: Mean 1.4%, Range 0.5 - 2%.
Low Cover (<0.5m): Mean 7.4%, Range 3 - 17%.
Medium Cover (0.5-4.0m): Mean 0.8%, Range 0.5 - 1%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 23.0, Range 16 - 38.

STAND TABLE

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Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Shrub									
	ERWRS	*Eriogonum wrightii var. subscaposum*	100	1.85	1	3	X	X	X
	ERFAF2	*Eriogonum fasciculatum var. foliolosum*	57.1	0.28	0.5	0.5			
Herb									
	DUCY	*Dudleya cymosa*	100	0.5	0.5	0.5	X		
	ALFIF	*Allium fimbriatum var. fimbriatum*	85.7	0.42	0.5	0.5	X		
	ERCI6	*Erodium cicutarium*	57.1	0.28	0.5	0.5			
	LERE7	*Lewisia rediviva*	57.1	0.28	0.5	0.5			
	MIDO3	*Minuartia douglasii*	57.1	0.28	0.5	0.5			
	ERPEP4	*Erigeron petrophilus var. petrophilus*	42.8	0.21	0.5	0.5			
	HYGL2	*Hypochaeris glabra*	42.8	0.21	0.5	0.5			
	MICAC2	*Micropus californicus var. californicus*	42.8	0.21	0.5	0.5			
	SEVU	*Senecio vulgaris*	42.8	0.21	0.5	0.5			
	URLI5	*Uropappus lindleyi*	42.8	0.21	0.5	0.5			
	SEBI	*Selaginella bigelovii*	28.5	0.71	1	4			
	ALLAM2	*Allium lacunosum var. micranthum*	28.5	0.21	0.5	1			
	ERCOC12	*Eriophyllum confertiflorum var. confertiflorum*	28.5	0.21	0.5	1			
	CEME2	*Centaurea melitensis*	28.5	0.14	0.5	0.5			
	CIOCV	*Cirsium occidentale var. venustum*	28.5	0.14	0.5	0.5			
	CLARK	*Clarkia* sp.	28.5	0.14	0.5	0.5			
	CLGY2	*Claytonia gypsophiloides*	28.5	0.14	0.5	0.5			
	COHE	*Collinsia heterophylla*	28.5	0.14	0.5	0.5			
	ERSA6	*Eriogonum saxatile*	28.5	0.14	0.5	0.5			
	FIGA	*Logfia gallica*	28.5	0.14	0.5	0.5			
	SATU	*Sanicula tuberosa*	28.5	0.14	0.5	0.5			
	THCU	*Thysanocarpus curvipes*	28.5	0.14	0.5	0.5			
	TRWI3	*Trifolium willdenowii*	28.5	0.14	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	100	0.85	0.5	2	X		
	AVBA	*Avena barbata*	100	0.5	0.5	0.5	X		
	VUMY	*Vulpia myuros*	71.4	0.57	0.5	1			
	BRHO2	*Bromus hordeaceus*	71.4	0.35	0.5	0.5			
	LAAU	*Lamarckia aurea*	28.5	0.14	0.5	0.5			
	NAPU4	*Nassella pulchra*	28.5	0.14	0.5	0.5			
	POA	*Poa* sp.	28.5	0.14	0.5	0.5			
	POACXX	Poaceae sp.	28.5	0.14	0.5	0.5			

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VULPI	*Vulpia* sp.	28.5	0.14	0.5	0.5			
Nonvascular								
UMBIL2	*Umbilicaria* sp.	100	1.14	0.5	4	X	X	X
XANTH7	*Xanthoparmelia* sp.	85.7	1.57	0.5	5	X	X	X
LICHEN	Lichen sp.	57.1	0.92	0.5	3		X	
MOSS	Moss sp.	57.1	0.28	0.5	0.5			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 7) PINN_858, PINN_859, PINN_861, PINN_862, PINN_879, PINN_880, PINN_881

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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[Park Special] Lichen Gravel - Bedrock Nonvascular Sparse Vegetation

Lichen Gravel - Bedrock Nonvascular Sparse Vegetation

CODE	Park Special
PHYSIOGNOMIC CLASS	Not Applicable
PHYSIOGNOMIC SUBCLASS	Not Applicable
PHYSIOGNOMIC GROUP	Not Applicable
PHYSIOGNOMIC SUBGROUP	Not Applicable
FORMATION	Not Applicable
SUGGESTED ALLIANCE	Rock-Cobble-Gravel Lichen Sparsely Vegetated Alliance

PINNACLES LOCAL SUMMARY

This sparse association occurs on moderate to very steep slopes on all aspects at elevations between 368 and 844 m. It occurs on rock outcrops and gravel patches below steep slopes. It is dominated by lichens in the nonvascular layer, which also may contain moss species. Vascular herbaceous plants may be present at low cover and include *Bromus rubens (= Bromus madritensis ssp. rubens)* and *Vulpia myuros*.

PINNACLES LOCAL DISTRIBUTION

This association was sampled in the Old Boundaries (30) areas of Pinnacles National Monument, within the USDA Ecological Section(s) and Subsection(s).

PINNACLES LOCAL ENVIRONMENTAL DESCRIPTION

This sparse association occurs on moderate to very steep slopes on all aspects at elevations between 368 and 844 m.

Elevation: Mean 651.2 m, Range 368 - 844 m.
Aspect: East (9), North (1), Northeast (4), Northwest (5), South (1), Southeast (2), Southwest (1), West (7).
Slope: Mean 30.5 degrees, Range 7 - 55 degrees.
Macro Topography: Middle 1/3 of slope to Ridgetop (4), Ridge top (6), Upper 1/3 of slope (12), Upper 1/3 of slope to Ridgetop (8).
Micro Topography: Concave or depression (1), Convex or rounded (5), Linear or even (12), Other (1), Undulating pattern (11).

Fines Cover: Mean 0.6%, Range 0 - 1%.
Gravel Cover: Mean 27.4%, Range 0 - 95%.
Cobble Cover: Mean 1.2%, Range 0 - 10%.
Stone Cover: Mean 0.4%, Range 0 - 3%.
Bedrock Cover: Mean 68.5%, Range 1 - 100%.
Litter Cover: Mean 2.3%, Range 0.5 - 16%.
Stem Basal Area Cover: Mean 0.5%, Range 0 - 2%.
Water Cover: Mean 0.0%, Range 0 - 0%.
Parent Material: Ash (4), Breccia (volcanic) (24), General volcanic extrusives (2).
Soil Texture: Sand (2), Unknown (28).

PINNACLES LOCAL SITE IMPACTS

Impacts observed in plots of this association include light competition from exotics (15), moderate competition from exotics (9), light feral pig damage (1), heavy foot traffic/trampling (3), light foot traffic/trampling (4), moderate foot traffic/trampling (5), and light vandalism/dumping/litter (7).

PINNACLES LOCAL VEGETATION DESCRIPTION

In this association, the nonvascular layer is dominated by *Xanthoparmelia* sp. The herbaceous layer may include low cover of the graminoids *Bromus rubens (= Bromus madritensis ssp. rubens)* and *Vulpia myuros*.

Total Vegetation Cover: Mean 54.9%, Range 2 - 95%.
Non-native Cover: Mean 1.4%, Range 0.5 - 4%.
Low Cover (<0.5m): Mean 54.5%, Range 2 - 95%.
Medium Cover (0.5-4.0m): Mean 1.3%, Range 0.5 - 4%.
Tall Cover (>4.0m): Mean 0.0%, Range 0 - 0%.
Species Richness: Mean 16.8, Range 8 - 36.

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STAND TABLE

Lifeform	Code	Species	Con	Avg	Min	Max	C	A	D
Herb									
	DUCY	*Dudleya cymosa*	53.3	0.26	0.5	0.5			
	SEBI	*Selaginella bigelovii*	43.3	0.33	0.5	2			
	ERPEP4	*Erigeron petrophilus var. petrophilus*	36.6	0.2	0.5	1			
	HYGL2	*Hypochaeris glabra*	30	0.15	0.5	0.5			
	LERE7	*Lewisia rediviva*	30	0.15	0.5	0.5			
	FIGA	*Logfia gallica*	26.6	0.13	0.5	0.5			
Graminoid									
	BRMAR	*Bromus rubens*	76.6	0.56	0.5	3	X	X	X
	VUMY	*Vulpia myuros*	56.6	0.4	0.5	2		X	
	BRHO2	*Bromus hordeaceus*	33.3	0.18	0.5	1			
	AVBA	*Avena barbata*	26.6	0.13	0.5	0.5			
Nonvascular									
	XANTH7	*Xanthoparmelia* sp.	96.6	16.7	1	53	X	X	X
	LICHEN	Lichen sp.	86.6	5.4	0.5	35	X		
	MOSS	Moss sp.	80	5.73	0.5	23	X		
	ASPIC2-	*Aspicilia* sp. (dark grey)	76.6	11.7	4	39	X		
	ASPIC2-	*Aspicilia* sp. (light grey)	66.6	8.13	4	25			
	CANDE2	*Candelaria* sp.	66.6	0.51	0.5	3			
	UMPH	*Umbilicaria phaea*	63.3	3.11	0.5	15			
	CALOP7	*Caloplaca* sp.	50	0.26	0.5	1			
	PLEOP2	*Pleopsidium* sp.	40	0.2	0.5	0.5			
	UMBIL2	*Umbilicaria* sp.	33.3	0.76	0.5	6			

OTHER NOTEWORTHY SPECIES:

SAMPLES USED TO DESCRIBE ASSOCIATION
(n= 30) PINN_140, PINN_141, PINN_142, PINN_143, PINN_144, PINN_145, PINN_146, PINN_147, PINN_148, PINN_149, PINN_184, PINN_186, PINN_187, PINN_189, PINN_845, PINN_851, PINN_855, PINN_856, PINN_857, PINN_864, PINN_866, PINN_868, PINN_869, PINN_908, PINN_909, PINN_910, PINN_911, PINN_912, PINN_913, PINN_914

CLASSIFICATION CONFIDENCE: 3 - Weak
REFERENCES: Data are not available.

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Appendix D

Key to the Plant Associations of Pinnacles National Monument

Natural Resource Report NPS/SFAN/NRR—2012/574

NatureServe
4001 Discovery Drive, Suite 2110
Boulder, CO 80302

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

KEY TO THE PLANT ASSOCIATIONS OF

Pinnacles National Monument

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Introduction

The vegetation of Pinnacles National Monument was characterized using field data collected in 2003 and 2004 under the US Geological Survey and National Park Service's Vegetation Mapping Program. This dichotomous key has been developed to assist in the accurate field identification of the 73 plant associations (including “park special” and “unclassified” types) described for Pinnacles National Monument, from 589 relevés.

This key is structured to facilitate identification of plant associations with one or a combination of dominant or characteristic species, and in some cases, the key also relates associations to their primary habitats and range within the Park. Because of natural variation within plant associations, it is possible that a community can be keyed using more than one of the physiognomic keys. For sites within ecotones (areas where dominant species intermix between plant associations), it may be difficult to determine a definitive association name.

For Key to Map Units for the 2008 Vegetation Map of Pinnacles created by AIS, see the Key to Map Units for Pinnacles NM.

HOW TO USE THE KEY

The key approaches plant association identification at two levels. The first level is physiognomic, allowing the user to determine which major group is being evaluated, e.g., forest, woodland, shrubland or herbaceous. The second level is based on dominant, indicator, or character species and to a lesser extent, habitat and range.

When using this key, you may have difficulty arriving at an association that precisely describes your community. There are several possible reasons for this problem and each has a solution:

1. You are observing vegetation that you think is an herbaceous or shrubland community, but it has some tree cover. In this case, try keying the vegetation through the woodland key as well as the herbaceous or shrubland key. In general with any layer, if it does not cover at least 8% (tree layer) or 5% (shrub or herbaceous layers), it is ignored. The exception is in very sparse communities (see #6 below). Shrublands throughout the park can have very infrequent emergent trees. Try keying these as shrublands first, and as woodlands second.

2. There are stands dominated by the spike moss, *Selaginella bigelovii*, with an overstory shrub layer that is very open. Try keying as an herbaceous type and as a shrubland type. Note also that all non-vascular vegetation is treated as herbaceous in this key.

3. The diagnostic layer consists of woody plants that may appear in either a shrub or a tree form, depending on site conditions and age of the stand. These species include *Cercocarpus montanus var. glaber, Quercus berberidifolia,* and *Salix lasiolepis.* In this key, these species are ALWAYS considered to be shrubs regardless of their height or growth form. And *Salix laevigata* is always considered a tree, regardless of height or growth form.

4. You can follow a key to a certain point, but you clearly have something not described in the key. This is to be expected occasionally – very likely you have an association that was not sampled by this project. In this instance, simply record "Unclassified *Pinus sabiniana* Woodland Association" --or "*Pinus sabiniana* Alliance", or whatever type of vegetation you have. Be sure to note the dominant species in each stratum as you fill out the Vegetation Description portion of the accuracy assessment form, as well as writing careful, complete notes on the environmental setting.

5. Communities that are sparsely vegetated (e.g. less than approximately 10% total vascular plant cover) may need to be run through multiple keys, because it may not be clear whether they are woodlands, shrublands, or herbaceous communities because the cover levels for each stratum are so low. In addition, some of the woodland types may have sparse cover when on steep rocky slopes.

6. Focus on the perennial species in the community, unless the community consists almost entirely of annuals or ephemerals or is highly disturbed or degraded.

Special instructions for AA Crews

1. Associations with "forest" in the name may not have 60+% canopy cover that forests usually require. Don't worry about it. Likewise, examples of associations with "woodland" in the name may occasionally have more than 60% cover.

2. A few taxonomic issues to be aware of. In order to standardize names with the National Vegetation Classification, the following synonyms are used:
    a. *Cercocarpus betuloides* var. *betuloides* is called *Cercocarpus montanus* var. *glaber*
    b. *Mimulus aurantiacus* is referred to as *Diplacus aurantiacus*
    c. *Bromus rubens* is referred to as *Bromus madritensis* ssp. *rubens.*
    d. To save space in the key text, *Prunus ilicifolia* var. *ilicifolia* is listed as *Prunus ilicifolia* and *Ceanothus cuneatus* var. *cuneatus* is referred to as just *Ceanothus cuneatus*.

3. Many of the shrubland association have dominant and co-dominant species. Nearly all the chaparral shrub species appear in all shrubland associations. Pay careful attention when delineating the area you wish to key. Be sure you choose a homogenous area, with similar slope, aspect and micro-topography. Most often the dominant shrubs are clear, and many other species are present as well, but never with more than half the amount of cover as the dominant. The most difficult choices are distinguishing these types:
    a. *Adenostoma fasciculatum* Shrubland from
        i. *Adenostoma fasciculatum - Arctostaphylos glauca* Shrubland
        ii. *Adenostoma fasciculatum - Arctostaphylos pungens* Shrubland
        iii. *Adenostoma fasciculatum - Ceanothus cuneatus* var. *cuneatus* Shrubland
        iv. *Adenostoma fasciculatum - Salvia mellifera* Shrubland
    b. *Salvia mellifera* Shrubland from
        i. *Salvia mellifera - Eriogonum fasciculatum / Bromus madritensis* Shrubland
    c. *Prunus ilicifolia* Shrubland from
        i. *Prunus ilicifolia - Heteromeles arbutifolia* Shrubland
        ii. *Prunus ilicifolia - Fraxinus dipetala* Shrubland
        iii. *Prunus ilicifolia - Ceanothus cuneatus* Shrubland

4. If you still cannot key to association, remember you can use the Alliance level. For example, if a shrubland is clearly an *Adenostoma fasciculatum* type, but doesn't fit anything in the key, call the stand an *Adenostoma fasciculatum* Alliance. Same rule applies to forests, woodlands, and herbaceous types.

5. Many of the shrubland and dwarf-shrubland and some of the herbaceous associations occur in harsh habitats and may have a total vegetative cover that is technically "sparse" (<10%). There is no separate key for sparse vegetation, so continue on in the shrubland or herbaceous key, but ratchet down your cover expectations for dominant species and total vegetation cover from what the key may say. Go by dominance, and relative cover rather than absolute cover measurements.

6. When in doubt, record detailed field notes. These notes and the Vegetation Description information will be entered into a database to be evaluated in detail during the Accuracy Assessment meeting that will be held to determine the map accuracy by comparing the interpreted map unit to the association identified in the field.

Key I: A Key to the Major Physiognomic Groups of Pinnacles National Monument

1a. Vegetation woody or appearing woody; the tallest stratum consists primarily or entirely of trees, shrubs or subshrubs; total vegetation cover may range from sparse to dense (2).

1b. Vegetation non-woody; consisting predominantly of grasses, graminoids and/or broad-leaf herbs (forbs), which may be tall and coarse, mosses, spike mosses, or non-vascular plants. Woody shrubs or trees may be present, but woody plant cover does not exceed approximately 10%. Characteristic genera include *Artemisia (dracunculus), Avena, Collinsia*, *Erodium, Heterotheca*, *Juncus, Selaginella, Sedum*, and *Vulpia*, as well as mosses and lichens.

(Key IV—Herbaceous Communities)

2a. Vegetation of forest (predominantly interlocking tree canopies) or woodland (predominantly open, tree canopies) stands; tree cover except in sparse vegetation is usually greater than 10%; characteristic genera include *Aesculus, Juniperus, Pinus, Quercus, Platanus, Populus, and Salix.*

(Key II—Forests and Woodland Communities)

2b. Vegetation of tall shrubs, short shrubs or dwarf-shrubs; canopies may interlock, but more commonly are less dense; characteristic genera include *Adenostoma, Arctostaphylos, Artemisia (californica), Baccharis, Ceanothus, Cercocarpus, Diplacus (=Mimulus), Eriogonum, Lotus, Lupinus, Prunus, Quercus (berberidifolia), Rhamnus, Rosa, Salvia, or Salix*.

(Key III—Shrubland Communities)

Key II: A Key to the Forest and Woodland Associations of Pinnacles National Monument

1a. Forests or woodlands occupying a variety of habitats including stream banks, floodplains and riparian areas. Canopy dominants include *Populus, Platanus, Quercus lobata, Quercus agrifolia* (where its feet gets wet) and *Salix,* **(2)**

1b. Forests or woodlands occupying a variety of upland habitats; canopy dominants include *Aesculus, Juniperus, Pinus, Quercus agrifolia, Q. douglasii, and/or Q. wislizeni* **(12)**

Riparian/Mesic Draw Forest and Woodlands

2a (1) Forests or woodlands characterized by *Quercus agrifolia, Quercus lobata,* or a combination of the two, often occupying mesic, steep draws or low gradient intermittent streams **(3)**.

2b. Forests or woodlands characterized by *Populus fremontii, Plantanus racemosa or Salix laevigata. Quercus agrifolia* may be present to co-dominant. All stands occurring within drainage bottoms or on alluvial deposits **(6)**

3a (2) Forests or woodlands characterized by *Quercus agrifolia. Q lobata* is not present **(4).**

3b. Forests or woodlands characterized by *Quercus agrifolia* and *Quercus lobata* (**5)**

4a (3) Forests or woodlands characterized by *Quercus agrifolia* often occupying mesic, steep draws or low gradient intermittent streams. Shrub cover is low, and highly variable, but characterized by the presence of poison oak. Woody species such as *Rubus ursinus, Rhamnus ilicifolia* ,and *Salix laevigata* can be present >10% cover. Most of the species present are not wetland obligates, but site is wetter than upland sites due to subsurface or surface drainage. Herbaceous cover can be very low, the ground covered in dense litter.

***Quercus agrifolia / Toxicodendron diversilobum* Intermittently Flooded Woodland**

4b Woodlands dominated by *Quercus agrifolia. Pinus sabiniana* may be present with very low cover. No shrub layer occurs, but a few scattered individuals of *Adenostoma fasciculatum, Prunus ilicifolia*, or *Rhamnus ilicifolia* may be present. The site is characterized by the herbaceous layer, the shrub layer is insignificant. The herbaceous understory is dominated by a mix forbs and grasses such as *Amsinckia menziesii var. intermedia, Bowlesia incana, Clarkia* sp., *Claytonia perfoliata ssp. perfoliata, Collinsia heterophylla, Delphinium parryi ssp. parryi, Erigeron foliosus var. foliosus, Eriogonum nudum, Galium aparine, Galium porrigens var. porrigens, Bromus diandrus*, and *Melica imperfecta.*

***Quercus agrifolia* / Annual Grass-Forb Woodland**

5a. (3) Woodlands dominated by *Quercus lobata*. *Quercus agrifolia* present to co-dominant. *Pinus sabiniana* may be present with low cover. Shrubs are generally absent, but few scattered individuals may appear in the stand or along edges from surrounding communities, and may include *Toxicodendron diversilobum, Rubus ursinus, Baccharis pilularis,* which may have as much as 15% cover, but are not

consistently present. Herbaceous cover is usually dominated by annual introduced grasses such as *Bromus diandrus, Bromus madritensis ssp. rubens, Hordeum murinum ssp. leporinum.* One stand had the native wetland sedge, *Carex barbarae,* with 45% cover.

***Quercus lobata* - *Quercus agrifolia* / Annual Grass - Herb Woodland**

5b. Woodlands not like above in all respects. Community type not yet described from Pinnacles NM.

6a (2) Forests or woodlands characterized by *Platanus racemosa. Salix laevigata and Populus fremontii* may be present to co-dominant. Stands dominated by *Platanus* solely or with other tree species **(7)**

6b. Forests or woodlands characterized by *Populus fremontii or Salix laevigata. Plantanus* if present not co-dominant **(9)**

7a. (6) Riparian forests dominated by *Platanus racemosa* with *Quercus agrifolia*, usually in near equal cover (10-35%). Stands occur on valley bottoms or on steep subirrgated slopes, are wetter than the *Quercus agrifolia /Toxicodendron diversilobum* Intermittently Flooded Woodland. Understory shrubs include *Toxicodendron diversilobum* and *Rubus ursinus*. One stand had 35% cover of *Aesculus californica*. The herbaceous understory is highly variable.

***Platanus racemosa* - *Quercus agrifolia var. agrifolia* Woodland**

7b. Riparian forests dominated by *Platanus racemosa,* wetter still than above, *Quercus agrifolia* may or may not present. *Populus fremontii* may be present **(8)**

8a (6) *Salix laevigata* often co-dominant with *Platanus racemosa*. Only sampled once in the park. Could probably be considered part of the next type.

***Platanus racemosa – Salix laevigata / Rubus ursinus* Woodland**

8b. *Salix laevigata* absent or present. If present it is not co-dominant with *Platanus racemosa* the dominant tree, *Populus fremontii* may also be present to co-dominant, *Toxicodendron diversilobum* abundant (only sampled once in the park). ***Platanus racemosa* Temporarily Flooded Woodland**

9a. (3) Riparian woodlands dominated by *Populus fremontii, Salix laevigata* can be absent to co-dominant **(10)**

9b. Riparian woodlands dominated by *Salix laevigata, Populus fremontii,* if present not more than 5% cover. Other trees present may include *Pinus sabiniana, Plantanus racemosa,* and *Quercus agrifolia,* all usually not more that 5% cover, and generally overwhelmed by the *Salix laevigata* cover. This association is highly variable composition, shrubs that can have significant cover (>10%) observed include *Rubus ursinus , Artemisia douglasiana, Toxicodendron diversilobum, Rosa californica, Baccharis salicifolia .*

***Salix laevigata / Artemisia douglasiana* - *Rubus ursinus* Woodland**

10a. (9) *Populus fremontii* co-dominated with *Salix laevigata* and/or *Salix lasiolepis* **(11)**

10b. *Populus fremontii* dominates the riparian corridor. Other trees if present are less than half the cover of Fremont's cottonwood. Tree species include *Quercus agrifolia, Q. lobata,* and *Pinus sabiniana*. Shrub cover is low, but diverse and in our samples *Baccharis salicifolia* had the highest cover with 4%, but *Artemisia douglasiana,* and *Rubus ursinus,* were also present with 3% cover. Other riparian shrubs may be present include *Salix lasiolepis,* these generally in small amounts.

***Populus fremontii / Baccharis salicifolia* Woodland**

11a. (10) *Populus fremontii* co-dominated with *Salix laevigata* (5-70% cover), *Quercus agrifolia* was present with 35% cover in one stand. Characteristic understory shrubs include *Rubus ursinus, Salix lasiolepis, Baccharis salicifolia,* and *Rosa californica* with 5% or higher cover.

***Populus fremontii –Salix laevigata* Woodland**

11b. *Populus fremontii* co-dominated with *Salix lasiolepis.* This type casually observed several times in the park, but was never sampled and its not formally described.

***Populus fremontii / Salix lasiolepis* Woodland** (no description available)

Upland/Dry Forests and Woodlands

12a. (1) Woodland dominated or co-dominated by *Aesculus California,* often on mesic toe slopes **(13)**

12b. Woodlands dominated by pines, oaks, and combinations thereof. If California Buckeye is present, its not co-dominant **(14)**

13a. (12) Woodlands on gentle to steep northerly facing slopes, dominated by *Aesculus californica* (20-70% cover). Other trees present include *Pinus sabiniana, Quercus agrifolia,* or *Quercus douglasii,* and the shrub layer often dominated by *Prunus ilicifolia, Adenostoma fasciculatum,* or *Quercus berberidifolia. Toxicodendron diversilobum* was not present in every stand sampled. Moss is the most consistent herbaceous understory component, and the most abundant, with up to 45% cover.

***Aesculus californica / Toxicodendron diversilobum* / Moss Woodland**

13b. Stands dominated *by Quercus agrifolia* and *Aesculus californica* occurring together. Stands occur on gentle to moderate and often mesic slopes and draws. The understory shrub layer includes *Lonicera subspicata var. denudata* and *Toxicodendron diversilobum*, and the herbaceous layer may include *Anthriscus caucalis, Galium aparine, Galium porrigens var. porrigens, Sanicula arctopoides (=S. crassicaulis),* and *Bromus diandrus*.

***Quercus agrifolia - Aesculus californica* Woodland**

14a. (12) Woodlands dominated by *Pinus sabiniana* or *Juniperus californica*. If *Quercus* species are present they have low cover. **(15)**

14b. Woodlands dominated by various oaks, included stands co-dominated with *Quercus* spp. and *Pinus sabiniana* **(17)**

Coniferous Forest and Woodlands

15a. (14) Woodlands on steep north facing slopes dominated by *Juniperus californica* (20-65%). Other trees infrequently present include *Aesculus californica, Pinus sabiniana* and *Quercus douglasii*. Shrubs present includes *Prunus ilicifolia ssp. ilicifolia*, and the herbaceous layer may include *Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Melica torreyana,* and *Vulpia myuros*.
***Juniperus californica / Prunus ilicifolia* / Moss Woodland**

15b. Woodlands dominated by *Pinus sabiniana* **(16)**

16a (11) Woodland on flat to moderate slopes at all aspects. Tree layer is dominated by *Pinus sabiniana* other trees may be present include *Quercus agrifolia* and *Q. douglasii*. Understory shrubs includes *Eriogonum fasciculatum var. foliolosum, Adenostoma fasciculatum,* and *Lonicera subspicata var. denudate.*
***Pinus sabiniana / Eriogonum fasciculatum* Woodland**

16b. Woodlands on steep north facing slopes dominated by *Pinus sabiniana* other tree species at lower cover include *Quercus agrifolia var. agrifolia*. Understory shrub characterized by *Rhamnus ilicifolia, Ceanothus cuneatus var. cuneatus, Adenostoma fasciculatum* and other shrubs.
***Pinus sabiniana / Ceanothus cuneatus - Rhamnus ilicifolia* Woodland**

Oak and Mixed Oak-Conifer Forests and Woodlands

17a. (14) Stands dominated by *Quercus douglasii,* with and without a co-dominant of *Pinus* or *Juniperus* **(18)**

17b. Woodland dominated by other oaks, such as *Quercus agrifolia, Q. lobata,* or *Q. wislizeni* **(21)**

18a. (17) Woodlands dominated by *Juniperus californica* and *Quercus douglasii,* which can have equal cover. In some stands Juniper has lower cover, as low as 1/3 the cover of the oak. If Juniper is only 25% of the oak cover, go to the next couplet. Other trees present with low cover include *Pinus sabiniana*. Shrubs present include *Ceanothus cuneatus var. cuneatus* and *Rhamnus ilicifolia,* but these with less than 5% cover. Herbaceous layer may include *Galium porrigens var. porrigens, Packera breweri, Vulpia myuros,* and *Bromus rubens (= Bromus madritensis ssp. rubens).*
***Quercus douglasii - Juniperus californica* Woodland**

18b. Stands of *Quercus douglasii* where *Juniperus* is absent or if present in low cover, not co-dominant, less than ¼ cover of the oak present. *Pinus sabiniana* may be present to co-dominant or absent (19)

19a. (18) Woodland occurs on steep slopes dominated by *Quercus douglasii*. Other trees present may include *Quercus agrifolia* and *Pinus sabiniana* in low cover. A shrub layer is characteristic and abundant. The shrub layer includes *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides), Lonicera subspicata var. denudata,* and *Rhamnus ilicifolia*.

***Quercus douglasii - Pinus sabiniana / Cercocarpus montanus* var. *glaber* Woodland**

19b. Woodlands without characteristic nor abundant shrub layer. Shrub species may be present, but these widely scattered, not forming a layer or shrub canopy **(20)**

20a (19). Woodland of steep slopes dominated by *Quercus douglasii* and *Pinus sabiniana*. The shrub layer includes *Lonicera subspicata var. denudata,* and the herbaceous layer may include *Avena fatua, Bromus diandrus, Bromus rubens (= Bromus madritensis ssp. rubens),* and *Poa secunda (= ssp. secunda).* ***Quercus douglasii - Pinus sabiniana* / Grass Woodland**

20b. Woodland of moderate to steep slopes, dominated by *Quercus douglasii. Other trees* that may be present include *Juniperus californica, Pinus sabiniana,* and *Quercus agrifolia,* but these in low cover. Typically there are few to no shrubs, recorded species include *Rhamnus ilicifolia, Arctostaphylos glauca, Eriogonum fasciculatum* and *Arctostaphylos pungens*. The herbaceous layer is abundant and may include the graminoids *Avena* spp., *Leymus triticoides, Bromus diandrus, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens), Poa secunda,* or *Vulpia myuros.* Forb species may include *Clarkia purpurea ssp. quadrivulnera, Galium porrigens var. porrigens, Lotus wrangelianus, Micropus californicus var. californicus, Pterostegia drymarioides, or Viola pedunculata.*

***Quercus douglasii* / Mixed Herbaceous Woodland**

21a (17) Woodlands of *Quercus wislizeni* with *Pinus sabiniana*. Quercus agrifolia was present in one of two stands sampled with 12% cover. Low shrub cover(1-5%) includes *Rhamnus ilicifolia* and *Toxicodendron diversilobum.* The herbaceous layer includes *Anthriscus caucalis, Bowlesia incana, Cardamine californica, Claytonia perfoliata ssp. perfoliata, Galium aparine, Galium porrigens var. porrigens, Marah fabaceus, Pentagramma triangularis ssp. triangularis, Sanicula crassicaulis, Thysanocarpus laciniatus, Bromus diandrus, Bromus hordeaceus, Elymus glaucus ssp. glaucus,* and *Melica torreyana*. This community was sampled only twice, and is a tentative association.

***Quercus wislizeni - Pinus Sabiniana* / Mixed Herbaceous Woodland**

21b. Woodland or forests dominated by other oak or pine species, not at all similar to any of the above in all respects. **Woodland type not yet described for Pinnacles National Monument.**

KEY III: A Key to the Shrubland Associations of Pinnacles National Monument

1a. Tall or short shrublands occupying wetlands, riparian areas, floodplains, canyon floors, alcoves, or other habitats that are either wet or periodically flooded, including the dry streambeds of arroyos. Characteristic genera include *Baccharis, Rosa,* and *Salix* **(2)**

1b. Tall, short, or dwarf-shrublands occupying upland habitats or dry, high terraces in the broad valleys of the major rivers. Characteristic genera include *Adenostoma, Arctostaphylos, Artemisia, Baccharis (pilularis), Ceanothus, Cercocarpus, Diplacus (=Mimulus), Lotus, Lupinus, Prunus, Quercus (berberidifolia), Rhamnus,* and *Salvia* **(6)**

Wetland, Riparian, Wash, and Alluvial Flat Shrublands

2a. (1) Shrublands with dominate shrubs of *Baccharis, Rosa, Lupinus or Senecio*. *Salix* may be present, but does not form the dominant shrub canopy **(3)**

2b. Shrublands dominated by *Salix* spp. **(5)**

3a. (1) Low shrublands in open dry alluvial and fluvial terraces**,** dominated by *Lupinus albifrons var. albifrons*. Other shrubs present at low cover may include *Artemisia californica, Lotus scoparius, Eriogonum fasciculatum, Diplacus aurantiacus, Adenostoma fasciculata.* The understory herbaceous layer generally includes *Clarkia* sp., *Eriogonum elegans, Erodium cicutarium, Heterotheca sessiliflora ssp. echioides, Senecio flaccidus var. douglasii, Bromus hordeaceus, Bromus diandrus,* or *Bromus rubens.* ***Lupinus albifrons - Senecio flaccidus var. douglasii*** **Shrubland**

3b. Shrubland not like above in all respects **(4)**

4a. (2) Tall **s**hrublands dominated by *Baccharis salicifolia*. *Salix lasiolepis, Salix laevigata* and *Populus fremontii* may be present with not more than 5% cover, widely scattered, the cover of Baccharis clearly the most abundant and characteristic shrub. The understory herbaceous layer may sparse to abundant, and include *Artemisia douglasiana, Pseudognaphalium canescens ssp. beneolens (= Gnaphalium canescens ssp. beneolens), Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Melilotus indicus, Rumex salicifolius, Aira caryophyllea, Bromus diandrus, Bromus hordeaceus,* and *Vulpia myuros*. ***Baccharis salicifolia*** **Riparian Shrubland**

4b. Low shrubland (1-3 feet tall) dominated by *Rosa californica*. Accompanying shrubs can be highly variable, but Rosa is always the most dominant shrub. The ground cover sparse to abundant depending on the amount of moisture and shading. Understory herbaceous species may include *Artemisia dracunculus, Bromus diandrus, Bromus hordeaceus,* and *Leymus triticoides*. Emergent trees are often present, but the overstory tree layer is usually less than 10% cover. Tree species that may be present include *Populus fremontii, Quercus agrifolia, Q. douglasii, Q. lobata,* or *Salix laevigata*. ***Rosa californica*** **Shrubland**

5a. (3) Tall or short shrublands in valley bottoms, stream sides or sandy washes. *Salix exigua* is the predominant cover. It can occur in highly disturbed washes with very low cover (2%), with only scattered

individuals, especially in highly disturbed settings. *Salix lasiolepis* may be present but generally with less than half the cover of *Salix exigua.* If *Salix lasiolepis* is abundant (nearly equal to, equal, or more than *Salix exigua*, key as a *Salix lasiolepis* dominated type. ***Salix exigua* Temporarily Flooded Shrubland**

5b. Riparian and wetland areas dominated by *Salix lasiolepis*. Other willows and riparian shrubs may be present, but these not more than half the cover of *S. lasiolepis* **(6)**

6a. (3) Riparian or wetland shrublands dominated by *Salix lasiolepis*. *Baccharis salicifolia* is often present with about 10% cover. Emergent trees such as *Populus fremontii, Quercus agrifolia, Salix laevigata* or *Pinus sabiniana* can be present, but with low cover (<10%, usually <5%). Other shrubs may be present at low cover, including *Rosa californica* and *Toxicodendron diversilobum*. The understory herbaceous is highly variable and may include *Artemisia douglasiana, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Rumex salicifolius, Bromus diandrus*, and *Bromus rubens (= Bromus madritensis ssp. rubens).* ***Salix lasiolepis / Baccharis salicifolia* Shrubland**

6b. Shrubland not like above in all respects **(7)**

7a (5) Shrubland dominated by *Salix lasiolepis* with high cover of *Toxicodendron diversilobum,* and lower cover of *Rosa californica,* and *Baccharis salicifolia*. Emergent trees of *Quercus agrifolia, Q. douglasii* and *Pinus sabiniana* were also present, and makes the one stand sampled unique, and this association is tentative. ***Salix lasiolepis / Rosa californica* Shrubland**

7b. Shrublands not like above in all respects. Shrublands may be dominated by *Salix lasiolepis* with *Salix laevigata* and *Quercus agrifolia,* often on upper terraces, or with other riparian species.
Community not yet described for Pinnacles National Monument

Upland/Dry to Mesic Shrublands

8a. (1) Shrublands of disturbed ground from prolonged heavy grazing (including feral pig disturbance), clearing, or other, soil-moving disturbances, i.e. human induced disturbance. Stands dominated by *Baccharis pilularis, Lotus scoparius* or *Lupinus albifrons* **(9)**

8b. Shrublands of relatively undisturbed ground, or recovering from natural disturbance such as minor landslides or fire. Stands dominated by *Adenostoma fasciculatum, Arctostaphylos glauca, Artemisia californica, Eriogonum fasciculatum, Cercocarpus montanus var. glaber (=Cercocarpus betuloides var. betuloides), Diplacus (=Mimulus) aurantiacus, Quercus berberidifolia, Rhamnus ilicifoli*a, and/or *Salvia mellifera.* Stands may have standing dead *Quercus douglasii*. **(11)**

Weedy, Disturbance-driven Shrublands

9a. (6) Shrubland on gentle valley bottoms to steep slopes, typically on cleared/disturbed land, dominated by *Baccharis pilularis. Rosa californica* may be present as well. The herbaceous layer is a variety of non-native, largely annual grasses and herbs such as *Bromus hordeaceus, Avena barbata, Artemisia dracunculus,* and *Distichlis spicata*. Other native herbaceous species include *Distichlis spicata.*

The emergent tree layer may be present with *Quercus lobata* or *Quercus agrifolia var. agrifolia* at low cover. ***Baccharis pilularis* / Annual Grass - Herb Shrubland**

9b. Shrublands of disturbed ground but not like above in all respects **(10)**

10a. (7) South facing low stature shrublands stands dominated by *Lotus scoparius*. Other shrubs present include *Eriogonum fasciculatum var. foliolosum* and *Lupinus albifrons var. albifrons*. The understory herbaceous layer may include, *Artemisia dracunculus, Chaenactis glabriuscula, Cuscuta californica, Eriogonum elegans, Hirschfeldia incana, Lupinus bicolor, Nemacladus gracilis, Silene gallica, Trifolium microcephalum, Trifolium willdenowii, Aira caryophyllea, Avena barbata, Bromus arenarius, Bromus hordeaceus, Bromus rubens (= Bromus madritensis ssp. rubens),* and *Vulpia myuros*. This type was sampled only once in the park. ***Lotus scoparius* Shrubland Association**

10b. *Adenostoma fasciculatum* shrubland, co-dominated *Eriogonum fasciculatum*. Other shrubs present may include *Ceanothus cuneatus*, *Eriodictyon tomentosum*, and Senecio spp. A very common combination, but not sampled, thus no plot data nor description available.
***Adenostoma fasciculatum – Eriogonum fasciculatum* Shrubland** (no descritption available)

Upland Chaparral Shrublands (may be recovering from natural disturbance)

11a. (8) Shrublands of steep to moderate hill slopes, dominated by *Adenostoma fasciculatum* with other shrubs or singly **(12)**

11b. Shrublands of similar habitats, dominated by other shrub species. If *Adenostoma fasciculatum* present, it is not dominant nor co-dominant, but may be abundant in the stand **(18)**

Adenostoma fasciculatum Shrublands

12a. (11) *Adenostoma fasciculatum* shrubland with closed canopy. *Salvia mellifera* is as abundant or its canopy cover is at least half that of *Adenostoma.* Other shrubs that may be present include *Ceanothus cuneatus var. cuneatus* and *Rhamnus ilicifolia.* The canopy cover is thick such that the herbaceous layer is depauperate. No emergent trees were present in any of the stands sampled.
***Adenostoma fasciculatum* - *Salvia mellifera* Shrubland**

12b. *Adenostoma fasciculatum* shrubland with a closed canopy, shrubs present may include *Ceanothus cuneatus* var. *cuneatus, Arctostaphylos glauca,* or *A. pungens*. *Salvia mellifera* may be present in very low cover**. (13)**

13a. (10) *Adenostoma fasciculatum* shrubland co-dominated with *Ceanothus cuneatus* var. *cuneatus*. Generally in near equal cover, or *Ceanothus cuneatus* is at least half that of *Adenostoma fasciculatum.* If other shrubs are present they are not more than one quarter of the cover of *Adenostoma.* Rarely emergent individual trees may be present and include *Quercus douglasii* or *Pinus sabiniana,* with very low cover.

***Adenostoma fasciculatum* - *Ceanothus cuneatus var. cuneatus* Shrubland**

13b. *Adenostoma fasciculatum* shrubland co-dominated with *Arctostaphylos* species, or no other shrub species is as abundant as *Adenostoma* **(14)**

14a. (11) Shrublands characterized by a mixture of *Adenostoma* with *Arctostaphylos pungens* or *A. glauca* **(15)**

14b. Shrublands characterized by a matrix of *Adenostoma fasciculatum*, other shrubs may be present but are not more than a quarter of the cover of *Adenostoma* **(16)**

15a. (14) Shrublands dominated by *Adenostoma fasciculatum*, with a consistent presence to co-dominance of *Arctostaphylos pungens*. These stands are found almost always on the upper 1/3 to ridge top of slopes in the park. No emergent trees were seen from the 9 samples of this type. Other shrubs may be present but with less than half that of *Arctostaphylos pungens*.

***Adenostoma fasciculatum - Arctostaphylos pungens* Shrubland**

15b. Shrublands of steep to moderate slopes dominated by *Adenostoma fasciculatum* and *Arctostaphylos glauca*. Other shrubs may be present by are never more that a quarter of the two co-dominant shrub's cover. Scattered trees are rarely present, but may include *Pinus sabiniana, Quercus douglasii* or *Q. agrifolia* with very low cover. Herbaceous understory is highly variable and generally low due to heavy shading.

***Adenostoma fasciculatum - Arctostaphylos glauca* Shrubland**

16a. (14) Shrublands dominated by *Adenostoma fasciculatum.* Other shrubs if present are scattered, with less than half more often less than a quarter of the cover of *Adenostoma,* and includes *Eriogonum fasciculatum.* The understory includes a thick mat of *Selaginella bigelovii* with cover of at least 10% Emergent trees included young *Pinus sabiniana*. This type seems to occur only on the upper 1/3 to ridge tops of slopes, often on shallow soils. This type is similar to stands of *Pinus sabiniana* / *Eriogonum fasciculatum* but there is no *Selaginella bigelovii.*

***Adenostoma fasciculatum / Selaginella bigelovii* Shrubland**

16b. Shrublands dominated solely by *Adenostoma fasciculatum.* Not like above in all respects **(17)**

17a. (16) Other shrubs if present are scattered, with less than half more often less than a quarter of the cover of *Adenostoma*. *Selaginella bigelovii,* if present, is less than 10% cover, does not form a mat-like layer under the shrub canopy. Any of the previously mentioned co-dominant shrubs may be present, but these usually with very low cover. A few emergent trees may be present with species such as *Juniperus californica, Pinus sabiniana, or Quercus douglasii.* ***Adenostoma fasciculatum* Shrubland**

17b. South facing xeric slope shrublands dominated by *Adenostoma fasciculatum* shrubland and *Eriogonum fasciculatum*. Other shrubs present may include *Ceanothus cuneatus*, *Eriodictyon tomentosum* and Senecio species. A very common combination, but not sampled, thus no plot data nor description available. ***Adenostoma fasciculatum – Eriogonum fasciculatum* Shrubland** (no description available)

18a. (11). Shrublands dominated by tall, medium or low stature shrubs, *Adenostoma fasciculatum* may be present, but is less than half that of other shrubs forming the matrix cover of the stand. Stands generally characterized by a dominance or co-dominance of *Prunus ilicifolia* **(19)**

18b. Shrubland dominated by shrubs other than *Prunus ilicifolia.* **(22)**

Prunus ilicifolia var. ilicifolia Shrublands

19a. (18) Shrubland dominated by a mix of *Prunus ilicifolia* and *Fraxinus dipetala*. Most stands co-dominated by *Prunus ilicifolia* are a mix of several shrubs, in this case dipetala is clearly a co-dominant with *Prunus ilicifolia*. *Clematis lasiantha* can be abundant, draped over the tops of the taller shrubs. *Quercus berberidifolia* and *Heteromeles arbutifolia* may have as much as 10% cover, but generally occur in clumps, and not as abundant throughout the stand as *Fraxinus*. *Pinus sabiniana* may be an occasional emergent tree, but with very low cover and not forming a tree overstory layer.
***Prunus ilicifolia - Fraxinus dipetala* Shrubland**

19b. Shrublands not like above in all respects **(20)**

20a. (17) Shrubland of moderate to steep, north-facing slopes, dominated by *Prunus ilicifolia* and *Ceanothus cuneatus. Clematis lasiantha* and *Rhamnus ilicifolia* may be locally abundant. Several shrub species may be present with greater than 10% cover, but never more than half that of *Prunus ilicifolia* or *Ceanothus cuneatus.* ***Prunus ilicifolia - Ceanothus cuneatus* Shrubland**

20b. Shrubland not like above in all respects **(21)**

21a. (18) Shrublands of steep north-facing slopes. The shrub layer is dominated by *Prunus ilicifolia* and *Heteromeles arbutifolia*. Other shrubs such as *Ceanothus cuneatus* and *Adenostoma* may be present, but at low cover, and not more than half that of the *Prunus* or *Heteromeles* cover.
***Prunus ilicifolia - Heteromeles arbutifolia* Shrubland**

21b. Shrubland dominated by *Prunus ilicifolia*. Several other shrubs are commonly present, none as abundant as Prunus. If stand overwhelming dominated by *Prunus ilicifolia* then
***Prunus ilicifolia* Shrubland**
However only one stand of this type was sampled in the park. If stand dominated by Prunus ilicifolia, but with shrubs co-dominated other than mentioned above then key to ***Prunus ilicifolia* Alliance**

Other Shrubland Types

22a. (18) Shrublands of moderate to steep slopes on all aspects. Stands dominated by *Arctostaphylos glauca,* Other shrubs present at low cover may include *Adenostoma fasciculatum, Ceanothus cuneatus, Prunus ilicifolia,* or *Rhamnus ilicifolia.* Emergent trees at very low cover include *Pinus sabiniana* and *Quercus agrifolia.* ***Arctostaphylos glauca* Shrubland**

22b. Shrublands not like above in all respects. **(23)**

23a. (22) Shrublands dominated by *Artemisia californica, Eriogonum fasciculatum, Salvia mellifera*, or *Diplacus (=Mimulus) aurantiacus* , or by some combination of these **(24)**

23b. Shrublands dominated by *Ceanothus cuneatus, Cercocarpus montanus var. glaber, Quercus berberidifolia,* or *Rhamnus ilicifolia*, or some combination of these **(30)**

24a. (23) Shrublands on mostly steep, southern aspects, dominated by *Artemisia calfornica* or also co-dominated by other shrubs **(25)**

24b. Shrublands dominated by other species **(26)**

25a. (24) Shrublands of mostly steep, southerly aspects, dominated by *Artemisia calfornica* Other shrub such as *Eriogonum fasciculatum* may be present but with very low cover (<5%) . *Herbaceous understory contains* forbs *Dichelostemma capitatum ssp. capitatum, Logfia gallica (= Filago gallica), Lotus scoparius var. scoparius*, and *Lotus wrangelianus*, and the graminoids *Bromus hordeaceus* and *Bromus rubens (= Bromus madritensis ssp. rubens).* ***Artemisia californica*** **Shrubland**

25b. Shrublands in similar habitats with a co-dominance of *Artemisia californica* and *Eriogonum fasciculatum*. Other shrubs may be present with much lower cover (usually less than 5%), such as *Salvia mellifera, Ceanothus cuneatus, Mimulus aurantiacus , Prunus ilicifolia,* or *Rhamnus ilicifolia. Pinus sabiniana* often present as an emergent tree, but with very low cover (2%).
Artemisia californica - Eriogonum fasciculatum **Shrubland**

26a. (24) Shrublands dominated *Eriogonum fasciculatum*. **(27)**

26b. Shrublands not like above in all respects, other species are present and co-dominant. **(29)**

27a. (26) Shrublands dominated by nearly pure stands of *Eriogonum fasciculatum*. Other shrubs if present are in very low cover, usually 1-2%, maybe be as high as 7-8%, but never more than half the cover of *Eriogonum fasciculatum.* Other shrub species include *Artemisia dracunculus, Prunus ilicifolia , Salvia mellifera, Rhamnus ilicifolia, Adenostoma fasciculatum,* and *Cercocarpus betuloides.* Diverse annual herbs comprise the herb understory. Emergent trees with low cover include *Pinus sabiniana, Juniperus californica, Quercus agrifolia*, or *Q. douglasii*. ***Eriogonum fasciculatum*** **Shrubland**

27b. Not like above in all respects **(28)**

28a. (27) Shrublands with open canopy (25%) to sparse cover (<5%) of *Eriogonum fasciculatum. Selaginella bigelovii* is the dominant understory herb layer. This type can also be keyed through the herbaceous section. ***Eriogonum fasciculatum / Selaginella bigelovii*** **Herbaceous Vegetation**

28b. South facing xeric slope shrublands dominated by *Adenostoma fasciculatum* shrubland and *Eriogonum fasciculatum*. Other shrubs present may include *Ceanothus cuneatus, Eriodictyon tomentosum*

and Senecio species. A very common combination, but not sampled, thus no plot data nor description available. ***Adenostoma fasciculatum – Eriogonum fasciculatum*** **Shrubland** (no description available)

29a. (26) Shrublands on moderate to abrupt slopes on most aspects, often unstable, or recently burned, or a product of recent land or rock slides, and dominated by *Diplacus (=Mimulus) aurantiacus.* Other shrubs may be present with low cover, such as *Arctostaphylos glauca, Adenostoma fasciculatum, Eriogonum fasciculatum, Lotus scoparius,* or *Lupinus albifrons var. albifrons* . Moss and/or Selaginella bigelovii can be quite abundant in the understory. Emergent trees such as *Pinus sabiniana* and *Quercus agrifolia* are also occasionally present with very low cover. ***Diplacus aurantiacus*** **Shrubland**

29b. Shrubland not like above in all respects **(30)**

30a. (29) Shrublands dominated by *Salvia mellifera,* solely or with other shrubs **(31)**

30b. Shrublands dominated by other shrub species (**32).**

Salvia mellifera Shrublands

31a. (30) Shrubland of to steep slopes with variable aspects, dominated by *Salvia mellifera* and *Eriogonum fasciculatum. Other* shrubs present with much lower cover include *Artemisia californica or Prunus ilicifolia*. *Bromus madritensis ssp. rubens* is present in the understory.
Salvia mellifera - Eriogonum fasciculatum / Bromus madritensis **Shrubland**

31b. Shrubland of moderate to steep, south- and west-facing slopes, the shrub layer overwhelmingly dominated by *Salvia mellifera.* Other shrubs if present are very low cover, and may include *Eriogonum fasciculatum* or *Adenostoma fasciculatum*. The understory herbaceous layer is high variable.
Salvia mellifera **Shrubland**

32a. (23b and 30) Steep slopes of chaparral stands dominated by *Ceanothus cuneatus, Cercocarpus montanus* , and/or *Quercus berberidifolia* **(33)**

32b. Shrublands on steep or gentle slopes, dominated by other species **(36)**

Other Shrublands

33a. (29) Shrubland on moderate to steep slopes with a shrub layer dominated by *Ceanothus cuneatus var. cuneatus.* Several other shrub species may be present but these with less than half the cover of *Ceanothus.* Shrub species include *Adenostoma fasciculatum, Arctostaphylos glauca, Cercocarpus montanus var glaber*. Emergent trees may occur with very low cover, and include *Pinus sabiniana, Quercus douglasii* or *Q. agrifolia*, and may be standing dead trees. ***Ceanothus cuneatus*** **Shrubland** However if mixed with *Eriodictyon tomentosum* and/or *Malacothamnus* then
Ceanothus cuneatus **Alliance**

33b. Shrublands of moderate to steep slopes, dominated by *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides) and/or Quercus berberidifolia* **(34)**

34a. (33) Shrublands of moderate to steep slopes, dominated by *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides)* The herbaceous layer has no characteristic species. The emergent tree layer may include infrequent *Quercus agrifolia, Quercus douglasii, Juglans californica,* or *Pinus sabiniana.* ***Cercocarpus montanus var. glaber*** **Shrubland**

34b. Shrublands dominated or co-dominated by ***Quercus berberidifolia*** **(35)**

35a. (34) Shrublands on steep north facing slopes dominated by *Quercus berberidifolia* and *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides).* Other shrubs that may be present include *Lonicera subspicata var. denudata,* and *Rhamnus ilicifolia*. The emergent tree layer includes *Juniperus californica, Pinus sabiniana, Quercus agrifolia, or Q. douglasii* at low cover. The understory herbaceous layer has no characteristic species

Quercus berberidifolia - Cercocarpus montanus var. glaber **Shrubland**

35b. Shrublands of steep north facing slopes dominated by *Quercus berberidifolia*. Other shrubs can be abundant (as high as 15% cover) but never as much as half that of *Quercus berberidifolia*. Other shrub species include *Adenostoma fasciculatum, Arctostaphylos pungens, A. glauca, Ceanothus cuneatus, Heteromeles arbutifolia, or Prunus ilicifolia.* A few emergent trees may be present at low cover and include *Aesculus californica, Juniperus californica, Quercus agrifolia,* or *Q. douglasii.*

Quercus berberidifolia **Shrubland**

36a. (32) Shrublands dominated by *Rhamnus ilicifolia* draped with the vine *Clematis lasiantha*, occuring on steep slopes facing northeast. Other shrubs present in much lower cover include *Heteromeles arbutifolia, Lepechinia calycina, Mimulus aurantiacus, and Prunus ilicifolia ssp. ilicifolia*. Only 2 plots were sampled of this type, and its classification is tentative

Unclassified: ***Rhamnus ilicifolia - Clematis lasiantha*** **Shrubland**

36b. Shrublands not like those listed above in all respects, dominated by other species**.**

Shrubland community not yet described from Pinnacles NM

KEY IV: A Key to the Herbaceous Associations of Pinnacles National Monument

1a. Herbaceous vegetation occupying mesic sites including wetlands, perennial drainages, floodplains, seeps, and springs. **(2)**

1b. Herbaceous vegetation occupying xeric and upland sites including dry drainages, terraces, and benches; community not controlled by water table or subsurface flow of water. This includes areas dominated by non-vascular plants such as lichens, and the semi-vascular plant *Selaginella bigelovii*. This key also includes sparsely vegetated areas with scatted shrubs and herbs, total vegetated cover maybe less than 10-25% cover. **(9)**

Wetland and Mesic Herbaceous Communities

2a. (3) Sites perennially wet and are dominated by forb species, including *Mimulus* spp., *Veronica*, and others. Stands are small, generally limited to very wet edge of creek or seep. Grasses may be present to abundant, but the mere presence of *Mimulus* species is enough to key to this type.
***Mimulus guttatus – (Mimulus spp.)* Herbaceous Vegetation**

2b. Sites are dominated by forb or grass species, and *Mimulus* is not present. Stands are often small to large, occurring on a subirrgated floodplain, can be limited to a band along a stream channel, but also occurs in wide areas, possibly filling the valley floor. **(3)**

3a. (2) Sites are dominated by forb species. Subshrubs may be present, grasses are few **(4)**

3b. Sites are dominated by grasses and grass like plants **(5)**

4a. (3) Herbaceous association on flat or gentle slopes with east and southeast-facing aspects dominated by *Gnaphalium canescens ssp. beneolens (=Pseudognaphalium canescens ssp. beneolens)* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum. Artemisia dracunculus* is listed in parentheses because most of the sampled stands occurred in a matrix of *Artemisia dracunculus* dominated area, the plots appear to be small openings.
***(Artemisia dracunculus) - Gnaphalium canescens* Herbaceous Vegetation**

4b. Herbaceous association alluvial fans dominated by *Artemisia dracunculus* and *Bromus diandrus* and *Bromus hordeaceus* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum* at low cover. ***Artemisia dracunculus* Alluvial Fan Herbaceous Vegetation**

5a. (3) Wet or mesic and slightly alkaline sites dominated by *Juncus, Eleocharis, Leymus, or Distichlis. Bromus* or *Poa* species maybe present to abundant, but the presence of *Juncus, Eleocharis* , or *Distichlis* over rides any grass dominance as wetland indicator species **(6)**

5b. Sites similar to above but dominated by other species such as *Carex*, *Equisetum* and others.
Herbaceous Community not yet described from Pinnacles National Monument.

6a. (5) Sites that are saturated throughout the growing season, either stream margins or areas where water ponds, dominated by *Eleocharis macrostachya.* Stands can be small, narrow and confined to the channel or water source margin, or can occur in wide wet meadows or swales. *Juncus balticus* may be present to abundant to dominant, but *Eleocharis* is the indicator species.
***Eleocharis macrostachya* Herbaceous Vegetation**

6b. *Eleocharis macrostachya* is not present **(7)**

7a. (6) Wet swales or merely mesic areas that may or may not be slightly alkaline. Grasslands dominated by *Leymus triticoides.* Usually several other species are present with <1% to 5% cover; species such as *Bromus hordeaceus, Lactuca serriola, Vulpia myuros,* and *Juncus phaeocephalus var. paniculatus*.
***Leymus triticoides* Herbaceous Vegetation**

7b. Sites on the margins of alkaline or freshwater seeps, in heavily grazed wetlands, and on the margins of overflow channels where the water level fluctuates greatly throughout the growing season, dominated by *Juncus balticus or Hordeum brachyantherum* **(8)**

8a. (7) Sites on the margins of alkaline or freshwater seeps, in heavily grazed wetlands, and on the margins of overflow channels where the water level fluctuates greatly throughout the growing season, and is dominated by *Juncus balticus. Carex* species, if present, are not more than 2-5% cover.
***Juncus balticus* Herbaceous Vegetation**

8b. Herbaceous community flat areas dominated by *Centaurea solstitialis* and *Hordeum brachyantherum ssp. californicum* in the herbaceous layer. This type sampled only once in the park, in a meadow complex with other wetland herbaceous types including *Juncus balticus* and *Distichlis spicata*. The site has active livestock grazing at the Kingman area. ***Hordeum brachyantherum* Herbaceous Vegetation**

Upland/Dry and Dry Alluvial Herbaceous Communities

9a. (1) Dry to mesic upland sites dominated low non-vascular, semi-vascular cover (lichens and *Selaginella*) or by *Sedum spathulifolium.* Other vascular plants can be present and form a taller "canopy" but their cover is less than 10% **(10)**

9b. Dry to mesic upland areas low to tall vascular plants, forming meadows and grasslands dominated by species such as *Artemisia (dracunculus), Epilobium, Eriogonum, Erodium, Eschscholzia, Heterotheca, Avena, Bromus, Hordeum, Muhlenbergia, Vulpia,* and others. **(14)**

10a. (6) Dry to mesic rock outcrops and gravel areas densely covered in moss and *Sedum spathulifolium*
Sedum spathulifolium - Moss - Bedrock Vegetation

10b. Stands not like above in all respects (11)

11a. (10) Stands densely covered in mats of *Selaginella bigelovii*. Scattered *Eriogonum fasciculatum* can be present with as much as 25% cover. Other species that may have high cover, (>10%) but are always less than half that of *Selaginella bigelovii*, include *Avena barbata*, lichens, *Melica imperfecta*, mosses, *Bromus madritensis* ssp. *rubens, Mirabilis californica* ssp. *californica, Vulpia microstachys, Eriogonum wrightii* var. *subscaposum,* or *Plantago erecta.* This type can be keyed through the shrubland section.
***Eriogonum fasciculatum / Selaginella bigelovii* Herbaceous Vegetation**

11b. Bed rock and gravel patches with very sparse vegetations but may have high cover of lichens, and are not like above in all respects **(12)**

12a. (11) Bedrock and/or gravel patches with heavy Lichen covering. Few scattered grasses an forbs, all merely present or absent. **Lichen Gravel - Bedrock Nonvascular Sparse Vegetation**

12b. Bedrock and/or gravel patches with heavy lichen covering, and a vascular plant component of at least 10% cover **(13)**

13a. (10) Bedrock and/or gravel patches with heavy lichen covering, *Collinsia heterophylla* is always present with up to 15% cover. Other species may include scattered grasses, forbs and an occasional shrub may be present. ***Collinsia heterophylla* - Lichen Sparse Vegetation**

13b. Bedrock and/or gravel patches with heavy lichen covering, *Eriogonum wrightii* present. Other species may include scattered grasses, forbs and an occasional shrub may be present.
***Eriogonum wrightii* - Lichen Sparse Vegetation**

14a. (7) Herbaceous communities dominated by grass species such as *Avena, Bromus, Hordeum, Muhlenbergia,* or *Vulpia* **.** Forb species may be present to co-dominant. **(21)**

14b. Herbaceous communities dominated by forb species such as *Artemisia dracunculus, Gnaphalium canescens, Epilobium, Eriogonum, Eschscholzia,* or *Heterotheca* species **(15)**

15a. (14) Herbaceous community dominated by *Artemisia dracunculus* and/or *Gnaphalium canescens* **(16)**

15b. Herbaceous community dominated by other species **(17)**

16a. (13) Herbaceous association on flat or gentle slopes with east and southeast-facing aspects dominated by *Gnaphalium canescens ssp. beneolens (=Pseudognaphalium canescens ssp. beneolens)* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum*. *Artemisia dracunculus* is listed in parentheses because most of the sampled stands occurred in a matrix of *Artemisia dracunculus* dominated area, the plots appear to be small openings.
***(Artemisia dracunculus) - Gnaphalium canescens* Herbaceous Vegetation**

16b. Herbaceous association alluvial fans dominated by *Artemisia dracunculus* and *Bromus diandrus* and *Bromus hordeaceus* in the herbaceous layer. The emergent shrub layer includes *Eriogonum fasciculatum var. foliolosum* at low cover. ***Artemisia dracunculus* Alluvial Fan Herbaceous Vegetation**

17a. (15) Herbaceous community dominated by *Eriogonum elongatum* or *E. nudum* **(18)**

17b. Herbaceous community dominated by other species **(19)**

18a. (15) Herbaceous association on steep slopes at all aspects except north facing, dominated by *Eriogonum elongatum* An emergent shrub layer includes *Eriodictyon tomentosum* and *Eriogonum fasciculatum.* ***Eriogonum elongatum* Herbaceous Vegetation**

18b. Herbaceous association on a flat north-facing sites dominated by *Eriogonum nudum. Avena fatua,* and *Bromus rubens (= Bromus madritensis ssp. rubens)* also occur in the herbaceous layer. The emergent shrub layer includes *Prunus ilicifolia ssp. ilicifolia, Heteromeles arbutifolia,* and *Toxicodendron diversilobum*. Only one stand was sampled **Unclassified Herbaceous: *Eriogonum nudum***

19a. (16) Herbaceous community dominated by *Epilobium canum,* on a very steep northwest-facing slopes Also present are the grass *Vulpia myuros,* and shrubs *Cercocarpus montanus var. glaber (= Cercocarpus betuloides var. betuloides)* and *Toxicodendron diversilobum*. In very low cover Nonvascular taxa include a liverwort species. Only one stand sampled of this type.
Unclassified Herbaceous: *Epilobium canum*

19b. Not like above in all respects **(20)**

20a. Herbaceous community on flat to gentle slopes at all aspects dominated by *Eschscholzia californica* and many weedy grasses, such as *Bromus hordeaceus.*
***Eschscholzia californica* Herbaceous Vegetation**

20b. Herbaceous community on flat to steep slopes at all aspects dominated by *Heterotheca sessiliflora ssp. echioides* and *Bromus hordeaceus* in the herbaceous layer. *Penstemon centranthifolius* may be present. ***Heterotheca sessiliflora* ssp. *echioides* Herbaceous Vegetation**

21a. (14) Herbaceous communities dominated by grass species. Forbs may be present to co-dominant **(22)**

21b. Herbaceous community dominated by forbs, not like any of the above herbaceous communities.
Herbaceous Community not yet described from Pinnacles National Monument.

22a. (21) Herbaceous stands dominated by *Vulpia bromides* **(23)**

22b. Herbaceous stands dominated by other grass species **(24)**

23a. (22) Herbaceous stands dominated by the introduced grass *Vulpia bromides* with *Hemizonia lobbii (=Deinandra lobbii)*. Three stands sampled in the park. **Unclassified: *Vulpia bromides – Hemisonia lobbii***

23b. Herbaceous stands dominated by the introduced species *Vulpia bromides* with *Plagiobothrys canescens*, and *Amsinckia menziesii var. menziesii.* Only two stands sampled in the park.
Unclassified: *Vulpia bromides - Plagiobothrys canescens - Amsinckia menziesii*

24a. (22) Herbaceous stands dominated by *Avena* species **(25)**

24b. Herbaceous stands dominated by other grass species **(26)**

25a. (24) Herbaceous stand dominated by *Avena barbata* with *Melica imperfecta* and several other forbs such as Galium angustifolium ssp. angustifolium. Three stands sampled in the park.
Unclassified: *Avena barbata - Melica imperfecta*

25b. Herbaceous stands dominated by *Avena fatua* with several other species including *Hypochaeris glabra, Avena barbata, Plantago erecta,* and *Nassella pulchra*.
***Avena fatua - (Nassella pulchra - Plantago erecta)* Herbaceous Vegetation**

26a. (24) Herbaceous stands dominated by *Bromus hordeaceus, Bromus diandrus* and *Erodium brachycarpum*. *Bromus madritensis* ssp. *rubens* is usually present, but with lower cover. Many other forbs and grasses may be present, but none consistently so.
***Erodium brachycarpum - Bromus hordeaceus - Bromus madritensis* Herbaceous Vegetation**

26b. Herbaceous stands not above in all respects. **(27)**

27a. (26) Herbaceous communities dominated by *Hordeum brachyantherum* or *Muhlenbergia rigens* **(28)**

27b. Herbaceous community not like above in all respects.
Herbaceous Community not yet described from Pinnacles National Monument.

28a. (27) Herbaceous community flat areas dominated by *Centaurea solstitialis* and *Hordeum brachyantherum ssp. californicum* in the herbaceous layer. This type sampled only once in the park, in a meadow complex with other wetland herbaceous types including *Juncus balticus* and *Distichlis spicata*.
***Hordeum brachyantherum* Herbaceous Vegetation**

28b. Herbaceous community on a gentle, south-facing slopes or on alluvial plains, dominated by and *Muhlenbergia rigens.* Other graminoids include *Bromus diandrus.* The shrub layer *Eriogonum fasciculatum var. foliolosum* may also be present in low cover. Only one stand of this type sampled in the park. ***Muhlenbergia rigens* Herbaceous Vegetation**

Appendix E

Plant Species List

Natural Resource Report NPS/SFAN/NRR—2012/574

NatureServe
4001 Discovery Drive, Suite 2010
Boulder, CO 80302

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Tree	Hippocastanaceae	Aesculus californica--Saplings	Aesculus californica	California buckeye
Tree	Hippocastanaceae	Aesculus californica--Seedlings	Aesculus californica	California buckeye
Tree	Hippocastanaceae	Aesculus californica--Trees	Aesculus californica	California buckeye
Tree	Juglandaceae	Carya illinoinensis -- Trees	Carya illinoinensis	pecan
Tree	Juglandaceae	Juglans californica var. hindsii--Saplings	Juglans californica var. hindsii	Northern California walnut
Tree	Juglandaceae	Juglans californica var. hindsii--Trees	Juglans californica var. hindsii	Northern California walnut
Tree	Cupressaceae	Juniperus californica--Saplings	Juglans californica var. hindsii	California juniper
Tree	Cupressaceae	Juniperus californica--Seedlings	Juniperus californica	California juniper
Tree	Cupressaceae	Juniperus californica--Trees	Juniperus californica	California juniper
Tree	Pinaceae	Pinus sabiniana--Saplings	Pinus sabiniana	foothill pine
Tree	Pinaceae	Pinus sabiniana--Seedlings	Pinus sabiniana	foothill pine
Tree	Pinaceae	Pinus sabiniana--Trees	Pinus sabiniana	foothill pine
Tree	Platanaceae	Platanus racemosa--Saplings	Platanus racemosa	California sycamore
Tree	Platanaceae	Platanus racemosa--Seedlings	Platanus racemosa	California sycamore
Tree	Platanaceae	Platanus racemosa--Trees	Platanus racemosa	California sycamore
Tree	Salicaceae	Populus fremontii ssp. fremontii--Saplings	Populus fremontii ssp. fremontii	Fremont cottonwood
Tree	Salicaceae	Populus fremontii ssp. fremontii--Seedlings	Populus fremontii ssp. fremontii	Fremont cottonwood
Tree	Salicaceae	Populus fremontii ssp. fremontii--Trees	Populus fremontii ssp. fremontii	Fremont cottonwood
Tree	Fagaceae	Quercus agrifolia var. agrifolia--Saplings	Quercus agrifolia var. agrifolia	coast live oak
Tree	Fagaceae	Quercus agrifolia var. agrifolia--Seedlings	Quercus agrifolia var. agrifolia	coast live oak
Tree	Fagaceae	Quercus agrifolia var. agrifolia--Trees	Quercus agrifolia var. agrifolia	coast live oak
Tree	Fagaceae	Quercus berberidifolia--Saplings	Quercus berberidifolia	scrub oak
Tree	Fagaceae	Quercus berberidifolia--Seedlings	Quercus berberidifolia	scrub oak
Tree	Fagaceae	Quercus berberidifolia--Trees	Quercus berberidifolia	scrub oak
Tree	Fagaceae	Quercus douglasii--Saplings	Quercus douglasii	blue oak
Tree	Fagaceae	Quercus douglasii--Seedlings	Quercus douglasii	blue oak
Tree	Fagaceae	Quercus douglasii--Trees	Quercus douglasii	blue oak
Tree	Fagaceae	Quercus lobata--Saplings	Quercus lobata	valley oak
Tree	Fagaceae	Quercus lobata--Seedlings	Quercus lobata	valley oak
Tree	Fagaceae	Quercus lobata--Trees	Quercus lobata	valley oak
Tree	Fagaceae	Quercus spp.	Quercus	oak
Tree	Fagaceae	Quercus wislizeni var. frutescens--Trees	Quercus wislizeni var. frutescens	interior live oak
Tree	Fagaceae	Quercus wislizeni var. wislizeni--Saplings	Quercus wislizeni var. wislizeni	interior live oak
Tree	Fagaceae	Quercus wislizeni var. wislizeni--Seedlings	Quercus wislizeni var. wislizeni	interior live oak
Tree	Fagaceae	Quercus wislizeni var. wislizeni--Trees	Quercus wislizeni var. wislizeni	interior live oak
Tree	Fagaceae	Quercus x moreha (kelloggii x wislizenii) --Trees	Quercus ×moreha	oracle oak
Shrub	Rosaceae	Adenostoma fasciculatum	Adenostoma fasciculatum	chamise
Shrub	Ericaceae	Arctostaphylos glauca	Arctostaphylos glauca	bigberry manzanita
Shrub	Ericaceae	Arctostaphylos pungens	Arctostaphylos pungens	pointleaf manzanita
Shrub	Asteraceae	Artemisia californica	Artemisia californica	coastal sagebrush

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Shrub	Asteraceae	Baccharis douglasii	Baccharis douglasii	saltmarsh baccharis
Shrub	Asteraceae	Baccharis pilularis	Baccharis pilularis	coyotebrush
Shrub	Asteraceae	Baccharis salicifolia	Baccharis salicifolia	mule's fat
Shrub	Asteraceae	Brickellia californica	Brickellia californica	California brickellbush
Shrub	Rhamnaceae	Ceanothus cuneatus var. cuneatus	Ceanothus cuneatus var. cuneatus	buckbrush
Shrub	Rosaceae	Cercocarpus betuloides var. betuloides	Cercocarpus montanus var. glaber	birchleaf mountain mahogany
Shrub	Ranunculaceae	Clematis lasiantha	Clematis lasiantha	pipestem clematis
Shrub	Ranunculaceae	Clematis ligusticifolia	Clematis ligusticifolia	western white clematis
Shrub	Papaveraceae	Dendromecon rigida	Dendromecon rigida	tree poppy
Shrub	Hydrophyllaceae	Eriodictyon tomentosum	Eriodictyon tomentosum	woolly yerba santa
Shrub	Polygonaceae	Eriogonum fasciculatum var. foliolosum	Eriogonum fasciculatum var. foliolosum	Eastern Mojave buckwheat
Shrub	Polygonaceae	Eriogonum wrightii var. subscaposum	Eriogonum wrightii var. subscaposum	bastardsage
Shrub	Oleaceae	Forestiera pubescens	Forestiera pubescens	stretchberry
Shrub	Oleaceae	Fraxinus dipetala	Fraxinus dipetala	California ash
Shrub	Garryaceae	Garrya congdonii	Garrya congdonii	chaparral silktassel
Shrub	Agavaceae	Hesperoyucca whipplei	Yucca whipplei var. whipplei	chaparral yucca
Shrub	Rosaceae	Heteromeles arbutifolia	Heteromeles arbutifolia	toyon
Shrub	Scrophulariaceae	Keckiella breviflora ssp. breviflora	Keckiella breviflora ssp. breviflora	bush beardtongue
Shrub	Lamiaceae	Lepechinia calycina	Lepechinia calycina	woodbalm
Shrub	Caprifoliaceae	Lonicera subspicata var. denudata	Lonicera subspicata var. denudata	Santa Barbara honeysuckle
Shrub	Fabaceae	Lupinus albifrons var. albifrons	Lupinus albifrons var. albifrons	silver lupine
Shrub	Malvaceae	Malacothamnus aboriginum	Malacothamnus aboriginum	Gray bushmallow
Shrub	Viscaceae	Phoradendron macrophyllum	Phoradendron macrophyllum	Colorado Desert mistletoe
Shrub	Rosaceae	Prunus ilicifolia ssp. ilicifolia	Prunus ilicifolia ssp. ilicifolia	hollyleaf cherry
Shrub	Rhamnaceae	Rhamnus ilicifolia	Rhamnus ilicifolia	hollyleaf redberry
Shrub	Grossulariaceae	Ribes californicum var. californicum	Ribes californicum var. californicum	hillside gooseberry
Shrub	Grossulariaceae	Ribes malvaceum var. viridifolium	Ribes malvaceum var. viridifolium	chaparral currant
Shrub	Grossulariaceae	Ribes quercetorum	Ribes quercetorum	rock gooseberry
Shrub	Grossulariaceae	Ribes sp.	Ribes	currant
Shrub	Rosaceae	Rosa californica	Rosa californica	California wildrose
Shrub	Rosaceae	Rubus discolor	Rubus discolor	Himalayan blackberry
Shrub	Rosaceae	Rubus ursinus	Rubus ursinus	California blackberry
Shrub	Salicaceae	Salix exigua	Salix exigua	coyote willow
Shrub	Salicaceae	Salix laevigata	Salix laevigata	polished willow
Shrub	Salicaceae	Salix lasiolepis	Salix lasiolepis	arroyo willow
Shrub	Salicaceae	Salix spp.	Salix	willow
Shrub	Lamiaceae	Salvia mellifera	Salvia mellifera	black sage
Shrub	Caprifoliaceae	Sambucus mexicana	Sambucus nigra ssp. canadensis	common elderberry
Shrub	Caprifoliaceae	Symphoricarpos albus var. laevigatus	Symphoricarpos albus var. laevigatus	common snowberry
Shrub	Caprifoliaceae	Symphoricarpos mollis	Symphoricarpos mollis	creeping snowberry
Shrub	Caprifoliaceae	Symphoricarpos sp.	Symphoricarpos	snowberry
Shrub	Anacardiaceae	Toxicodendron diversilobum	Toxicodendron diversilobum	Pacific poison-oak
Nonvascular		Cryptobiotic Crust		cryptobiotic crust

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Nonvascular		Lichens		lichens
Nonvascular		Mosses and/or Liverworts		mosses and/or liverworts
Graminoid	Asteraceae	Agoseris grandiflora	Agoseris grandiflora	bigflower agoseris
Graminoid	Asteraceae	Agoseris retrorsa	Agoseris retrorsa	spearleaf agoseris
Graminoid	Asteraceae	Agoseris sp.	Agoseris	agoseris
Graminoid	Poaceae	Agrostis exarata	Agrostis exarata	spike bentgrass
Graminoid	Poaceae	Aira caryophyllea	Aira caryophyllea	silver hairgrass
Graminoid	Poaceae	Avena barbata	Avena barbata	slender oat
Graminoid	Poaceae	Avena fatua	Avena fatua	wild oat
Graminoid	Poaceae	Avena sp.	Avena	oat
Graminoid	Poaceae	Bromus arenarius	Bromus arenarius	Australian brome
Graminoid	Poaceae	Bromus carinatus var. carinatus	Bromus carinatus	California brome
Graminoid	Poaceae	Bromus diandrus	Bromus diandrus	ripgut brome
Graminoid	Poaceae	Bromus hordeaceus	Bromus hordeaceus	soft brome
Graminoid	Poaceae	Bromus laevipes	Bromus laevipes	Chinook brome
Graminoid	Poaceae	Bromus madritensis ssp. madritensis	Bromus madritensis	compact brome
Graminoid	Poaceae	Bromus madritensis ssp. rubens	Bromus rubens	red brome
Graminoid	Poaceae	Bromus sp.	Bromus	brome
Graminoid	Poaceae	Bromus trinii	Bromus berterianus	Chilean chess
Graminoid	Cyperaceae	Carex barbarae	Carex barbarae	Santa Barbara sedge
Graminoid	Cyperaceae	Carex brevicaulis	Carex brevicaulis	shortstem sedge
Graminoid	Cyperaceae	Carex sp.	Carex	sedge
Graminoid	Poaceae	Cynosurus echinatus	Cynosurus echinatus	bristly dogstail grass
Graminoid	Cyperaceae	Cyperus difformis	Cyperus difformis	variable flatsedge
Graminoid	Cyperaceae	Cyperus eragrostis	Cyperus eragrostis	tall flatsedge
Graminoid	Cyperaceae	Cyperus sp.	Cyperus	flatsedge
Graminoid	Cyperaceae	Cyperus strigosus	Cyperus strigosus	strawcolored flatsedge
Graminoid	Poaceae	Deschampsia danthonioides	Deschampsia danthonioides	annual hairgrass
Graminoid	Poaceae	Distichlis spicata	Distichlis spicata	inland saltgrass
Graminoid	Cyperaceae	Eleocharis macrostachya	Eleocharis palustris	common spikerush
Graminoid	Cyperaceae	Eleocharis parishii	Eleocharis parishii	Parish's spikerush
Graminoid	Cyperaceae	Eleocharis rostellata	Eleocharis rostellata	beaked spikerush
Graminoid	Cyperaceae	Eleocharis sp.	Eleocharis	spikerush
Graminoid	Poaceae	Elymus glaucus ssp. glaucus	Elymus glaucus ssp. glaucus	blue wildrye
Graminoid	Poaceae	Elymus multisetus	Elymus multisetus	big squirreltail
Graminoid	Poaceae	Elymus sp.	Elymus	wildrye
Graminoid	Poaceae	Festuca sp.	Festuca	fescue
Graminoid	Poaceae	Gastridium ventricosum	Gastridium phleoides	nit grass
Graminoid	Poaceae	Hordeum brachyantherum ssp. californicum	Hordeum brachyantherum ssp. californicum	California barley
Graminoid	Poaceae	Hordeum murinum ssp. leporinum	Hordeum murinum ssp. leporinum	leporinum barley
Graminoid	Poaceae	Hordeum sp.	Hordeum	barley
Graminoid	Poaceae	Hordeum vulgare	Hordeum vulgare	common barley
Graminoid	Juncaceae	Juncus balticus	Juncus balticus	Baltic rush
Graminoid	Juncaceae	Juncus bufonius	Juncus bufonius	toad rush
Graminoid	Juncaceae	Juncus effusus var. pacificus	Juncus effusus var. pacificus	Pacific rush
Graminoid	Juncaceae	Juncus phaeocephalus var. paniculatus	Juncus phaeocephalus var. paniculatus	brownhead rush
Graminoid	Juncaceae	Juncus sp.	Juncus	rush
Graminoid	Juncaceae	Juncus xiphioides	Juncus xiphioides	irisleaf rush
Graminoid	Poaceae	Koeleria macrantha	Koeleria macrantha	prairie Junegrass

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Graminoid	Poaceae	Lamarckia aurea	Lamarckia aurea	goldentop grass
Graminoid	Lemnaceae	Lemna minor	Lemna minor	common duckweed
Graminoid	Poaceae	Leymus triticoides	Leymus triticoides	beardless wildrye
Graminoid	Poaceae	Lolium perenne	Lolium perenne	perennial ryegrass
Graminoid	Poaceae	Lolium sp.	Lolium	ryegrass
Graminoid	Poaceae	Melica californica	Melica californica	California melicgrass
Graminoid	Poaceae	Melica imperfecta	Melica imperfecta	smallflower melicgrass
Graminoid	Poaceae	Melica sp.	Melica	melicgrass
Graminoid	Poaceae	Melica torreyana	Melica torreyana	Torrey's melicgrass
Graminoid	Poaceae	Muhlenbergia rigens	Muhlenbergia rigens	deergrass
Graminoid	Poaceae	Nassella cernua	Nassella cernua	nodding tussockgrass
Graminoid	Poaceae	Nassella lepida	Nassella lepida	smallflower tussockgrass
Graminoid	Poaceae	Nassella pulchra	Nassella pulchra	purple tussockgrass
Graminoid	Poaceae	Nassella sp.	Nassella	tussockgrass
Graminoid	Poaceae	Phalaris californica	Phalaris californica	California canarygrass
Graminoid	Poaceae	Poa annua	Poa annua	annual bluegrass
Graminoid	Poaceae	Poa bulbosa	Poa bulbosa	bulbous bluegrass
Graminoid	Poaceae	Poa secunda ssp. secunda	Poa secunda	Sandberg bluegrass
Graminoid	Poaceae	Poa sp.	Poa	bluegrass
Graminoid	Poaceae	Polypogon interruptus	Polypogon interruptus	ditch rabbitsfoot grass
Graminoid	Poaceae	Polypogon monspeliensis	Polypogon monspeliensis	annual rabbitsfoot grass
Graminoid	Poaceae	Polypogon sp.	Polypogon	rabbitsfoot grass
Graminoid	Cyperaceae	Scirpus americanus	Schoenoplectus americanus	chairmaker's bulrush
Graminoid	Cyperaceae	Scirpus microcarpus	Scirpus microcarpus	panicled bulrush
Graminoid	Cyperaceae	Scirpus sp.	Scirpus	bulrush
Graminoid	Poaceae	Vulpia bromoides	Vulpia bromoides	brome fescue
Graminoid	Poaceae	Vulpia microstachys	Vulpia microstachys	small fescue
Graminoid	Poaceae	Vulpia myuros	Vulpia myuros	rat-tail fescue
Graminoid	Poaceae	Vulpia octoflora	Vulpia octoflora	sixweeks fescue
Graminoid	Poaceae	Vulpia sp.	Vulpia	fescue
Forb	Asteraceae	Achillea millefolium	Achillea millefolium	common yarrow
Forb	Asteraceae	Achyrachaena mollis	Achyrachaena mollis	blow wives
Forb	Pteridaceae	Adiantum jordanii	Adiantum jordanii	California maidenhair
Forb	Liliaceae	Allium cratericola	Allium cratericola	Cascade onion
Forb	Liliaceae	Allium crispum	Allium crispum	crinkled onion
Forb	Liliaceae	Allium fimbriatum var. fimbriatum	Allium fimbriatum var. fimbriatum	fringed onion
Forb	Liliaceae	Allium lacunosum var. micranthum	Allium lacunosum var. micranthum	pitted onion
Forb	Liliaceae	Allium sp.	Allium	onion
Forb	Polemoniaceae	Allophyllum gilioides ssp. violaceum	Allophyllum gilioides ssp. violaceum	dense false gilyflower
Forb	Amaranthaceae	Amaranthus albus	Amaranthus albus	prostrate pigweed
Forb	Amaranthaceae	Amaranthus californicus	Amaranthus californicus	California amaranth
Forb	Asteraceae	Ambrosia acanthicarpa	Ambrosia acanthicarpa	flatspine burr ragweed
Forb	Boraginaceae	Amsinckia menziesii var. intermedia	Amsinckia menziesii var. intermedia	common fiddleneck
Forb	Boraginaceae	Amsinckia menziesii var. menziesii	Amsinckia menziesii var. menziesii	Menzies' fiddleneck
Forb	Boraginaceae	Amsinckia sp.	Amsinckia	fiddleneck
Forb	Primulaceae	Anagallis arvensis	Anagallis arvensis	scarlet pimpernel
Forb	Asteraceae	Anaphalis margaritacea	Anaphalis margaritacea	western pearly everlasting
Forb	Asteraceae	Ancistrocarphus filagineus	Ancistrocarphus filagineus	false neststraw
Forb	Apiaceae	Anthriscus caucalis	Anthriscus caucalis	burr chervil
Forb	Scrophulariaceae	Antirrhinum kelloggii	Neogaerrhinum strictum	Kellogg's snapdragon
Forb	Scrophulariaceae	Antirrhinum multiflorum	Sairocarpus multiflorus	Sierra snapdragon
Forb	Rosaceae	Aphanes occidentalis	Aphanes arvensis	field parsley piert

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Forb	Apiaceae	Apiastrum angustifolium	Apiastrum angustifolium	mock parsley
Forb	Apiaceae	Apium graveolens	Apium graveolens	wild celery
Forb	Brassicaceae	Arabis breweri var. breweri	Arabis breweri var. breweri	Brewer's rockcress
Forb	Brassicaceae	Arabis glabra var. glabra	Arabis glabra	tower rockcress
Forb	Asteraceae	Artemisia biennis	Artemisia biennis	biennial wormwood
Forb	Asteraceae	Artemisia douglasiana	Artemisia douglasiana	Douglas' sagewort
Forb	Asteraceae	Artemisia dracunculus	Artemisia dracunculus	dragon wormwood
Forb	Asclepiadaceae	Asclepias fascicularis	Asclepias fascicularis	Mexican whorled milkweed
Forb	Asclepiadaceae	Asclepias vestita	Asclepias vestita	woolly milkweed
Forb	Fabaceae	Astragalus gambelianus	Astragalus gambelianus	Gambel's dwarf milkvetch
Forb	Fabaceae	Astragalus sp.	Astragalus	milkvetch
Forb	Brassicaceae	Athysanus pusillus	Athysanus pusillus	common sandweed
Forb	Azollaceae	Azolla filiculoides	Azolla filiculoides	Pacific mosquitofern
Forb	Apiaceae	Berula erecta	Berula erecta	cutleaf waterparsnip
Forb	Liliaceae	Bloomeria crocea	Bloomeria crocea	common goldenstar
Forb	Apiaceae	Bowlesia incana	Bowlesia incana	hoary bowlesia
Forb	Brassicaceae	Brassica nigra	Brassica nigra	black mustard
Forb	Liliaceae	Brodiaea terrestris ssp. terrestris	Brodiaea terrestris ssp. terrestris	dwarf brodiaea
Forb	Portulacaceae	Calandrinia ciliata	Calandrinia ciliata	fringed redmaids
Forb	Liliaceae	Calochortus venustus	Calochortus venustus	butterfly mariposa lily
Forb	Convolvulaceae	Calystegia collina ssp. venusta	Calystegia collina ssp. venusta	coast range false bindweed
Forb	Convolvulaceae	Calystegia purpurata ssp. purpurata	Calystegia purpurata ssp. purpurata	Pacific false bindweed
Forb	Convolvulaceae	Calystegia sp.	Calystegia	false bindweed
Forb	Convolvulaceae	Calystegia subacaulis ssp. subacaulis	Calystegia subacaulis ssp. subacaulis	hillside false bindweed
Forb	Onagraceae	Camissonia boothii ssp. decorticans	Camissonia boothii ssp. decorticans	shredding suncup
Forb	Onagraceae	Camissonia campestris ssp. campestris	Camissonia campestris ssp. campestris	Mojave suncup
Forb	Onagraceae	Camissonia contorta	Camissonia contorta	plains evening-primrose
Forb	Onagraceae	Camissonia hirtella	Camissonia hirtella	Santa Cruz Island suncup
Forb	Onagraceae	Camissonia ignota	Camissonia ignota	Jurupa Hills suncup
Forb	Onagraceae	Camissonia micrantha	Camissonia micrantha	miniature suncup
Forb	Onagraceae	Camissonia sp.	Camissonia	suncup
Forb	Brassicaceae	Capsella bursa-pastoris	Capsella bursa-pastoris	shepherd's purse
Forb	Brassicaceae	Cardamine californica	Cardamine californica	milkmaids
Forb	Brassicaceae	Cardamine oligosperma	Cardamine oligosperma	little western bittercress
Forb	Asteraceae	Carduus pycnocephalus	Carduus pycnocephalus	Italian plumeless thistle
Forb	Asteraceae	Carduus tenuiflorus	Carduus tenuiflorus	winged plumeless thistle
Forb	Scrophulariaceae	Castilleja affinis ssp. affinis	Castilleja affinis ssp. affinis	coast Indian paintbrush
Forb	Scrophulariaceae	Castilleja attenuata	Castilleja attenuata	attenuate Indian paintbrush
Forb	Scrophulariaceae	Castilleja brevistyla	Castilleja brevistyla	shortstyle Indian paintbrush
Forb	Scrophulariaceae	Castilleja exserta ssp. exserta	Castilleja exserta ssp. exserta	exserted Indian paintbrush
Forb	Scrophulariaceae	Castilleja foliolosa	Castilleja foliolosa	Texas Indian paintbrush
Forb	Scrophulariaceae	Castilleja sp.	Castilleja	Indian paintbrush
Forb	Asteraceae	Centaurea melitensis	Centaurea melitensis	Maltese star-thistle
Forb	Asteraceae	Centaurea solstitialis	Centaurea solstitialis	yellow star-thistle
Forb	Gentianaceae	Centaurium exaltatum	Centaurium exaltatum	desert centaury
Forb	Polygonaceae	Centrostegia thurberi	Centrostegia thurberi	red triangles
Forb	Primulaceae	Centunculus minimus	Anagallis minima	chaffweed
Forb	Caryophyllaceae	Cerastium glomeratum	Cerastium glomeratum	sticky chickweed
Forb	Asteraceae	Chaenactis glabriuscula	Chaenactis glabriuscula	yellow pincushion
Forb	Euphorbiaceae	Chamaesyce maculata	Chamaesyce nutans	eyebane

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Forb	Euphorbiaceae	Chamaesyce ocellata ssp. ocellata	Chamaesyce ocellata ssp. ocellata	Contura Creek sandmat
Forb	Asteraceae	Chamomilla suaveolens	Matricaria discoidea	disc mayweed
Forb	Chenopodiaceae	Chenopodium berlandieri	Chenopodium berlandieri	pitseed goosefoot
Forb	Chenopodiaceae	Chenopodium californicum	Chenopodium californicum	California goosefoot
Forb	Chenopodiaceae	Chenopodium desiccatum	Chenopodium desiccatum	aridland goosefoot
Forb	Chenopodiaceae	Chenopodium sp.	Chenopodium	goosefoot
Forb	Liliaceae	Chlorogalum pomeridianum var. pomeridianum	Chlorogalum pomeridianum var. pomeridianum	wavyleaf soap plant
Forb	Polygonaceae	Chorizanthe douglasii	Chorizanthe douglasii	San Benito spineflower
Forb	Polygonaceae	Chorizanthe membranacea	Chorizanthe membranacea	pink spineflower
Forb	Polygonaceae	Chorizanthe sp.	Chorizanthe	spineflower
Forb	Polygonaceae	Chorizanthe uniaristata	Chorizanthe uniaristata	oneawn spineflower
Forb	Asteraceae	Cirsium occidentale var. occidentale	Cirsium occidentale var. occidentale	cobwebby thistle
Forb	Asteraceae	Cirsium occidentale var. venustum	Cirsium occidentale var. venustum	cobwebby thistle
Forb	Asteraceae	Cirsium sp.	Cirsium	thistle
Forb	Asteraceae	Cirsium vulgare	Cirsium vulgare	bull thistle
Forb	Onagraceae	Clarkia affinis	Clarkia affinis	chaparral clarkia
Forb	Onagraceae	Clarkia breweri	Clarkia breweri	fairy fans
Forb	Onagraceae	Clarkia cylindrica ssp. cylindrica	Clarkia cylindrica ssp. cylindrica	speckled clarkia
Forb	Onagraceae	Clarkia epilobioides	Clarkia epilobioides	canyon clarkia
Forb	Onagraceae	Clarkia modesta	Clarkia modesta	Waltham Creek clarkia
Forb	Onagraceae	Clarkia purpurea ssp. quadrivulnera	Clarkia purpurea ssp. quadrivulnera	winecup clarkia
Forb	Onagraceae	Clarkia similis	Clarkia similis	Ramona clarkia
Forb	Onagraceae	Clarkia sp.	Clarkia	clarkia
Forb	Onagraceae	Clarkia speciosa ssp. speciosa	Clarkia speciosa ssp. speciosa	redspot clarkia
Forb	Onagraceae	Clarkia unguiculata	Clarkia unguiculata	elegant clarkia
Forb	Portulacaceae	Claytonia exigua ssp. exigua	Claytonia exigua ssp. exigua	serpentine springbeauty
Forb	Portulacaceae	Claytonia gypsophiloides	Claytonia gypsophiloides	gypsum springbeauty
Forb	Portulacaceae	Claytonia parviflora ssp. parviflora	Claytonia parviflora ssp. parviflora	streambank springbeauty
Forb	Portulacaceae	Claytonia perfoliata ssp. perfoliata	Claytonia perfoliata ssp. perfoliata	miner's lettuce
Forb	Portulacaceae	Claytonia sp.	Claytonia	springbeauty
Forb	Scrophulariaceae	Collinsia heterophylla	Collinsia heterophylla	purple Chinese houses
Forb	Scrophulariaceae	Collinsia parviflora	Collinsia parviflora	maiden blue eyed Mary
Forb	Scrophulariaceae	Collinsia sp.	Collinsia	blue eyed Mary
Forb	Apiaceae	Conium maculatum	Conium maculatum	poison hemlock
Forb	Convolvulaceae	Convolvulus arvensis	Convolvulus arvensis	field bindweed
Forb	Asteraceae	Conyza canadensis	Conyza canadensis	Canadian horseweed
Forb	Asteraceae	Conyza sp.	Conyza	horseweed
Forb	Scrophulariaceae	Cordylanthus rigidus ssp. rigidus	Cordylanthus rigidus ssp. rigidus	stiffbranch bird's beak
Forb	Asteraceae	Cotula coronopifolia	Cotula coronopifolia	common brassbuttons
Forb	Crassulaceae	Crassula aquatica	Crassula aquatica	water pygmyweed
Forb	Crassulaceae	Crassula connata	Crassula connata	sand pygmyweed
Forb	Boraginaceae	Cryptantha decipiens	Cryptantha decipiens	gravelbar cryptantha
Forb	Boraginaceae	Cryptantha intermedia	Cryptantha intermedia	Clearwater cryptantha
Forb	Boraginaceae	Cryptantha microstachys	Cryptantha microstachys	Tejon cryptantha
Forb	Boraginaceae	Cryptantha muricata	Cryptantha muricata	pointed cryptantha
Forb	Boraginaceae	Cryptantha sp.	Cryptantha	cryptantha
Forb	Cuscutaceae	Cuscuta californica	Cuscuta californica	chaparral dodder
Forb	Cuscutaceae	Cuscuta sp.	Cuscuta	dodder

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Forb	Cuscutaceae	Cuscuta subinclusa	Cuscuta ceanothi	canyon dodder
Forb	Boraginaceae	Cynoglossum grande	Cynoglossum grande	Pacific hound's tongue
Forb	Datiscaceae	Datisca glomerata	Datisca glomerata	Durango root
Forb	Solanaceae	Datura wrightii	Datura wrightii	sacred thorn-apple
Forb	Apiaceae	Daucus pusillus	Daucus pusillus	American wild carrot
Forb	Asteraceae	Deinandra lobbii	Hemizonia lobbii	Lobb's tarweed
Forb	Ranunculaceae	Delphinium californicum ssp. interius	Delphinium californicum ssp. interius	California larkspur
Forb	Ranunculaceae	Delphinium hesperium ssp. pallescens	Delphinium hesperium ssp. pallescens	foothill larkspur
Forb	Ranunculaceae	Delphinium parryi ssp. parryi	Delphinium parryi ssp. parryi	San Bernardino larkspur
Forb	Ranunculaceae	Delphinium patens ssp. patens	Delphinium patens ssp. patens	zigzag larkspur
Forb	Ranunculaceae	Delphinium sp.	Delphinium	larkspur
Forb	Fumariaceae	Dicentra chrysantha	Ehrendorferia chrysantha	golden eardrops
Forb	Liliaceae	Dichelostemma capitatum ssp. capitatum	Dichelostemma capitatum ssp. capitatum	bluedicks
Forb	Primulaceae	Dodecatheon clevelandii ssp. patulum	Dodecatheon clevelandii ssp. patulum	padre's shootingstar
Forb	Primulaceae	Dodecatheon hendersonii	Dodecatheon hendersonii	mosquito bills
Forb	Primulaceae	Dodecatheon sp.	Dodecatheon	shootingstar
Forb	Brassicaceae	Draba verna	Draba verna	spring draba
Forb	Dryopteridaceae	Dryopteris arguta	Dryopteris arguta	coastal woodfern
Forb	Crassulaceae	Dudleya cymosa	Dudleya cymosa	canyon liveforever
Forb	Crassulaceae	Dudleya lanceolata	Dudleya lanceolata	lanceleaf liveforever
Forb	Crassulaceae	Dudleya sp.	Dudleya	dudleya
Forb	Hydrophyllaceae	Emmenanthe penduliflora var. penduliflora	Emmenanthe penduliflora var. penduliflora	whisperingbells
Forb	Onagraceae	Epilobium brachycarpum	Epilobium brachycarpum	tall annual willowherb
Forb	Onagraceae	Epilobium canum ssp. canum	Epilobium canum ssp. canum	hummingbird trumpet
Forb	Onagraceae	Epilobium densiflorum	Epilobium densiflorum	denseflower willowherb
Forb	Onagraceae	Epilobium minutum	Epilobium minutum	chaparral willowherb
Forb	Onagraceae	Epilobium sp.	Epilobium	willowherb
Forb	Onagraceae	Epilobium torreyi	Epilobium torreyi	Torrey's willowherb
Forb	Euphorbiaceae	Eremocarpus setigerus	Croton setigerus	dove weed
Forb	Poaceae	Eriastrum densifolium	Eragrostis deflexa	Pacific lovegrass
Forb	Polemoniaceae	Eriastrum virgatum	Eriastrum virgatum	wand woollystar
Forb	Asteraceae	Erigeron foliosus var. foliosus	Erigeron foliosus var. foliosus	leafy fleabane
Forb	Asteraceae	Erigeron petrophilus var. petrophilus	Erigeron petrophilus var. petrophilus	rockloving erigeron
Forb	Asteraceae	Erigeron sp.	Erigeron	fleabane
Forb	Polygonaceae	Eriogonum angulosum	Eriogonum angulosum	anglestem buckwheat
Forb	Polygonaceae	Eriogonum elegans	Eriogonum elegans	elegant buckwheat
Forb	Polygonaceae	Eriogonum elongatum	Eriogonum elongatum	longstem buckwheat
Forb	Polygonaceae	Eriogonum nortonii	Eriogonum nortonii	Pinnacles buckwheat
Forb	Polygonaceae	Eriogonum nudum	Eriogonum nudum	naked buckwheat
Forb	Polygonaceae	Eriogonum roseum	Eriogonum roseum	wand buckwheat
Forb	Polygonaceae	Eriogonum saxatile	Eriogonum saxatile	hoary buckwheat
Forb	Asteraceae	Eriophyllum confertiflorum var. confertiflorum	Eriophyllum confertiflorum var. confertiflorum	golden-yarrow
Forb	Asteraceae	Eriophyllum multicaule	Eriophyllum multicaule	manystem woolly sunflower
Forb	Geraniaceae	Erodium botrys	Erodium botrys	longbeak stork's bill
Forb	Geraniaceae	Erodium brachycarpum	Erodium brachycarpum	shortfruit stork's bill
Forb	Geraniaceae	Erodium cicutarium	Erodium cicutarium	redstem stork's bill
Forb	Geraniaceae	Erodium moschatum	Erodium moschatum	musky stork's bill

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Forb	Geraniaceae	Erodium sp.	Erodium	stork's bill
Forb	Brassicaceae	Erysimum capitatum var. capitatum	Erysimum capitatum var. capitatum	sanddune wallflower
Forb	Papaveraceae	Eschscholzia caespitosa	Eschscholzia caespitosa	tufted poppy
Forb	Papaveraceae	Eschscholzia californica	Eschscholzia californica	California poppy
Forb	Papaveraceae	Eschscholzia sp.	Eschscholzia	California poppy
Forb	Hydrophyllaceae	Eucrypta chrysanthemifolia var. chrysanthemifolia	Eucrypta chrysanthemifolia var. chrysanthemifolia	spotted hideseed
Forb	Euphorbiaceae	Euphorbia spathulata	Euphorbia spathulata	warty spurge
Forb	Asteraceae	Euthamia occidentalis	Euthamia occidentalis	western goldentop
Forb	Asteraceae	Filago californica	Filago californica	California cottonrose
Forb	Asteraceae	Filago gallica	Logfia gallica	narrowleaf cottonrose
Forb	Asteraceae	Filago sp.	Filago	cottonrose
Forb	Liliaceae	Fritillaria affinis var. affinis	Fritillaria affinis var. affinis	checker lily
Forb	Rubiaceae	Galium angustifolium ssp. angustifolium	Galium angustifolium ssp. angustifolium	narrowleaf bedstraw
Forb	Rubiaceae	Galium aparine	Galium aparine	stickywilly
Forb	Rubiaceae	Galium californicum ssp. californicum	Galium californicum ssp. californicum	California bedstraw
Forb	Rubiaceae	Galium murale	Galium murale	yellow wall bedstraw
Forb	Rubiaceae	Galium parisiense	Galium parisiense	wall bedstraw
Forb	Rubiaceae	Galium porrigens var. porrigens	Galium porrigens var. porrigens	graceful bedstraw
Forb	Rubiaceae	Galium sp.	Galium	bedstraw
Forb	Geraniaceae	Geranium carolinianum	Geranium carolinianum	Carolina geranium
Forb	Geraniaceae	Geranium dissectum	Geranium dissectum	cutleaf geranium
Forb	Polemoniaceae	Gilia achilleifolia ssp. achilleifolia	Gilia achilleifolia ssp. achilleifolia	California gilia
Forb	Polemoniaceae	Gilia achilleifolia ssp. multicaulis	Gilia achilleifolia ssp. multicaulis	California gilia
Forb	Polemoniaceae	Gilia angelensis	Gilia angelensis	chaparral gilia
Forb	Polemoniaceae	Gilia capitata ssp. staminea	Gilia capitata ssp. staminea	bluehead gilia
Forb	Polemoniaceae	Gilia clivorum	Gilia clivorum	purplespot gilia
Forb	Polemoniaceae	Gilia sp.	Gilia	gilia
Forb	Polemoniaceae	Gilia tenuiflora ssp. tenuiflora	Gilia tenuiflora ssp. tenuiflora	greater yellowthroat gilia
Forb	Campanulaceae	Githopsis specularioides	Githopsis specularioides	common bluecup
Forb	Fabaceae	Glycyrrhiza lepidota	Glycyrrhiza lepidota	American licorice
Forb	Asteraceae	Gnaphalium californicum	Pseudognaphalium californicum	ladies' tobacco
Forb	Asteraceae	Gnaphalium canescens ssp. beneolens	Pseudognaphalium canescens ssp. beneolens	Wright's cudweed
Forb	Asteraceae	Gnaphalium luteo-album	Pseudognaphalium luteoalbum	Jersey cudweed
Forb	Asteraceae	Gnaphalium palustre	Gnaphalium palustre	western marsh cudweed
Forb	Asteraceae	Gnaphalium sp.	Gnaphalium	cudweed
Forb	Asteraceae	Gnaphalium stramineum	Pseudognaphalium stramineum	cottonbatting plant
Forb	Brassicaceae	Guillenia lasiophylla	Guillenia lasiophylla	California mustard
Forb	Asteraceae	Helenium puberulum	Helenium puberulum	rosilla
Forb	Cistaceae	Helianthemum scoparium	Helianthemum scoparium	Bisbee Peak rushrose
Forb	Boraginaceae	Heliotropium curassavicum	Heliotropium curassavicum	salt heliotrope
Forb	Caryophyllaceae	Herniaria hirsuta ssp. cinerea	Herniaria hirsuta ssp. cinerea	hairy rupturewort
Forb	Asteraceae	Hesperevax acaulis var. acaulis	Hesperevax acaulis var. acaulis	stemless dwarf-cudweed
Forb	Urticaceae	Hesperocnide tenella	Hesperocnide tenella	western stingingnettle
Forb	Linaceae	Hesperolinon disjunctum	Hesperolinon disjunctum	Coast Range dwarf-flax

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Forb	Linaceae	Hesperolinon micranthum	Hesperolinon micranthum	smallflower dwarf-flax
Forb	Linaceae	Hesperolinon sp.	Hesperolinon	dwarf-flax
Forb	Asteraceae	Heterotheca sessiliflora ssp. echioides	Heterotheca sessiliflora ssp. echioides	sessileflower false goldenaster
Forb	Brassicaceae	Hirschfeldia incana	Hirschfeldia incana	shortpod mustard
Forb	Apiaceae	Hydrocotyle umbellata	Hydrocotyle umbellata	manyflower marshpennywort
Forb	Asteraceae	Hypochaeris glabra	Hypochaeris glabra	smooth catsear
Forb	Asteraceae	Hypochaeris radicata	Hypochaeris radicata	hairy catsear
Forb	Asteraceae	Hypochaeris sp.	Hypochaeris	catsear
Forb	Asteraceae	Lactuca serriola	Lactuca serriola	prickly lettuce
Forb	Asteraceae	Lagophylla ramosissima ssp. ramosissima	Lagophylla ramosissima ssp. ramosissima	branched lagophylla
Forb	Lamiaceae	Lamium amplexicaule	Lamium amplexicaule	henbit deadnettle
Forb	Asteraceae	Lasthenia californica	Lasthenia californica	California goldfields
Forb	Asteraceae	Lasthenia microglossa	Lasthenia microglossa	smallray goldfields
Forb	Fabaceae	Lathyrus vestitus var. vestitus	Lathyrus vestitus	Pacific pea
Forb	Asteraceae	Layia glandulosa	Layia glandulosa	whitedaisy tidytips
Forb	Asteraceae	Layia hieracioides	Layia hieracioides	tall tidytips
Forb	Asteraceae	Layia sp.	Layia	tidytips
Forb	Brassicaceae	Lepidium nitidum var. nitidum	Lepidium nitidum var. nitidum	shining pepperweed
Forb	Polemoniaceae	Leptosiphon parviflorus	Linanthus parviflorus	variable linanthus
Forb	Asteraceae	Lessingia glandulifera var. glandulifera	Lessingia glandulifera var. glandulifera	valley lessingia
Forb	Asteraceae	Lessingia sp.	Lessingia	lessingia
Forb	Portulacaceae	Lewisia rediviva	Lewisia rediviva	bitter root
Forb	Polemoniaceae	Linanthus bicolor	Linanthus bicolor	true babystars
Forb	Polemoniaceae	Linanthus ciliatus	Linanthus ciliatus	whiskerbrush
Forb	Polemoniaceae	Linanthus pygmaeus ssp. continentalis	Linanthus pygmaeus ssp. continentalis	pygmy linanthus
Forb	Polemoniaceae	Linanthus sp.	Linanthus	linanthus
Forb	Scrophulariaceae	Linaria canadensis var. texana	Nuttallanthus texanus	Texas toadflax
Forb	Saxifragaceae	Lithophragma affine	Lithophragma affine	San Francisco woodland-star
Forb	Saxifragaceae	Lithophragma cymbalaria	Lithophragma cymbalaria	mission woodland-star
Forb	Saxifragaceae	Lithophragma heterophyllum	Lithophragma heterophyllum	hillside woodland-star
Forb	Saxifragaceae	Lithophragma sp.	Lithophragma	woodland-star
Forb	Caryophyllaceae	Loeflingia squarrosa ssp. squarrosa	Loeflingia squarrosa ssp. squarrosa	spreading pygmyleaf
Forb	Poaceae	Lolium multiflorum	Lolium perenne ssp. multiflorum	Italian ryegrass
Forb	Poaceae	Lolium temulentum	Lolium temulentum	Darnel ryegrass
Forb	Apiaceae	Lomatium californicum	Lomatium californicum	California lomatium
Forb	Apiaceae	Lomatium dasycarpum	Lomatium dasycarpum	woollyfruit desertparsley
Forb	Apiaceae	Lomatium sp.	Lomatium	desertparsley
Forb	Apiaceae	Lomatium utriculatum	Lomatium utriculatum	common lomatium
Forb	Fabaceae	Lotus humistratus	Lotus humistratus	foothill deervetch
Forb	Fabaceae	Lotus procumbens var. procumbens	Lotus procumbens var. procumbens	silky deerweed
Forb	Fabaceae	Lotus purshianus var. purshianus	Lotus unifoliolatus var. unifoliolatus	American bird's-foot trefoil
Forb	Fabaceae	Lotus salsuginosus var. salsuginosus	Lotus salsuginosus var. salsuginosus	coastal bird's-foot trefoil
Forb	Fabaceae	Lotus scoparius var. scoparius	Lotus scoparius var. scoparius	common deerweed
Forb	Fabaceae	Lotus sp.	Lotus	trefoil

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Forb	Fabaceae	Lotus strigosus	Lotus strigosus	strigose bird's-foot trefoil
Forb	Fabaceae	Lotus wrangelianus	Lotus wrangelianus	Chilean bird's-foot trefoil
Forb	Fabaceae	Lupinus bicolor	Lupinus bicolor	miniature lupine
Forb	Fabaceae	Lupinus concinnus	Lupinus concinnus	scarlet lupine
Forb	Fabaceae	Lupinus hirsutissimus	Lupinus hirsutissimus	stinging annual lupine
Forb	Fabaceae	Lupinus microcarpus	Lupinus subvexus var. subvexus	valley lupine
Forb	Fabaceae	Lupinus sp.	Lupinus	lupine
Forb	Fabaceae	Lupinus succulentus	Lupinus succulentus	hollowleaf annual lupine
Forb	Fabaceae	Lupinus truncatus	Lupinus truncatus	collared annual lupine
Forb	Solanaceae	Lycopersicon esculentum	Solanum lycopersicum var. lycopersicum	garden tomato
Forb	Lythraceae	Lythrum hyssopifolia	Lythrum hyssopifolia	hyssop loosestrife
Forb	Asteraceae	Madia elegans ssp. elegans	Madia elegans ssp. elegans	common madia
Forb	Asteraceae	Madia elegans ssp. vernalis	Madia elegans ssp. vernalis	spring madia
Forb	Asteraceae	Madia exigua	Madia exigua	small tarweed
Forb	Asteraceae	Madia gracilis	Madia gracilis	grassy tarweed
Forb	Asteraceae	Madia sp.	Madia	tarweed
Forb	Asteraceae	Malacothrix californica	Malacothrix californica	California desertdandelion
Forb	Asteraceae	Malacothrix clevelandii	Malacothrix clevelandii	Cleveland's desertdandelion
Forb	Asteraceae	Malacothrix floccifera	Malacothrix floccifera	woolly desertdandelion
Forb	Malvaceae	Malva parviflora	Malva parviflora	cheeseweed mallow
Forb	Malvaceae	Malva sp.	Malva	mallow
Forb	Malvaceae	Malvella leprosa	Malvella leprosa	alkali mallow
Forb	Cucurbitaceae	Marah fabaceus	Marah fabaceus	California manroot
Forb	Lamiaceae	Marrubium vulgare	Marrubium vulgare	horehound
Forb	Papaveraceae	Meconella linearis	Platystigma linearis	narrowleaf queen poppy
Forb	Fabaceae	Medicago polymorpha	Medicago polymorpha	burclover
Forb	Fabaceae	Melilotus indicus	Melilotus indicus	annual yellow sweetclover
Forb	Lamiaceae	Mentha arvensis	Mentha arvensis	wild mint
Forb	Lamiaceae	Mentha sp.	Mentha	mint
Forb	Lamiaceae	Mentha spicata var. spicata	Mentha spicata	spearmint
Forb	Lamiaceae	Mentha xpiperita	Mentha ×piperita	peppermint
Forb	Loasaceae	Mentzelia gracilenta	Mentzelia gracilenta	grass blazingstar
Forb	Asteraceae	Micropus californicus var. californicus	Micropus californicus var. californicus	q tips
Forb	Asteraceae	Microseris douglasii ssp. douglasii	Microseris douglasii ssp. douglasii	Douglas' silverpuffs
Forb	Scrophulariaceae	Mimulus androsaceus	Mimulus androsaceus	rockjasmine monkeyflower
Forb	Scrophulariaceae	Mimulus aurantiacus	Diplacus aurantiacus ssp. aurantiacus	orange bush monkeyflower
Forb	Scrophulariaceae	Mimulus bifidus	Diplacus grandiflorus	largeflower bush monkeyflower
Forb	Scrophulariaceae	Mimulus cardinalis	Mimulus cardinalis	scarlet monkeyflower
Forb	Scrophulariaceae	Mimulus congdonii	Mimulus congdonii	Congdon's monkeyflower
Forb	Scrophulariaceae	Mimulus floribundus	Mimulus floribundus	manyflowered monkeyflower
Forb	Scrophulariaceae	Mimulus fremontii	Mimulus fremontii	Fremont's monkeyflower
Forb	Scrophulariaceae	Mimulus guttatus	Mimulus guttatus	seep monkeyflower
Forb	Scrophulariaceae	Mimulus pilosus	Mimetanthe pilosa	false monkeyflower
Forb	Scrophulariaceae	Mimulus rattanii	Mimulus rattanii	Rattan's monkeyflower
Forb	Scrophulariaceae	Mimulus sp.	Mimulus	monkeyflower
Forb	Caryophyllaceae	Minuartia douglasii	Minuartia douglasii	Douglas' stitchwort
Forb	Nyctaginaceae	Mirabilis californica ssp. californica	Mirabilis californica var. californica	California four o'clock

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Forb	Lamiaceae	Monardella douglasii ssp. douglasii	Monardella douglasii ssp. douglasii	Douglas' monardella
Forb	Lamiaceae	Monardella villosa ssp. villosa	Monardella villosa ssp. villosa	coyote mint
Forb	Portulacaceae	Montia fontana	Montia fontana	annual water minerslettuce
Forb	Polemoniaceae	Navarretia jaredii	Navarretia jaredii	mitrefruit pincushionplant
Forb	Polemoniaceae	Navarretia pubescens	Navarretia pubescens	downy pincushionplant
Forb	Polemoniaceae	Navarretia sp.	Navarretia	pincushionplant
Forb	Campanulaceae	Nemacladus gracilis	Nemacladus gracilis	slender threadplant
Forb	Hydrophyllaceae	Nemophila menziesii var. menziesii	Nemophila menziesii var. menziesii	baby blue eyes
Forb	Hydrophyllaceae	Nemophila parviflora var. parviflora	Nemophila parviflora var. parviflora	smallflower nemophila
Forb	Hydrophyllaceae	Nemophila pedunculata	Nemophila pedunculata	littlefoot nemophila
Forb	Hydrophyllaceae	Nemophila sp.	Nemophila	baby blue eyes
Forb	Solanaceae	Nicotiana acuminata var. multiflora	Nicotiana acuminata var. multiflora	manyflower tobacco
Forb	Solanaceae	Nicotiana attenuata	Nicotiana attenuata	coyote tobacco
Forb	Solanaceae	Nicotiana quadrivalvis	Nicotiana quadrivalvis	Indian tobacco
Forb	Solanaceae	Nicotiana sp.	Nicotiana	tobacco
Forb	Orobanchaceae	Orobanche bulbosa	Orobanche bulbosa	chaparral broomrape
Forb	Orobanchaceae	Orobanche californica ssp. jepsonii	Orobanche californica ssp. jepsonii	Jepson's broomrape
Forb	Orobanchaceae	Orobanche fasciculata	Orobanche fasciculata	clustered broomrape
Forb	Orobanchaceae	Orobanche uniflora	Orobanche uniflora	oneflowered broomrape
Forb	Apiaceae	Osmorhiza brachypoda	Osmorhiza brachypoda	California sweetcicely
Forb	Asteraceae	Packera breweri	Packera breweri	Brewer's ragwort
Forb	Urticaceae	Parietaria hespera var. hespera	Parietaria hespera var. hespera	rillita pellitory
Forb	Crassulaceae	Parvisedum pentandrum	Sedella pentandra	Mt. Hamilton mock stonecrop
Forb	Boraginaceae	Pectocarya penicillata	Pectocarya penicillata	sleeping combseed
Forb	Boraginaceae	Pectocarya pusilla	Pectocarya pusilla	little combseed
Forb	Boraginaceae	Pectocarya sp.	Pectocarya	combseed
Forb	Scrophulariaceae	Pedicularis densiflora	Pedicularis densiflora	Indian warrior
Forb	Pteridaceae	Pellaea andromedifolia	Pellaea andromedifolia	coffee cliffbrake
Forb	Pteridaceae	Pellaea mucronata var. mucronata	Pellaea mucronata ssp. mucronata	birdfoot cliffbrake
Forb	Scrophulariaceae	Penstemon centranthifolius	Penstemon centranthifolius	scarlet bugler
Forb	Pteridaceae	Pentagramma triangularis ssp. triangularis	Pentagramma triangularis	goldback fern
Forb	Apiaceae	Perideridia californica	Perideridia californica	California yampah
Forb	Hydrophyllaceae	Phacelia brachyloba	Phacelia brachyloba	shortlobe phacelia
Forb	Hydrophyllaceae	Phacelia distans	Phacelia distans	distant phacelia
Forb	Hydrophyllaceae	Phacelia imbricata ssp. imbricata	Phacelia imbricata ssp. imbricata	imbricate phacelia
Forb	Hydrophyllaceae	Phacelia malvifolia	Phacelia malvifolia	stinging phacelia
Forb	Hydrophyllaceae	Phacelia ramosissima var. ramosissima	Phacelia ramosissima var. ramosissima	branching phacelia
Forb	Hydrophyllaceae	Pholistoma auritum var. auritum	Pholistoma auritum var. auritum	blue fiestaflower
Forb	Hydrophyllaceae	Pholistoma membranaceum	Pholistoma membranaceum	white fiestaflower
Forb	Hydrophyllaceae	Pholistoma sp.	Pholistoma	fiestaflower
Forb	Viscaceae	Phoradendron villosum	Phoradendron villosum	Pacific mistletoe
Forb	Verbenaceae	Phyla nodiflora	Phyla nodiflora	turkey tangle fogfruit
Forb	Orchidaceae	Piperia sp.	Piperia	rein orchid
Forb	Boraginaceae	Plagiobothrys canescens	Plagiobothrys canescens	valley popcornflower
Forb	Boraginaceae	Plagiobothrys nothofulvus	Plagiobothrys nothofulvus	rusty popcornflower

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Forb	Boraginaceae	Plagiobothrys sp.	Plagiobothrys	popcornflower
Forb	Boraginaceae	Plagiobothrys tenellus	Plagiobothrys tenellus	Pacific popcornflower
Forb	Plantaginaceae	Plantago erecta	Plantago erecta	dotseed plantain
Forb	Plantaginaceae	Plantago lanceolata	Plantago lanceolata	narrowleaf plantain
Forb	Papaveraceae	Platystemon californicus	Platystemon californicus	creamcups
Forb	Valerianaceae	Plectritis ciliosa ssp. ciliosa	Plectritis ciliosa ssp. ciliosa	longspur seablush
Forb	Valerianaceae	Plectritis macrocera	Plectritis macrocera	longhorn plectritis
Forb	Valerianaceae	Plectritis sp.	Plectritis	seablush
Forb	Polygonaceae	Polygonum arenastrum	Polygonum arenastrum	oval-leaf knotweed
Forb	Polygonaceae	Polygonum punctatum	Polygonum punctatum	dotted smartweed
Forb	Polygonaceae	Polygonum sp.	Polygonum	knotweed
Forb	Polypodiaceae	Polypodium californicum	Polypodium californicum	California polypody
Forb	Potamogetonaceae	Potamogeton foliosus var. foliosus	Potamogeton foliosus ssp. foliosus	leafy pondweed
Forb	Rosaceae	Potentilla glandulosa ssp. glandulosa	Potentilla glandulosa ssp. glandulosa	sticky cinquefoil
Forb	Asteraceae	Psilocarphus sp.	Psilocarphus	woollyheads
Forb	Dennstaedtiaceae	Pteridium aquilinum var. pubescens	Pteridium aquilinum var. pubescens	hairy brackenfern
Forb	Polygonaceae	Pterostegia drymarioides	Pterostegia drymarioides	woodland pterostegia
Forb	Asteraceae	Rafinesquia californica	Rafinesquia californica	California plumseed
Forb	Ranunculaceae	Ranunculus californicus	Ranunculus californicus	California buttercup
Forb	Ranunculaceae	Ranunculus hebecarpus	Ranunculus hebecarpus	delicate buttercup
Forb	Brassicaceae	Raphanus sativus	Raphanus sativus	cultivated radish
Forb	Asteraceae	Rigiopappus leptocladus	Rigiopappus leptocladus	wireweed
Forb	Brassicaceae	Rorippa curvisiliqua	Rorippa curvisiliqua	curvepod yellowcress
Forb	Brassicaceae	Rorippa nasturtium-aquaticum	Rorippa nasturtium-aquaticum	watercress
Forb	Brassicaceae	Rorippa sp.	Rorippa	yellowcress
Forb	Polygonaceae	Rumex acetosella	Rumex acetosella	common sheep sorrel
Forb	Polygonaceae	Rumex crispus	Rumex crispus	curly dock
Forb	Polygonaceae	Rumex salicifolius	Rumex salicifolius	willow dock
Forb	Caryophyllaceae	Sagina apetala	Sagina apetala	annual pearlwort
Forb	Lamiaceae	Salvia columbariae	Salvia columbariae	chia
Forb	Apiaceae	Sanicula bipinnata	Sanicula bipinnata	poison sanicle
Forb	Apiaceae	Sanicula bipinnatifida	Sanicula bipinnatifida	purple sanicle
Forb	Apiaceae	Sanicula crassicaulis	Sanicula crassicaulis	Pacific blacksnakeroot
Forb	Apiaceae	Sanicula laciniata	Sanicula laciniata	coastal blacksnakeroot
Forb	Apiaceae	Sanicula sp.	Sanicula	sanicle
Forb	Apiaceae	Sanicula tuberosa	Sanicula tuberosa	turkey pea
Forb	Saxifragaceae	Saxifraga californica	Saxifraga californica	California saxifrage
Forb	Apiaceae	Scandix pecten-veneris	Scandix pecten-veneris	shepherdsneedle
Forb	Scrophulariaceae	Scrophularia californica ssp. floribunda	Scrophularia californica ssp. floribunda	California figwort
Forb	Lamiaceae	Scutellaria tuberosa	Scutellaria tuberosa	Danny's skullcap
Forb	Crassulaceae	Sedum spathulifolium	Sedum spathulifolium	broadleaf stonecrop
Forb	Selaginellaceae	Selaginella bigelovii	Selaginella bigelovii	bushy spikemoss
Forb	Asteraceae	Senecio californicus	Senecio californicus	California ragwort
Forb	Asteraceae	Senecio flaccidus var. douglasii	Senecio flaccidus var. douglasii	Douglas' ragwort
Forb	Asteraceae	Senecio vulgaris	Senecio vulgaris	old-man-in-the-Spring
Forb	Caryophyllaceae	Silene gallica	Silene gallica	common catchfly
Forb	Asteraceae	Silybum marianum	Silybum marianum	blessed milkthistle
Forb	Brassicaceae	Sisymbrium orientale	Sisymbrium orientale	Indian hedgemustard
Forb	Brassicaceae	Sisymbrium sp.	Sisymbrium	hedgemustard
Forb	Solanaceae	Solanum umbelliferum	Solanum umbelliferum	bluewitch nightshade
Forb	Asteraceae	Solidago californica	Solidago californica	California goldenrod

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Forb	Asteraceae	Sonchus asper ssp. asper	Sonchus asper	spiny sowthistle
Forb	Asteraceae	Sonchus oleraceus	Sonchus oleraceus	common sowthistle
Forb	Asteraceae	Sonchus sp.	Sonchus	sowthistle
Forb	Lamiaceae	Stachys albens	Stachys albens	whitestem hedgenettle
Forb	Lamiaceae	Stachys bullata	Stachys bullata	California hedgenettle
Forb	Lamiaceae	Stachys pycnantha	Stachys pycnantha	shortspike hedgenettle
Forb	Caryophyllaceae	Stellaria media	Stellaria media	common chickweed
Forb	Caryophyllaceae	Stellaria nitens	Stellaria nitens	shiny chickweed
Forb	Caryophyllaceae	Stellaria pallida	Stellaria media ssp. pallida	common chickweed
Forb	Caryophyllaceae	Stellaria sp.	Stellaria	starwort
Forb	Asteraceae	Stephanomeria virgata ssp. pleurocarpa	Stephanomeria virgata ssp. pleurocarpa	wand wirelettuce
Forb	Brassicaceae	Streptanthus glandulosus ssp. glandulosus	Streptanthus glandulosus ssp. glandulosus	bristly jewelflower
Forb	Brassicaceae	Streptanthus insignis	Streptanthus insignis	plumed jewelflower
Forb	Brassicaceae	Streptanthus sp.	Streptanthus	twistflower
Forb	Asteraceae	Stylocline gnaphalioides	Stylocline gnaphalioides	mountain neststraw
Forb	Papaveraceae	Stylomecon heterophylla	Stylomecon heterophylla	windpoppy
Forb	Apiaceae	Tauschia hartwegii	Tauschia hartwegii	Hartweg's umbrellawort
Forb	Brassicaceae	Thysanocarpus curvipes	Thysanocarpus curvipes	sand fringepod
Forb	Brassicaceae	Thysanocarpus laciniatus	Thysanocarpus laciniatus	mountain fringepod
Forb	Brassicaceae	Thysanocarpus sp.	Thysanocarpus	fringepod
Forb	Apiaceae	Torilis arvensis	Torilis arvensis	spreading hedgeparsley
Forb	Asteraceae	Tragopogon dubius	Tragopogon dubius	yellow salsify
Forb	Lamiaceae	Trichostema lanatum	Trichostema lanatum	woolly bluecurls
Forb	Lamiaceae	Trichostema lanceolatum	Trichostema lanceolatum	vinegarweed
Forb	Fabaceae	Trifolium albopurpureum var. albopurpureum	Trifolium albopurpureum	rancheria clover
Forb	Fabaceae	Trifolium gracilentum var. gracilentum	Trifolium gracilentum var. gracilentum	pinpoint clover
Forb	Fabaceae	Trifolium microcephalum	Trifolium microcephalum	smallhead clover
Forb	Fabaceae	Trifolium obtusiflorum	Trifolium obtusiflorum	clammy clover
Forb	Fabaceae	Trifolium sp.	Trifolium	clover
Forb	Fabaceae	Trifolium variegatum	Trifolium variegatum	whitetip clover
Forb	Fabaceae	Trifolium willdenovii	Trifolium wormskioldii	cows clover
Forb	Liliaceae	Triteleia lugens	Triteleia lugens	Coast Range triteleia
Forb	Brassicaceae	Tropidocarpum gracile	Tropidocarpum gracile	dobie pod
Forb	Asteraceae	Uropappus lindleyi	Uropappus lindleyi	Lindley's silverpuffs
Forb	Urticaceae	Urtica dioica ssp. holosericea	Urtica dioica ssp. holosericea	stinging nettle
Forb	Urticaceae	Urtica urens	Urtica urens	dwarf nettle
Forb	Verbenaceae	Verbena lasiostachys	Verbena lasiostachys	western vervain
Forb	Scrophulariaceae	Veronica anagallis-aquatica	Veronica anagallis-aquatica	water speedwell
Forb	Scrophulariaceae	Veronica arvensis	Veronica arvensis	corn speedwell
Forb	Scrophulariaceae	Veronica catenata	Veronica anagallis-aquatica	water speedwell
Forb	Scrophulariaceae	Veronica persica	Veronica persica	birdeye speedwell
Forb	Scrophulariaceae	Veronica sp.	Veronica	speedwell
Forb	Fabaceae	Vicia sativa ssp. sativa	Vicia sativa ssp. sativa	garden vetch
Forb	Fabaceae	Vicia sp.	Vicia	vetch
Forb	Fabaceae	Vicia villosa ssp. varia	Vicia villosa ssp. Varia	winter vetch
Forb	Apocynaceae	Vinca major	Vinca major	bigleaf periwinkle
Forb	Violaceae	Viola pedunculata	Viola pedunculata	Johnny-jump-up
Forb	Blechnaceae	Woodwardia fimbriata	Woodwardia fimbriata	giant chainfern
Forb	Asteraceae	Wyethia helenioides	Wyethia helenioides	whitehead mule-ears
Forb	Asteraceae	Xanthium sp.	Xanthium	cocklebur
Forb	Asteraceae	Xanthium spinosum	Xanthium spinosum	spiny cockleburr

Life Form	Family	Park Staff ID Taxon	**Kartez 1999 Scientific Name** Cells highlighted in green indicate differences in taxonomic treatment	Common name
Forb	Asteraceae	Xanthium strumarium	Xanthium strumarium	rough cockleburr
Forb	Apiaceae	Yabea microcarpa	Yabea microcarpa	false carrot
Forb	Liliaceae	Zigadenus fremontii	Zigadenus fremontii	Fremont's deathcamas

Appendix F

Map Accuracy Assessment Protocol

Natural Resource Report NPS/SFAN/NRR—2012/574

Aerial Information Systems, Inc.
112 First Street
Redlands, California 92373

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

Accuracy Assessment Protocol
Pinnacles National Monument

Updated: August 29, 2008

This document defines the accuracy assessment (AA) data collection procedures for Pinnacles National Monument (PINN). This project is a collaboration of the California Native Plant Society (CNPS), Aerial Information Services (AIS), the National Park Service (NPS), and NatureServe. This protocol will be used in conjunction with the field survey form dated August 29, 2008.

The primary purpose of accuracy assessment (AA) fieldwork is to supply data that will test the accuracy of vegetation maps. This information can also contribute some information to the classification of vegetation communities. AA points in this project will focus more on the mapping polygon than the actual stand.

If an entire AA polygon cannot be fully investigated due to terrain or other reasons, an area will be assessed that encompasses the MMU (1/2 hectare = 50m x100m rectangle, 71m x71m square, 80m diameter circle). The MMU is the smallest area that the photo interpreters are required to map to vegetation class in this project. (However, mappers can choose to delineate smaller polygons if the map class is distinctive).

Definitions of Data Fields:

Polygon (Juno) #: A unique number assigned to each selected polygon by the mappers. At this time, if there is a difference between the polygon label on the GPS unit vs. the paper map – enter the number from the GPS unit here – this may or may not be the permanent number for each AA polygon.

Polygon (Map) #: A unique number given assigned to each selected polygon by the mappers. At this time, if there is a difference between the polygon label on the GPS unit vs. the paper map, enter the number from the paper maps here – this is the permanent number for each AA polygon.

Date: Enter the date the AA point was sampled. Please use the format Month-Day-Year.

Surveyors: The full names of each person assisting should be provided for their first accuracy

assessment. In successive assessments, initials of each person assisting can be recorded. Please note: The person recording the data on the form should circle their name/initials.

GPS Waypoint #: Enter a waypoint number into the GIS unit to match the AIS paper map polygon number. Mark and store each polygon location using this unique number. These waypoints will be downloaded from the GPS unit into a Geographic Information System to depict the sample points accurately on a map.

GPS Unit Name: The unique name or identifier assigned to each GPS unit (especially useful if more than one GPS unit is used to mark waypoints for the project). This is not the general type or model of GPS, and can be the serial number if another number/letter is not assigned.

UTM field reading: Easting (UTME) and northing (UTMN) location coordinates using the Universal Transverse Mercator (UTM) grid. Record UTMs from a GPS unit. The default GPS datum for this project is NAD 83. If you are using another datum for some reason, denote it under the UTMN. The entire Pinnacles National Monument falls within Zone 10.

GPS Error: The accuracy of the GPS location, when taking the UTM field reading. Please denote feet (ft), meters (m) or Position Dilution of Precision (pdop). It is typical for all commercial GPS units to be accurate to within 16 ft, 5 m, or a pdop value of 1-5. The lower the error number, the more accurate the GPS reading. If your GPS does not determine error, insert N/A in this field.

Elevation: Record from the GPS unit. Please denote feet (ft) or meters (m). (Please note: Readings taken from a GPS unit can be hundreds of feet off.)

Is GPS within polygon? Yes / No Circle"Yes" to denote that the GPS waypoint was taken directly within the polygon being assessed – make sure to take the point well within the boundary so there is no confusion after GPS error is taken into account. Circle "No" to denote the waypoint was taken at a distance from the stand (such as with a binocular view of the stand).

If No, write the *original* UTM numbers on your paper datasheet, along with the distance, bearing, and inclination. The original numbers are those in the Juno forms for the UTMN and UTME fields.

If you use ArcPad's offset tool to test where the point will end up, use a direct GPS point (not using ArcPad's offset tool), enter the distance, bearing, and inclination in the forms on the GPS page and tap the calculate button, then delete the point afterward to keep things simple and not cause confusion.

Distance (m): Record distance to center of the stand from GPS point using a rangefinder.

Bearing (degrees): Record the compass bearing from the GPS point to the center of the stand.

Secant (degrees): Record the secant (angle of sight) to the center of the stand from the GPS point using a compass. Be sure to indicate if the reading is positive/upslope or negative/downslope.

Has vegetation changed since photo? Yes/No. Has the vegetation in the polygon changed since the aerial photos were taken? Imagery used for photo interpretation within the Pinnacles project was NAIP 2005. Circle Yes or No.

If yes, provide notes on how the vegetation has changed. For example, burned, developed, visible dominance change over time.

Primary Vegetation Name: Using the Mapping Unit Field Key in conjunction with the Key to Plant Associations of Pinnacles National Monument, assign the best-fitting name for the vegetation within the polygon. Select and record here only those that have a corresponding mapping unit code. If you are able to key below a mapping unit, please enter the vegetation name in the *Vegetation Association Name* field below.

Secondary Vegetation Name: Using the Mapping Unit Field Key in conjunction with the Key to Plant Associations of Pinnacles National Monument, assign a second-best-fitting name for the vegetation within the polygon (optional). Select and record only those types that have a corresponding mapping unit code. Assign a secondary code only if there is some ambiguity in assigning the polygon to a primary vegetation type (e.g. Tree cover is sparse so the polygon may be typed as a tree type or a shrub/herbaceous type). Note the reasoning behind assigning a secondary call within the *Confidence in map unit identification* field below.

Tertiary Vegetation Name: Using the Mapping Unit Field Key in conjunction with the Key to Plant Associations of Pinnacles National Monument, assign a third-best-fitting name for the vegetation within the polygon (optional). Select and record only those types that have a

corresponding mapping unit code. Assign a tertiary code only if there is some ambiguity in assigning the polygon to a primary or secondary vegetation type (e.g. tree cover is sparse so may fall within a tree type or shrub/herbaceous type). Note the reasoning behind assigning a tertiary call within the *Confidence in map unit identification* field below.

Vegetation Association Name: This space is used to record the name of a vegetation association that does not have a corresponding map unit designation (optional). This field gives additional detail for future mapping or vegetation classification work.

Confidence in map unit identification? L M H: With respect to the *Vegetation Name and map unit code section,* note the level of confidence you feel in the map unit identification by circling low, moderate, or high. This is an area to describe how well the stand keys within the Mapping Unit Field Key. Are all diagnostic species present in proper proportions? In not, how do they differ? If secondary or tertiary types are identified, what made the stand ambiguous?

Polygon more than one type? Yes/No: Circle one. Note**:** The type with greatest coverage in polygon should be entered in *Vegetation Name and map unit* section. List the vegetation type of any inclusions found within the mapping polygon and note the percent of the polygon or size of inclusion occupied by a different type. Any descriptions and comments about polygon heterogeneity should be entered here.

Do you agree with polygon delineation? **Yes / No:** Circle one. Note whether you think the photo-interpreters did a good job of drawing a boundary line that surrounds a distinct vegetation type. Examples for which you would answer “no” include situations where there is more than one type of mappable vegetation within the polygon, when a portion of the boundary includes part of an adjacent stand, or when the stand continues beyond the polygon boundary. Please explain any “no” responses in the space provided.

Camera / Photograph # / Direction: *Take two photos per polygon.* Write the photographers initials and the last two digits of the serial number for the camera, JPG file name / frame number, and general direction of photo (N, NE, S, etc). The purpose is to get a good representation that accurately captures the stand; it is often advantageous to take photos where you have a good view of the overall vegetation. Try to include a little sky for perspective. The photos do not need to be taken within the stand, if the polygon is on a steep slope, attempt to take the photographs looking across the contour or from the adjacent slope.

Subsample: **½ hectare / entire polygon / other.** Denote the polygon area assessed for AA. Circle ½ hectare when the entire polygon was not accessible for some reason and a representative point was selected for assessement. Circle entire polygon if the whole polygon was viewed and assessed. Circle other for a different scenario and explain the area assessed.

Overall % cover

Provide an estimate of cover for the following categories (based on functional life forms). Record a specific number for the total aerial cover or "bird's-eye view" looking from above for each category. The USGS-NPS standard for collecting % cover data for strata in AA is to use "*Canopy Cover* - the percentage of ground covered by the vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings in the canopy are included" in the estimate (SRM 1989, USDA-NRCS 1997). The sum of the cover estimates must equal 100%.

When estimating cover, it is useful to keep in mind the cover intervals used by mappers to attribute tree and shrub cover within a polygon. The % cover intervals for reference are: 0-2%, >2-10%, >10-25%, >25-40%, >40-60%, >60-100%. After keeping these classes in mind, refine your estimate to a specific percentage.

% Conifer/Hardwood Tree: The total aerial cover (canopy closure) of all live tree species in the overstory or that are emerging, disregarding overlap of individual trees. Estimate conifer and hardwood covers separately.

%Shrub: The total aerial cover (canopy closure) of all live shrub species - disregarding cover that is underneath the tree canopy and disregarding the overlap of individual shrubs.

%Herbaceous: The total aerial cover (canopy closure) of all herbaceous species, disregarding overlap of individual herbs and disregarding cover of herbs underneath the canopy of trees or shrubs.

%Unvegetated: The total aerial cover of exposed litter/duff/bare soil.

Site location, history, stand age, and comments: Briefly describe the location of the polygon,

stand age/seral stage, disturbance history, nature and extent of land use, and other site environmental and vegetation factors. 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.

Species list, strata and cover: List up to 8 species that are dominant or characteristically consistent throughout the stand using Jepson Manual nomenclature. These species may or may not be abundant, but they should be constant representatives in the survey. When different layers of vegetation occur in the stand, make sure to list species from each stratum.

Provide the stratum where:
T= Overstory tree. A woody perennial plant that has a single trunk.
U= Understory tree. Trees species that grow in a strata under the overstory trees. Note: this category includes seedlings and saplings of trees that may be present in the overstory.
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 mosses, liverworts, hornworts, and algae.

In contrast to the overall strata cover estimation above, provide the % absolute cover for each species listed. "*Absolute cover* - the actual percentage (or proportion) of the ground covered by the vertical projection of the aerial portion of a single species (also known as the vertical projection of foliage of plants) as viewed from above. Small openings in the canopy and intraspecific overlap are excluded" from the estimate (SRM 1989). These values are collected in order to inform and crosswalk species data collected for AA to the vegetation classification data.

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%. After keeping these classes in mind, refine your estimate to a specific percentage. The sum of all species percent covers may total over 100% because of overlap.

Dominant vegetation cover: (Full/Partial) This field refers to the phenology of the dominant vegetation within the polygon. Circle *full* if all foliage is attached and contributing to the overall

cover for the polygon. Circle *partial* if some/all foliage has dropped and estimated cover values will be below the cover at the peak of the growing season. You may also note the species that has dropped leaves/has reduced cover. This data will clarify any differences in cover values between AA field surveys and surveys collected for the vegetation classification.

Adjacent Alliances: Identify other vegetation types that are directly adjacent to the stand being assessed by noting the dominant species (or known map unit). Also note the direction in degrees (aspect) that the adjacent alliance is found (e.g., *Eriogonum fasciculatum*, 110°). This information can be helpful in the clarification of polygon location and for additional AA of adjacent polygons.

Inaccessible polygons: Note any polygon numbers that were in the area but were not accessible for one reason or another. This information will be fed back to the mappers on a weekly basis and a second set of polygons will be selected to replace them.

Appendix G

Accuracy Assessment Field Form

Natural Resource Report NPS/SFAN/NRR—2012/574

California Native Plant Society
2707 K Street, Suite 1
Sacramento, CA 95816-5113

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

CALIFORNIA NATIVE PLANT SOCIETY – ACCURACY ASSESSMENT FIELD FORM - PINN

(Revised Aug. 29, 2008)

Polygon (Juno) #	**Polygon (Map) #**	**Date** (mm-dd-yy)	**Name(s) of surveyors:**

GPS waypoint #: _____ GPS name: _____UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___

GPS Error: _____ft / m / pdop Elevation: _____ ft / m Is GPS within polygon? Yes / No

If No, cite from GPS waypoint to polygon, distance _____(meters) and bearing _____(degrees) secant_____ (degrees)

Has the vegetation changed since air photo taken? Yes / No If Yes, What has changed? _____

Vegetation name and map unit code:

_____,_____

Primary

_____,_____

Secondary

_____,_____

Tertiary

_____

Vegetation Association Name (no map unit code assigned)

Confidence in map unit identification: L M H Explain:

_____

_____

_____

_____

Polygon more than one type?: (Yes, No) - (Note: type with greatest coverage in polygon should be entered in other section)

Other types/explain:_____

Do you agree with polygon delineation?: (Yes, No), Explain: _____

_____

_____

Camera / Photograph #'s / Direction: _____

Subsample: ½ hectare / entire polygon / other _____(circle one) _____

% Cover - Tree Conifer/Hardwood: _____/_____ Shrub (not under trees): _____ Herbaceous: _____ Unveg: _____ = 100 %

% cover intervals for reference: 0-2%, >2-10%, >10-25%, >25-40%, > 40-60%, >60-100% -- Estimate using a bird's eye view.

Site location, history, stand age, comments:

Species (List up to 8 major species), Stratum, and Approximate % cover .

*% cover intervals for reference***:** <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, 75%.

Stratum categories: T= Overstory tree, U= Understory Tree, S = Shrub, H= Herb, N= Non-vascular.

Strata	Species	% cover	Strata	Species	% cover

Dominant vegetation cover (phenology)**: full / partial? Species:**_____

Adjacent alliances / direction:

_____

Inaccessible polygon #'s:

Appendix H

List of Final Map Classes

Natural Resource Report NPS/SFAN/NRR—2012/574

Aerial Information Systems, Inc.
112 First Street
Redlands, California 92373

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

PINNACLES NATIONAL MONUMENT
FINAL MAPPING CLASSIFICATION
June 15, 2009

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I.VEGETATION MAPPING CLASS

1000 – 2000 FORESTS & WOODLANDS

1200 – California Evergreen Coniferous Forest & Woodland Group
- **1210** – Foothill Pine Woodland Alliance
- **1220** – California Juniper Woodland Alliance

1300 – Southwestern North American Riparian Evergreen and Deciduous Forest Group
- **1310** – California Sycamore Temporarily Flooded Woodland Alliance
  - **1311** – California Sycamore-Coast Live Oak Woodland Association [Park/Buffer]

2100 – Californian Broadleaf Forest and Woodland Group [non-deciduous]
- **2110** – Coast Live Oak Woodland Alliance

2200 – Californian Broadleaf Forest and Woodland Group [deciduous]
- **2210** – Blue Oak Woodland Alliance
  - **2212** – Blue Oak/Mixed Herbaceous Woodland Association [Park/Buffer]
- **2220** – California Buckeye Woodland Alliance
- **2230** – Valley Oak Woodland Alliance
  - **2231** – Valley Oak-Coast Live Oak/Grass Woodland Association [Park/Buffer]

3000 – SHRUBLANDS

3100 – Californian Chaparral Shrubland Macrogroup
- **3101** – Californian Xeric Chaparral Shrubland Group [Park/Buffer]
- **3103** – Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit [Park/Buffer]
- **3104** – Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit
- **3150** – Hollyleaf Cherry Shrubland Alliance [Park/Buffer]
- **3160** – California Scrub Oak Shrubland Alliance

3200 – Evergreen Coastal Scrub Shrubland Group
- **3210** – Coyote Brush Shrubland Alliance

3300 – California Coastal Scrub Shrubland Macrogroup
- **3330** – California Wild Buckwheat Shrubland Alliance [Park/Buffer]

3360 – Black Sage Shrubland Alliance [Park/Buffer]
3370 – California Sagebrush-California Wild Buckwheat Shrubland Alliance [Park/Buffer]

3400 – Southwestern North American Riparian/Wash Scrub Shrubland Group
3410 – California Rose Shrubland Alliance

4000 – HERBACEOUS

4004 – Alluvial Herb and Shrub Vegetation Mapping Unit [Park/Buffer]

4100 – Western North America Freshwater Marsh Herbaceous Vegetation Macrogroup
4101 – Bulrush–Cattails Herbaceous Vegetation Mapping Unit

4300 – Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Macrogroup

4500 – Western North America Wet Meadow And Low Shrub Carr Herbaceous Vegetation Macrogroup
4510 – Deergrass Herbaceous Vegetation Alliance [Park/Buffer]

9000 – MISCELLANEOUS CLASSES

9100 – Built-up Mapping Unit
9200 – Agriculture Mapping Unit
9400 – Sparsely Vegetated to Non-vegetated Mapping Units
9420 – Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit
9500 – Water Mapping Unit
9600 – Planted Trees & Shrubs Mapping Unit
9700 – Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Regeneration Mapping Unit

MODIFIERS

WOODY COVER CLASS – Conifer, Hardwood, Shrub

1 = >60%
2 = 40-60%
3 = 25-40%
4 = 10-25%
5 = 2-10%
9 = None

II. LAND USE MAPPING CLASSES

100 – Urban – Non-park facilities and private in-holdings
- **110** – Residential (includes farm residences along Hwy 25, Regan, Schmidt, McCabe Canyon, and West side)

200 – Agriculture
- **210** – Cropland
- **220** – Orchards and Vineyards
- **230** – Other Agriculture

400 - National Park/Monument Facilities
- **401** – Bear Gulch Facilities (Headquarters, Visitor Center, Employee Residence, Parking, Restrooms)
- **402** – Chalone Creek Facilities (Maintenance, Employee Residence)
- **403** – Bear Gulch Parking (Parking, Restrooms)
- **404** – Pinnacles Campground Facilities
- **405** – Chaparral Facilities (Visitor Center, Parking, Picnic Area, Employee Residence)
- **408** – Eastern Addition Former Farmsteads
- **409** – Eastern Addition Airport Buildings
- **410** – North Chalone Peak Lookout/Restroom

800 - Water

900 - Vacant

Appendix I

Key to Map Classes

Natural Resource Report NPS/SFAN/NRR—2012/574

Aerial Information Systems, Inc.
112 First Street
Redlands, California 92373

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

PINNACLES NATIONAL MONUMENT
MAPPING UNIT FIELD KEY

The purpose of the Mapping Unit Field Key is for use in field identification of vegetation mapping units as mapped in the 2008 Vegetation Map for Pinnacles National Monument. For Accuracy Assessment (AA), this key should be used in conjunction with the Key to Plant Associations of Pinnacles National Monument. This Mapping Unit Field Key is non-dichotomous, hierarchical, and includes all Map Units, forest/woodland and shrubland plant associations. Since AA will test the accuracy of the mapped units compared to the vegetation on the ground, it is important for the AA field crew to understand the mapping units, descriptions, and criteria in order to recognize the mapping units in the field. For Herbaceous Associations, see the Key to Pinnacles National Monument Plant Associations.

The mapping unit key is structured as a hierarchy with the plant association at the lowest level. Lower classes or categories nest into the ones higher in the hierarchy. The association will nest into either a sub-alliance mapping unit or alliance. The sub-alliance mapping unit will nest into an alliance. The alliance may nest into a group or macrogroup. Each mapped unit in the key, be it macrogroup, group, alliance, sub-alliance, or association, has a map code in parentheses if it was mapped. If no map code is given for an association or alliance, then it was mapped at the next level up in the hierarchy that has a map code.

- ✓ Key as far as you can, and use the numbered Map Unit. For example if you key a shrubland to the **IID3. *Diplacus aurantiacus* Shrubland**, the corresponding Map Unit is **IID. California Coastal Scrub Shrubland Macrogroup (3300).**

- ✓ Burned areas are an exception, as regenerating shrubs were harder to recognize to species by the mappers, so you may be able to key to the **IIB1. Californian Xeric Chaparral Shrubland (3101)**, but if the area is obviously recently burned, then you need to default to the **Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit (3104)** noted there also.

HIERARCHICAL KEY TO MAP UNITS

I. Woody cover is >8-10%

Class A. Forest and Woodland Vegetation (interlocking tree canopies to open tree canopies); tree cover is greater than approximately 8-10%; characteristic genera include *Aesculus, Juniperus, Pinus, Quercus, Platanus, Populus, and Salix laevigata.*

Class B. Shrubland Vegetation; canopies may interlock, but more commonly are less dense; characteristic genera include *Adenostoma, Arctostaphylos, Artemisia (californica), Baccharis, Ceanothus, Cercocarpus, Diplacus (=Mimulus), Eriogonum, Lotus, Lupinus, Prunus, Quercus (berberidifolia), Rhamnus, Rosa, Salvia,* or *Salix* (other than *laevigata*). Trees, if present, are scattered and do not contribute more than 8% cover in the upper story canopy.

II. Woody Cover is <8-10%. Vegetation predominately herbaceous or if scrubby then total vascular cover may be <10%.

Class C. Herbaceous vegetation, consisting predominantly of grasses, graminoids, and/or broad-leaf herbs (forbs), which may be tall. Also includes coarse mosses, spike mosses, or non-vascular plants. Woody shrubs or trees may be present, but woody plant cover does not exceed approximately 8-10%. Characteristic genera include *Artemisia (dracunculus), Avena, Bromus, Carex, Collinisia, Erodium, Eriogonum, Gnaphalium, Heterotheca, Hordeum, Juncus, Leymus, Lupinus, Muhlenbergia, Nassella, Poa, Selaginella, Sedum*, and *Vulpia*, as well as mosses and lichens.

Class D. Sparsely vegetated areas. Total vascular vegetation (herbaceous and/or woody) does not exceed 8-10%. Areas include alluvial flats, scree slopes, rock outcrops and cliffs. Any of the above mentioned species may be present.

Class A: Forests and Woodlands

Group I: Forests or woodlands occupying a variety of lowland mesic to wet (even if only temporarily so) habitats, including stream banks, floodplains and riparian areas. Canopy dominants include *Populus, Platanus, Quercus lobata, Quercus agrifolia* (where its roots get wet, such as the edge of the valley floor or toeslopes and below springs and seeps) and *Salix laevigata.*

IA. Forests or woodlands characterized by *Quercus agrifolia, Q. lobata,* or a combination of the two, often occupying mesic, steep draws **or** low gradient intermittent streams. If *Platanus* is present, go to IB. Generally *Platanus, Populus* and/or *Salix* are not present, or if present, with very low cover.

IA1. Forests or woodlands characterized by *Quercus agrifolia* as the dominant tree. *Q. lobata* is not present. *Pinus sabiniana* may be present in varying amounts. Includes sites below boulders, rocks, or cliffs where moisture is available.

***Quercus agrifolia* Woodland Alliance (2110)**

IA1a. Forests or woodlands characterized by *Quercus agrifolia*, often occupying mesic, steep draws, low gradient intermittent streams, or toeslope edges of floodplains. *Pinus sabiniana* is absent or present at low cover.

***Quercus agrifolia* Woodland Alliance (2110)**

IA1ai. Shrub cover is low and highly variable, but characterized by the presence of *Toxicodendron diversilobum*. Woody species, such as *Rubus ursinus, Rhamnus ilicifolia* and *Salix laevigata*, can be scattered to abundant. Most of the species present are not wetland obligates, but site is wetter than upland sites due to subsurface or surface drainage. Herbaceous cover can be very low, the ground covered in dense litter.

***Quercus agrifolia* / *Toxicodendron diversilobum* Intermittently Flooded Woodland Association**

IA1b. Woodlands dominated by *Quercus agrifolia*. *Pinus sabiniana* may be present with very low cover. No shrub layer occurs, but a few scattered individuals of *Adenostoma fasciculatum, Prunus ilicifolia*, or *Rhamnus ilicifolia* may be present. The site is characterized by the herbaceous layer, the shrub layer is insignificant. The herbaceous understory is dominated by a mix of forbs and grasses, such as *Amsinkia menziesii* var. *intermedia, Bowlesia incana, Clarkia* sp., *Claytonia perfoliata* ssp. *perfoliata, Collinsia heterophylla, Delphinium parryi* ssp. *parryi, Erigeron foliosus* var. *foliosus, Eriogonum nudum, Galium aparine, Galium porrigens* var. *porrigens, Bromus diandrus,* and *Melica imperfecta*.

***Quercus agrifolia* / Annual Grass - Herb Woodland Association**

IA1c. Forests or woodlands characterized by *Quercus agrifolia* and *Pinus sabiniana* as co-dominant.

***Quercus agrifolia* Woodland Alliance (2110)**

IA2. Forests or woodlands characterized by *Quercus agrifolia* and *Q. lobata*.

IA2a. Woodlands dominated by *Quercus lobata*. *Q. agrifolia* present to co-dominant. *Pinus sabiniana* may be present with low cover.

***Quercus lobata* Woodland Alliance (2230)**

IA2ai. Shrubs are generally absent, but few scattered individuals may appear in the stand or along edges from surrounding communities, and may include *Toxicodendron diversilobum*, *Rubus ursinus,* and *Baccharis pilularis*, which may have as much as 15% cover but are not consistently present. Herbaceous cover is usually dominated by annual introduced grasses, such as *Bromus diandrus, Bromus madritensis* ssp. *rubens, Hordeum murinum* ssp. *leprinum*.

***Quercus lobata* - *Quercus agrifolia* / Grass Woodland Association (2231)**

IA2aiα. One stand had the native wetland sedge *Carex barbarae* as an abundant undergrowth.

***Quercus lobata* - *Q. agrifolia* / Grass Woodland Association (2231)**

IB. Forests or woodlands characterized by *Populus fremontii, Platanus racemosa* or *Salix laevigata. Quercus agrifolia* may be present to co-dominant. *Q. lobata* may be present at very low cover.

Southwestern North America Riparian Evergreen and Deciduous Forest Group (1300)

IB1. Forests or woodlands characterized by *Platanus racemosa*. *Quercus agrifolia, Salix laevigata* and *Populus fremontii* may be present to co-dominant. Stands dominated by *Platanus* solely or with other tree species.

***Platanus racemosa* Temporarily Flooded Woodland Alliance (1310)**

IB1a. Riparian forests dominated by *Platanus racemosa* with *Quercus agrifolia* subdominant to co-dominant. Note the extent of *Platanus* in the uppermost canopy. Stands occur on valley bottoms or on steep subirrigated slopes, are wetter than the *Quercus agrifolia / Toxicodendron diversilobum* Intermittently Flooded Woodland. Understory shrubs may include *Toxicodendron diversilobum* and *Rubus ursinus*. One stand had 35% cover of *Aesculus californica*. The herbaceous understory is highly variable.

***Platanus racemosa* - *Quercus agrifolia* Woodland Association (1311)**

IB1b. Riparian forests dominated by *Platanus racemosa*, wetter still than above. *Quercus agrifolia,* if present, is not of significant cover. *Populus fremontii* may be present.

IB1bi. *Salix laevigata* is often co-dominant with *Platanus racemosa*. Only sampled once in the park. Could probably be considered part of the next type.

***Platanus racemosa* - *Salix laevigata* / *Rubus ursinus* Woodland Association**

IB1bii. *Salix laevigata* is absent or present. If present, it is not co-dominant with *Platanus racemosa*, the dominant tree. *Populus fremontii* may also be present to co-dominant. *Toxicodendron diversilobum* is abundant (only sampled once in the park).

***Platanus racemosa* Temporarily Flooded Woodland Association**

IB2. Forests or woodlands characterized by *Populus fremontii* or *Salix laevigata*. *Platanus,* if present, is not co-dominant.

IB2a. Riparian woodlands dominated by *Populus fremontii*. *Salix laevigata* can be absent to co-dominant.

IB2ai. *Populus fremontii* co-dominated with *Salix laevigata* and/or *Salix lasiolepis*.

IB2aiα. *Populus fremontii* co-dominated with *Salix laevigata* (5-70% cover). *Quercus agrifolia* was present with 35% cover in one stand. Characteristic understory shrubs include *Rubus ursinus, Salix lasiolepis, Baccharis salicifolia,* and *Rosa californica* with 5% or higher cover.

Populus fremontii / Salix laevigata Woodland Association of the _Populus fremontii_ Temporarily Flooded Forest Alliance

IB2aiβ. *Populus fremontii* co-dominated with *Salix lasiolepis*. This type casually observed several times in the park, but was never sampled and it is not formally described.

Populus fremontii / Salix lasiolepis Woodland Association of the _Populus fremontii_ Temporarily Flooded Forest Alliance

IB2aii. *Populus fremontii* dominates the riparian corridor. Other trees, if present, are less than half the cover of *Populus fremontii*. Tree species may include *Quercus agrifolia, Q. lobata,* and *Pinus sabiniana*. Shrub cover is low, but diverse. In our sample *Baccharis salicifolia* had the highest cover with 4%, but *Artemisia douglasiana* and *Rubus ursinus* were also present with 3% cover. Another riparian shrub that may be present is *Salix lasiolepis*, generally in small amounts.

Populus fremontii / Baccharis salicifolia Woodland Association of the _Populus fremontii_ Temporarily Flooded Forest Alliance

IB2b. Riparian woodlands dominated by *Salix laevigata*. *Populus fremontii*, if present, not more than 5% cover. Other trees present may include *Pinus sabiniana, Platanus racemosa*, and *Quercus agrifolia*, all usually not more than 5% cover, and generally overwhelmed by the *Salix laevigata* cover. This association is highly variable in composition. Shrubs that can have significant cover observed include *Rubus ursinus, Artemisia douglasiana, Toxicodendron diversilobum, Rosa californica*, and *Baccharis salicifolia*.

Salix laevigata / Artemisia douglasiana - Rubus ursinus Woodland Association of the _Salix laevigata_ Temporarily Flooded Woodland Alliance

Group II: Forests or woodlands occupying a variety of xeric, dry, or slightly mesic upland habitats. Canopy dominants include *Aesculus, Juniperus, Pinus, Quercus agrifolia, Q. douglasii,* and/or *Q. wislizenii.*

IIA. Woodlands dominated or co-dominated by *Aesculus californica*, often on mesic toe slopes.
***Aesculus californica* Woodland Alliance (2220)**

IIA1. Woodlands on gentle to steep north facing slopes, dominated by *Aesculus californica*. Other trees present may include *Pinus sabiniana, Quercus agrifolia*, or *Q. douglasii*, and the shrub layer is often dominated by *Prunus ilicifolia, Adenostoma fasciculatum*, or *Quercus berberidifolia. Toxicodendron diversilobum* was not present in every stand sampled. Moss is the most consistent herbaceous understory component, and the most abundant, with up to 45% cover. ***Aesculus californica / Toxicodendron diversilobum* / Moss Woodland Association**

IIA2. Stands co-dominated by *Quercus agrifolia* and *Aesculus californica* occurring together. Stands occur on gentle to moderate and often mesic slopes and draws. The understory shrub layer includes *Lonicera subspicata* var. *denudata* and *Toxicodendron diversilobum*, and the herbaceous layer may include *Anthriscus caucalis, Galium aparine*, *Galium porrigens* var. *porrigens*, *Sanicula crassicaulis*, and *Bromus diandrus*.
***Quercus agrifolia - Aesculus californica* Woodland Association of the *Quercus agrifolia* Woodland Alliance**

IIA3. Woodlands of moderate to steep slopes with *Quercus douglasi. Aesculus californica* is co-dominant. *Pinus sabiniana* and *Quercus agrifolia* may be present at low cover. This type is common in the park, but is not a described plant association.
***Quercus douglasii* Woodland Alliance (2210)**

IIB. Woodlands dominated by pines, oaks, and combinations thereof. If *Aesculus californica* is present, it is not co-dominant.

IIB1. Woodlands dominated by *Pinus sabiniana* or *Juniperus californica*. If *Quercus* species are present, they have low cover. Stands co-dominated by *Pinus sabiniana* and *Quercus*, go to IIB2.

IIB1a. Woodlands on steep north facing slopes dominated by *Juniperus californica*.
***Juniperus californica* Woodland Alliance (1220)**

IIB1ai. Other trees infrequently present include *Aesculus californica, Pinus sabiniana* and *Quercus douglasii*. Shrubs present include *Prunus ilicifolia*. The herbaceous layer may include *Galium aparine, Galium porrigens* var. *porrigens, Marah fabaceus, Pentagramma triangularis* ssp. *triangularis, Bromus hordeaceus, Bromus rubens* (=*Bromus madritensis* ssp. *rubens*), *Melica torreyana*, and *Vulpia myuros*.
***Juniperus californica / Prunus ilicifolia* / Moss Woodland Association**

IIB1b. Woodlands dominated by *Pinus sabiniana*. Other trees may be present at low cover.

***Pinus sabiniana* Woodland Alliance (1210)**

IIB1bi. Woodlands dominated by *Pinus sabiniana* at moderate cover, with an understory of *Eriogonum fasciculatum* at low to moderate cover.

***Pinus sabiniana / Eriogonum fasciculatum* Woodland Association**

IIB1biα. Woodlands on flat to moderate slopes at all aspects, more often on flat alluvial floodplain terraces and gently sloping lower alluvial fans or toe slopes adjacent to floodplains, valley or canyon bottoms. Tree layer is dominated by *Pinus sabiniana*. Other trees may be present and include *Quercus agrifolia* and *Q. douglasii*. Understory shrubs include *Eriogonum fasciculatum.* Other shrubs may include *Adenostoma fasciculatum*, and *Lonicera subspicata* var. *denudata.*

***Pinus sabiniana* Woodland Mapping Unit (1210)**

IIB1bii. Woodlands on very steep to moderate slopes, generally steeper than above, at all aspects. Substrate is thin or rocky. It seems to favor steep, southerly, lower to upper slopes, with convex to neutral shapes, and thin to rocky soils. Tree layer is dominated by *Pinus sabiniana,* with open to sparse stands of trees over an understory of open to sparse low shrubs, grass, and rock. Understory shrubs may include *Eriogonum fasciculatum*. *Selaginella bigelovii* may be present at very low to high cover.

***Pinus sabiniana* Woodland Alliance (1210)**

IIB1biii. Woodlands on steep north facing slopes dominated by *Pinus sabiniana* with an understory of chaparral shrubs. Other trees may be present at low cover.

***Pinus sabiniana* Woodland Alliance (1210)**

IIB1biiiα. Other tree species at lower cover may include *Quercus agrifolia.* Understory shrub characterized by *Rhamnus ilicifolia, Ceanothus cuneatus* var. *cuneatus, Adenostoma fasciculatum* and other shrubs.

***Pinus sabiniana / Ceanothus cuneatus - Rhamnus ilicifolia* Woodland Association**

IIB2. Woodlands dominated by various oaks, including stands co-dominated with *Quercus* spp. and *Pinus sabiniana*.

IIB2a. Stands dominated by *Quercus douglasii. Pinus* or *Juniperus* may be co-dominant. If other oaks are present with or without *Q. douglasii*, go to IIB2b.

***Quercus douglasii* Woodland Alliance (2210)**

IIB2ai. Woodlands co-dominated by *Juniperus californica* and *Quercus douglasii*, which can have equal cover. In some stands *Juniperus* has lower cover, as low as 1/3 to ¼ the cover of *Quercus douglasii*. Other trees present with low cover may include *Pinus sabiniana*. Shrubs present include *Ceanothus*

cuneatus and *Rhamnus ilicifolia*, at very low to high cover. Herbaceous layer may include *Galium porrigens* var. *porrigens, Packera breweri*, *Vulpia myuros*, and *Bromus rubens* (=*Bromus madritensis* ssp. *rubens*).

***Quercus douglasii - Juniperus californica* Woodland Association**

IIB2aii. Stands of *Quercus douglasii* where *Juniperus* is absent or, if present, is in low cover, is not co-dominant, and is less than ¼ of the oak present. *Pinus sabiniana* is usually present at low cover, but is usually subdominant to co-dominant. Shrubs may be present at varying cover, and may be poorly to well distributed. Generally when tree cover is high, the shrubs are difficult to see. *Pinus sabiniana* cover may be low, if so see IIB2aiii.

***Quercus douglasii* Woodland Alliance (2210)**

IIB2aiiα. Woodlands on steep slopes dominated by *Quercus douglasii*. *Pinus sabiniana* is absent or if present with very low cover. Shrubs are present at low to high cover. The chaparral may be evident through the tree canopy.

***Quercus douglasii* Woodland Alliance (2210)**

IIB2aiiβ. Woodland occurs on steep slopes dominated by *Quercus douglasii*. Other trees present may include *Quercus agrifolia* and *Pinus sabiniana* in low cover. A shrub layer is characteristic and abundant. The shrub layer includes *Cercocarpus montanus* (=*Cercocarpus betuloides*), *Lonicera subspicata* var. *denudata*, and *Rhamnus ilicifolia*.

***Quercus douglasii - Pinus sabiniana / Cercocarpus montanus* Woodland Association**

IIB2aiiγ. Woodlands of steep slopes co-dominated by *Quercus douglasii* and *Pinus sabiniana*. There is no characteristic or abundant shrub layer. The shrub layer includes *Lonicera subspicata* var. *denudata*, and the herbaceous layer may include *Avena fatua, Bromus diandrus, Bromus rubens* (=*Bromus madritensis* ssp*. rubens*), and *Poa secunda* (=ssp. *secunda*).

***Quercus douglasii - Pinus sabiniana* / Grass Woodland Association**

IIB2aiii. Stands of *Quercus douglasii* where *Pinus* and *Juniperus* are absent or if present are less then ¼ the cover of oak. Shrub cover may be high or not present.

IIBaiiiα. Woodlands of gentle to moderate slopes dominated by *Quercus douglasii*. The understory shrubs are composed of xeric or mesic chaparral, including *Adenostoma fasciculatum*. *Pinus sabiniana* generally is not present, or may be very widely scattered and chaparral cover may be evident through the tree canopy.

***Quercus douglasii* Woodland Alliance (2210)**

IIB2aiiiβ. Woodlands of moderate to steep slopes, dominated by *Quercus douglasii*. Other trees that may be present include *Juniperus californica*, *Pinus sabiniana*, and *Quercus agrifolia*, but in low cover. Typically there are few to no shrubs, but can be present at low cover. Recorded species include *Rhamnus ilicifolia, Arctostaphylos glauca, Eriogonum fasciculatum* and *Arctostaphylos pungens*. The herbaceous layer is abundant and may include the graminoids *Avena spp., Leymus triticoides, Bromus diandrus, Bromus hordeaceus, Bromus rubens* (=*Bromus madritensis* ssp. *rubens*), *Poa secunda*, or *Vulpia myuros*. Forb species may include *Clarkia purpurea* ssp. *quadrivulnera, Galium porrigens* var. *porrigens*, *Lotus wrangelianus, Micropus californicus* var. c*alifornicas, Pterostegia drymarioides*, or *Viola pedunculata*.

***Quercus douglasii* / Mixed Herbaceous Woodland Association (2212)**

IIB2aiiiγ. Woodlands of moderate to steep slopes dominated by *Quercus douglasii*. *Aesculus californica* is present or co-dominant. *Pinus sabiniana* and *Quercus agrifolia* may be present at low cover.

***Quercus douglasii* Woodland Alliance (2210)**

IIB2aiiiδ. Woodlands of gentle to moderate slopes dominated by *Quercus douglasii*. The understory shrubs are composed of coastal sage scrub, including *Artemisia californica, Eriogonum fasciculatum*, and/or *Salvia mellifera*. An herbaceous layer is present.

***Quercus douglasii* Woodland Alliance (2210)**

IIB2b. Woodlands dominated by other oaks, such as *Quercus wislizenii*, *Q. agrifolia*, or *Q. berberidifolia*.

IIB2bi. Dominant woodlands characterized by *Quercus agrifolia* as the dominant tree. *Q. douglasii* may be present to co-dominant. *Pinus* and *Juniperus* may also be present at low to moderate cover. *Q. lobata* is not present. *Pinus sabiniana* may be present in varying amounts. Includes sites below boulders, rocks, or cliffs where moisture is available.

***Quercus agrifolia* Woodland Alliance (2110)**

IIB2biα.Woodlands of gentle slopes consisting of co-dominant *Quercus agrifolia* and *Q. douglasii*.

***Quercus agrifolia* Woodland Alliance (2110)**

IIB2bii. Woodlands or tall shrublands of gentle to steep slopes consisting of dominant *Quercus berberidifolia*. *Pinus sabiniana* may be present or co-dominant. *Q. agrifolia* or *Q. wislizenii* may also be present at low cover. *Aesculus californica* is absent or of very low cover.

***Quercus berberidifolia* Shrubland Alliance (3160)**

IIB2biii. Woodlands of dominant *Quercus wislizenii*.

***Quercus wislizenii* Woodland Alliance**

IIB2biiiα. Woodlands of *Quercus wislizenii* with *Pinus sabiniana*. *Q. agrifolia* was present in one of two stands sampled, with 12% cover. Low shrub cover (1-5%) includes *Rhamnus ilicifolia* and *Toxicodendron diversilobum*. The herbaceous layer includes *Anthriscus caucalis*, *Bowlesia incana*, *Cardamine californica, Claytonia perfoliata* ssp. *perfoliata, Galium aparine, Galium porrigens* var. *porrigens, Marah fabaceus, Pentagramma triangularis* ssp. *triangularis, Sanicula crassicaulis*, *Thysanocarpus laciniatus*, *Bromus diandrus, Bromus hordeaceus*, *Elymus glaucus* ssp. *glaucus*, and *Melica torryeana*. This community was sampled only twice, and is a tentative association.

***Quercus wislizenii* - *Pinus sabiniana* / Mixed Herbaceous Woodland Association**

Class B: Shrubland

Group I: Shrublands occupying wetlands, riparian areas, floodplains, canyon floors, alcoves, or other habitats that are either wet or periodically flooded, including the dry streambeds of arroyos. Characteristic genera include *Baccharis, Rosa*, *Lupinus,* and *Salix*.

IA. Shrublands dominated by *Baccharis, Rosa, Lupinus*, or *Senecio*. *Salix* may be present, but does not form the dominant shrub canopy.

IA1. Low shrublands in open dry alluvial and fluvial terraces, dominated by *Lupinus albifrons*.

***Lupinus albifrons* Shrubland Alliance**

IA1a. Other shrubs present at low cover may include *Artemisia californica, Lotus scoparius, Eriogonum fasciculatum, Diplacus* (=*Mimulus*) *aurantiacus, Adenostoma fasciculatum*. The understory herbaceous layer generally includes *Clarkia* sp., *Eriogonum elegans, Eridium cicutarium, Heterotheca sessiliflora* ssp. *echioides, Senecio flaccidus* var. *douglasii, Bromus hordeaceus, Bromus diandrus,* or *Bromus rubens*.

***Lupinus albifrons* - *Senecio flaccidus* Shrubland Association**

IA2. Shrublands dominated by *Baccharis* or *Rosa.*

IA2a. Tall shrublands dominated by *Baccharis salicifolia*.

Southwestern North American Riparian/Wash Scrub Shrubland Group (3400)

IA2ai. Tall shrublands dominated by *Baccharis salicifolia*. *Salix lasiolepis*, *Salix laevigata* and *Populus fremontii* may be present with not more than half the

Baccharis cover, widely scattered, the cover of *Baccharis* clearly the most abundant and characteristic shrub. The understory herbaceous layer may be sparse to abundant, and may include *Artemisia douglasiana, Pseudognaphalium canescens* ssp. *beneolens* (=*Gnaphalium canescens* ssp. *beneolens*), *Lotus unifoliolatus var. unifoliolatus (=Lotus purshianus var. purshianus*), *Melilotus indicus, Rumex salicifolius, Aira caryophyllea, Bromus diandrus, Bromus hordeaceus*, and *Vulpia myuros*.

***Baccharis salicifolia* Riparian Shrubland Association of the *Baccharis salicifolia* Intermittently Flooded Shrubland Alliance**

IA2b. Low shrubland (1-3 feet tall) dominated by *Rosa californica*. If *Salix* is present to codominant, go to IB2a.

***Rosa californica* Shrubland Alliance (3410)**

IA2bi. Low shrubland (1-3 feet tall) dominated by *Rosa californica.* Accompanying shrubs can be highly variable, but *Rosa* is always the most dominant shrub. The ground cover is sparse to abundant depending on the amount of moisture and shading. Understory herbaceous species may include *Artemisia dracunculus. Bromus diandrus, Bromus hordeaceus* and *Leymus triticoides*. Emergent trees are often present, but the overstory tree layer is usually less than 10% cover. Tree species that may be present include *Populus fremontii, Quercus agrifolia, Q. douglasii, Q. lobata,* or *Salix laevigata*.

***Rosa californica* Shrubland Association**

IB. Shrublands dominated by *Salix* spp.

Southwestern North American Riparian/Wash Scrub Shrubland Group (3400)

IB1. Tall or short shrublands in valley bottoms, stream sides or sandy washes. *Salix exigua* is the predominant cover. It can occur in highly disturbed washes with very low cover (2%), with only scattered individuals, especially in highly disturbed settings, or it can be very abundant, forming a dense thicket. *Salix lasiolepis* may also be present but generally with less than half the cover of *Salix exigua*. If *Salix lasiolepis* is abundant (near equal to, equal, or more than *Salix exigua*), key as a *Salix lasiolepis* dominated type.

***Salix exigua* Temporarily Flooded Shrubland Association of the *Salix exigua* Temporarily Flooded Shrubland Alliance**

IB2. Riparian and wetland areas dominated by *Salix lasiolepis*. Other willows and riparian shrubs may be present, but these are not more than half the cover of *S. lasiolepis*.

IB2a. Shrublands dominated by *Salix lasiolepis* with high cover of *Toxicodendron diversilobum*, and low cover of *Rosa californica* and *Baccharis salicifolia.* Emergent trees of *Quercus agrifolia, Q. douglasii* andr *Pinus sabiniana* are also present and makes the one stand sampled unique, and this association is tentative.

***Salix lasiolepis / Rosa californica* Shrubland Association of the *Salix lasiolepis* Temporarily Flooded Shrubland Alliance**

IB2b**.** Riparian or wetland shrublands dominated by *Salix lasiolepis*. *Baccharis salicifolia* is often present to co-dominant. Emergent trees such as *Populus fremontii, Quercus agrifolia, Salix laevigata* or *Pinus sabiniana* can be present, but with low cover. Other shrubs may be present at low cover, including *Rosa californica* and *Toxicodendron diversilobum*. The understory herbaceous is highly variable and may include *Artemisia douglasiana, Lotus unifoliolatus var. unifoliolatus (= Lotus purshianus var. purshianus), Rumex salicifolius, Bromus diandrus*, and *Bromus rubens (= Bromus madritensis ssp. rubens)*.

***Salix lasiolepis / Baccharis salicifolia* Shrubland Association of the *Salix lasiolepis* Temporarily Flooded Shrubland Alliance**

Group II: Shrublands occupying upland habitats or dry, high terraces in the broad valleys of the major rivers. Characteristic genera include *Adenostoma, Arctostaphylos, Artemisia, Baccharis* (*pilularis*), *Ceanothus, Cercocarpus, Diplacus* (*=Mimulus*), *Eriogonum, Lotus, Lupinus, Prunus, Quercus* (*berberidifolia*), *Rhamnus*, and *Salvia*.

IIA. Shrubland stands dominated by *Baccharis pilularis* or *Lotus scoparius*.

IIA1. Shrubland on gentle valley bottoms to steep slopes, typically on cleared/disturbed land, dominated by *Baccharis pilularis*.

***Baccharis pilularis* Shrubland Alliance (3210)**

IIA1a. Stands dominated by *Baccharis pilularis*. *Rosa californica* may be present as well. The herbaceous layer is a variety of non-native, largely annual grasses and herbs such as *Bromus hordeaceus*, *Avena barbata*, *Artemisia dracunculus*, and *Distichlis spicata*. Other native herbaceous species include *Distichlis spicata*. The emergent tree layer may be present with *Quercus lobata* or *Quercus agrifolia* var. *agrifolia* at low cover.

***Baccharis pilularis* / Annual Grass - Herb Shrubland Association**

IIA2. South facing low stature shrubland stands dominated by *Lotus scoparius*. Other shrubs present include *Eriogonum fasciculatum* var. *foliolosum* and *Lupinus albifrons* var. *albifrons*. The understory herbaceous layer may include *Artemisia dracunculus, Chaenactis glabriuscula, Cuscuta californica, Eriogonum elegans, Hirschfeldia incana, Lupinus bicolor, Nemacladus gracilis, Silene gallica, Trifolium microcephalum, Trifolium willdenowii, Aira caryophyllea, Avena barbata, Bromus arenarius, Bromus hordeaceus, Bromus rubens* (*=Bromus madritensis* ssp. *rubens*), and *Vulpia myuros*. This type sampled only one in the park.

***Lotus scoparius* Shrubland Association of the *Lotus scoparius* Shrubland Alliance**

IIB. Shrubland stands dominated by chaparral shrubs such as *Adenostoma fasciculatum, Arctostaphylos glauca*, *Ceanothus cuneatus*, *Cercocarpus montanus* (=*Cercocarpus betuloides*), *Prunus ilicifolia, Quercus berberidifolia*, and/or *Rhamnus ilicifolia*.

Californian Chaparral Shrubland Macrogroup (3100)

If in a recently burned/disturbed area with regenerating shrubs:

Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit (3103)

IIB1. Shrubland stands dominated by *Adenostoma fasciculatum, Arctostaphylos glauca*, and *Ceanothus cuneatus*.

Californian Xeric Chaparral Shrubland Group (3101)

If in a recently burned/disturbed area with regenerating shrubs:

Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit (3104)

IIB2. Shrublands of steep to moderate hill slopes, dominated by *Adenostoma fasciculatum*, occurring alone or with other shrubs.

***Adenostoma fasciculatum* Shrubland Alliance**

IIB2a. *Adenostoma fasciculatum* shrubland with abundance or co-dominance with coastal sage scrub shrubs, such as *Salvia mellifera*, *Eriogonum fasciculatum*, *Eriodictyon tomentosum*, and *Lotus scoparius*.

***Adenostoma fasciculatum* Shrubland Alliance**

IIB2ai. *Adenostoma fasciculatum* shrubland usually with closed canopy. *Salvia mellifera* is as abundant or its canopy cover is at least half that of *Adenostoma.* Other shrubs that may be present include *Ceanothus cuneatus* and *Rhamnus ilicifolia*. The canopy cover is thick such that the herbaceous layer is depauperate. No emergent trees were present in any of the stands sampled.

***Adenostoma fasciculatum - Salvia mellifera* Shrubland Association**

IIB2ii. *Adenostoma fasciculatum* shrubland co-dominated with *Eriogonum fasciculatum*. Canopy cover is usually open. Other shrubs present may include *Ceanothus cuneatus, Eriodictyon tomentosum*, and *Senecio* spp. This is a very common combination, but was not sampled, thus no plot data nor description available.

***Adenostoma fasciculatum* Shrubland Alliance**

IIB2b. *Adenostoma fasciculatum* shrubland with a closed canopy, shrubs present may include *Ceanothus cuneatus, Arctostaphylos glauca*, or *A. pungens*. *Salvia mellifera* may be present in very low cover.

IIB2bi. *Adenostoma fasciculatum* shrubland co-dominated with *Ceanothus cuneatus*. Generally in near equal cover, or *Ceanothus cuneatus* is at least half that of *Adenostoma fasciculatum*. If other shrubs are present they are not more than a quarter of the cover of *Adenostoma*. Rarely emergent individual trees may be present and include *Quercus douglasii* or *Pinus sabiniana*, with very low cover.

Adenostoma fasciculatum - Ceanothus cuneatus **Shrubland Association**

IIB2bii. Shrubland dominated by *Adenostoma fasciculatum*, with a consistent presence to co-dominance of *Arctostaphylos pungens*. These stands are found almost always on the upper 1/3 of slopes to ridge tops in the park. No emergent trees were seen from the 9 samples of this type. Other shrubs may be present but with less than half the cover of *Arctostaphylos pungens*.

Adenostoma fasciculatum - Arctostaphylos pungens **Shrubland Association**

IIB2biii. Shrublands of steep to moderate slopes dominated by *Adenostoma fasciculatum* and *Arctostaphylos glauca*. Other shrubs may be present but are never more than a quarter of the two co-dominant shrubs' cover. Scattered trees are rarely present, but may include *Pinus sabiniana, Quercus douglasii* or *Q. agrifolia* with very low cover. Herbaceous understory is highly variable and generally low due to heavy shading.

Adenostoma fasciculatum - Arctostaphylos glauca **Shrubland Association**

IIB2biv. Shrublands dominated by *Adenostoma fasciculatum*. Other shrubs, if present, area scattered, with less than half, more often less than a quarter, of the cover of *Adenostoma*, and includes *Eriogonum fasciculatum*. The understory includes a thick mat of *Selaginella bigelovii* with a cover or at least 10%. Emergent trees include young *Pinus sabiniana*. This type seems to occur only on the upper 1/3 of slopes to ridge tops, often on shallow soils. This type is similar to stands of *Pinus sabiniana / Eriogonum fasciculatum* Thin Substrate Shrubland Mapping Unit.

Adenostoma fasciculatum / Selaginella bigelovii **Shrubland Association**

IIB2bv. Shrublands dominated solely by *Adenostoma fasciculatum*. If present, other shrubs are scattered, with less than half, more often less than a quarter, of the cover of *Adenostoma*. *Selaginella bigelovii*, if present, is less than 10% cover, and does not form a mat-like layer under the shrub canopy. Other shrubs may be present, but with very low cover. A few emergent trees may be present, with species such as *Juniperus californica, Pinus sabiniana*, or *Quercus douglasii.*

Adenostoma fasciculatum **Shrubland Association**

IIB3. Shrublands of similar habitats, dominated by other shrub species. If *Adenostoma fasciculatum* present, it is not dominant nor co-dominant, but may be abundant in the stand.

IIB3a. Shrublands of moderate to steep slopes on all aspects. Stands dominated by *Arctostaphylos glauca*. Other shrubs present at low cover may include *Adenostoma fasciculatum*, *Ceanothus cuneatus, Prunus ilicifolia,* or *Rhamnus ilicifolia*. Emergent trees at very low cover include *Pinus sabiniana* and *Quercus agrifolia*.

***Arctostaphylos glauca* Shrubland Association of the *Arctostaphylos glauca* Shrubland Alliance**

IIB3b. Shrublands on moderate to steep slopes with a shrub layer dominated by *Ceanothus cuneatus*. Several other shrub species may be present but these with less than half the cover of *Ceanothus*. Shrub species include *Adenostoma fasciculatum*, *Arctostaphylos glauca,* and *Cercocarpus montanus*. Emergent trees may occur with very low cover, and include *Pinus sabiniana, Quercus douglasii*, or *Q. agrifolia*, and may be standing dead trees.

***Ceanothus cuneatus* Shrubland Association of the *Ceanothus cuneatus* Shrubland Alliance**

However if mixed with *Eriodictyon tomentosum* and/or *Malacothamnus*, then

***Ceanothus cuneatus* Shrubland Alliance**

IIC. Shrubland stands dominated by *Cercocarpus montanus* (=*Cercocarpus betuloides*), *Prunus ilicifolia, Quercus berberidifolia*, and/or *Rhamnus ilicifolia*.

Californian Chaparral Shrubland Macrogroup (3100)

If in a recently burned/disturbed area with regenerating shrubs:

Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit (3103)

IIC1. Stands generally characterized by a dominance or co-dominance of *Prunus ilicifolia*. *Adenostoma fasciculatum* may be present, but is less than half the cover of other shrubs forming the matrix cover of the stand.

***Prunus ilicifolia* Shrubland Alliance (3150)**

IIC1a. Shrubland dominated by a mix of *Prunus ilicifolia* and *Fraxinus dipetala*. Most stands co-dominated by *Prunus ilicifolia* are a mix of several shrubs. In this case *F. dipetala* is clearly a co-dominant with *Prunus ilicifolia*. *Clematis lasiantha* can be abundant, draped over the tops of the taller shrubs. *Quercus berberidifolia* and *Heteromeles arbutifolia* may have as much as 10% cover, but generally occur in clumps, and are not as abundant throughout the stand as *Fraxinus*. *Pinus sabiniana* may be an occasional emergent tree, but with a very low cover and not forming a tree overstory layer.

***Prunus ilicifolia - Fraxinus dipetala* Shrubland Association**

IIC1b. Shrubland of moderate to steep north facing slopes, dominated by *Prunus ilicifolia* and *Ceanothus cuneatus*. *Clematis lasiantha* and *Rhamnus ilicifolia* may be locally abundant. Several shrub species may be present with greater than 10% cover, but never more than half that of *Prunus ilicifolia* or *Ceanothus cuneatus*.

***Prunus ilicifolia - Ceanothus cuneatus* Shrubland Association**

IIC1c. Shrubland of steep north-facing slopes. The shrub layer is dominated by *Prunus ilicifolia* and *Heteromeles arbutifolia*. Other shrubs such as *Ceanothus cuneatus* and *Adenostoma fasciculatum* may be present, but at low cover, and not more than half that of *Prunus* or *Heteromeles* cover.

***Prunus ilicifolia - Heteromeles arbutifolia* Shrubland Association**

IIC1d. Shrubland dominated by *Prunus ilicifolia*. Several other shrubs are commonly present, none as abundant as *Prunus*. Stand is overwhelmingly dominated by *Prunus ilicifolia*.

***Prunus ilicifolia* Shrubland Association**

IIC2. Shrublands of moderate to steep slopes, dominated by *Cercocarpus montanus* (=*Cercocarpus betuloides*). The herbaceous layer has no characteristic species. The emergent tree layer may include *Quercus agrifolia, Q. douglasii, Juniperus californica*, or *Pinus sabiniana*.

***Cercocarpus montanus* Shrubland Association of the *Cercocarpus montanus* Shrubland Alliance**

IIC3. Shrublands and low stature oak stands dominated by *Quercus berberidifolia*, *Q. agrifolia*, or *Q. wislizenii*.

IIC3a. Shrublands dominated or co-dominated by *Quercus berberidifolia*. *Pinus sabiniana* may be present to co-dominant. *Q. agrifolia, Q. douglasii*, and *Q. wislizenii* may also be present at low cover. Other shrubs, including *Prunus ilicifolia* and *Rhamnus ilicifolia* may be present at low cover.

***Quercus berberidifolia* Shrubland Alliance (3160)**

IIC3ai. Shrublands on steep north-facing slopes dominated by *Q. berberidifolia* and *Cercocarpus montanus* (=*Cercocarpus betuloides*). Other shrubs that may be present include *Lonicera subspicata* var. *denudata*, and *Rhamnus ilicifolia*. The emergent tree layer includes *Juniperus californica*, *Pinus sabiniana*, *Quercus agrifolia*, or *Q. douglasii* at low cover. The understory herbaceous layer has no characteristic species.

***Quercus berberidifolia - Cercocarpus montanus* Shrubland Association**

IIC3aii. Shrublands of steep north-facing slopes dominated by *Quercus berberidifolia*. Other shrubs can be abundant (as high as 15% cover) but never as much as half that of *Q. berberidifolia*. Other shrubs species include *Adenostoma*

fasciculatum, Arctostaphylos pungens, A. glauca, Ceanothus cuneatus, *Heteromeles arbutifolia*, or *Prunus ilicifolia*. A few emergent trees may be present at low cover and include *Aesculus californica, Juniperus californica, Q. agrifolia*, or *Q. douglasii*.

***Quercus berberidifolia* Shrubland Association**

IIC3b. Low stature woodlands dominated by *Quercus agrifolia*.

***Quercus agrifolia* Woodland Alliance (2110)**

IIC3c. Low stature woodlands or shrublands dominated by *Quercus wislizenii*.

***Quercus wislizenii* Woodland Alliance**

IIC4. Shrublands dominated by *Rhamnus ilicifolia*, draped with the vine *Clematis lasiantha*, occurring on steep slopes facing northeast. Other shrubs present in much lower cover include *Heteromeles arbutifolia*, *Lepechinia calycina, Diplacus (=Mimulus) aurantiacus*, and *Prunus ilicifolia*. Only two plots were sampled of this type, and its classification is tentative.

***Rhamnus ilicifolia - Clematis lasiantha* Shrubland Association of the *Rhamnus ilicifolia* Shrubland Alliance**

IID. Shrubland stands dominated by *Artemisia californica, Eriogonum fasciculatum, Diplacus (=Mimulus) aurantiacus, Eriodictyon tomentosum, Lotus scoparius, Lupinus albifrons*, and/or *Salvia mellifera*.

California Coastal Scrub Shrubland Macrogroup (3300)

If in a recently burned/disturbed area with regenerating shrubs:

Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Mapping Unit (9700)

IID1. Stands dominated by *Artemisia californica* or also co-dominated with *Eriogonum fasciculatum.*

IID1a. Stands dominated by *Artemisia californica*. Other shrubs may be present at very low cover.

***Artemisia californica* Shrubland Alliance**

IID1ai. Shrubland of mostly steep southerly aspects dominated by *Artemisia californica*. Other shrubs, such as *Eriogonum fasciculatum*, may be present, but with very low cover (<5%). Herbaceous understory contains forbs *Dichelostemma capitatum* ssp. *capitatum, Logfia gallica* (=*Filago gallica*), *Lotus scoparius* var. *scoparius,* and *Lotus wrangelianus*, and the graminoids *Bromus hordeaceus* and *Bromus rubens* (=*Bromus madritensis* ssp. *rubens*).

***Artemisia californica* Shrubland Association**

IID1b. Stands with co-dominance of *Artemisia californica* and *Eriogonum fasciculatum*.

***Artemisia californica - Eriogonum fasciculatum* Shrubland Alliance (3370)**

IID1bi. Shrublands of mostly steep, southerly aspects with a co-dominance of *Artemisia californica* and *Eriogonum fasciculatum*. Other shrubs may be present with much lower cover (usually less than 5%), such as *Salvia mellifera*, *Ceanothus cuneatus*, *Diplacus (=Mimulus) aurantiacus*, *Prunus ilicifolia*, or *Rhamnus ilicifolia*. *Pinus sabiniana* is often present as an emergent tree, but with very low cover (2%).

***Artemisia californica - Eriogonum fasciculatum* Shrubland Association**

IID2. Shrublands dominated by *Eriogonum fasciculatum*.

***Eriogonum fasciculatum* Shrubland Alliance (3330)**

IID2a. Shrubland dominated by nearly pure stands of *Eriogonum fasciculatum*. Total canopy cover is generally >25. If present, other shrubs are in very low cover, usually 1-2%, and may be as high as 7-8%. They are never more than half the cover of *Eriogonum fasciculatum*. Other shrub species include *Artemisia dracunculus, Prunus ilicifolia, Salvia mellifera*, *Rhamnus ilicifolia, Adenostoma fasciculatum*, and *Cercocarpus montanus (=Cercocarpus betuloides)*. Diverse annual herbs comprise the herb understory. Emergent trees with low cover include *Pinus sabiniana, Juniperus californica, Quercus douglasii*, or *Q. agrifolia*.

***Eriogonum fasciculatum* Shrubland Association**

IID2ai. Stands occurring on floodplain terraces, alluvial washes, and adjacent lower toe slopes.

***Eriogonum fasciculatum* Woodland Alliance (3330)**

IID2b. Shrublands with open canopy (25%) to sparse cover (<5%) of *Eriogonum fasciculatum*. Occurs on steep slopes of rocky or thin substrate. *Pinus sabiniana* may be present at very low cover. Since *Selaginella bigelovii* is not mappable by photo interpretation, it may be present in this class at very low to high cover.

***Eriogonum fasciculatum* Woodland Alliance (3330)**

IID2bi. Shrubland with open canopy (25%) to sparse cover (<5%) of *Eriogonum fasciculatum*. *Selaginella bigelovii* is the dominant herb layer. This type can also be keyed through the herbaceous section.

***Eriogonum fasciculatum / Selaginella bigelovii* Herbaceous Vegetation Association of the *Selaginella bigelovii* Herbaceous Alliance**

IID3. Shrublands on moderate to abrupt slopes on most aspects, often unstable, or recently burned, or a product of recent land or rock slides, and dominated by *Diplacus* (*=Mimulus*)

aurantiacus. Other shrubs may be present with low cover, such as *Arctostaphylos glauca, Adenostoma fasciculatum, Eriogonum fasciculatum, Lotus scoparius*, or *Lupinus albifrons*. Moss and/or *Selaginella bigelovii* can be quite abundant in the understory. Emergent trees such as *Pinus sabiniana* and *Quercus agrifolia* are also occasionally present with very low cover.

***Diplacus (=Mimulus) aurantiacus* Shrubland Association of the *Diplacus (=Mimulus) aurantiacus* Shrubland Alliance**

IID4. Shrubland dominated by *Salvia mellifera*, solely or with other low shrubs.

***Salvia mellifera* Shrubland Alliance (3360)**

IID4a. Shrubland of steep slopes with variable aspects, co-dominated by *Salvia mellifera* and *Eriogonum fasciculatum*. Other shrubs present with much lower cover include *Artemisia californica* or *Prunus ilicifolia*. *Bromus madritensis* ssp. *rubens* is present in the understory.

***Salvia mellifera - Eriogonum fasciculatum / Bromus madretensis* Shrubland Association**

IID4b. Shrubland of moderate to steep, south and west-facing slopes, the shrub layer overwhelmingly dominated by *Salvia mellifera.* Other shrubs, if present, are very low cover, and may include *Eriogonum fasciculatum* or *Adenostoma fasciculatum*. The understory herbaceous layer is highly variable.

***Salvia mellifera* Shrubland Association**

Class C: Herbaceous Vegetation
(Due to the many-to-many relationship between map units and Herbaceous plant associations, this section includes the Mapping Units, but only 1 of the known 24 herbaceous plant associations. See "Key to Plant Associations of Pinnacles National Monument" for a key to all the herbaceous / sparse plant associations)

Group I: Herbaceous vegetation occupying mesic sites including wetlands, perennial drainages, floodplains, alluvial flats, seeps, and springs, vegetative cover greater than 8% cover, excluding non-vascular plants.

IA. Stands of vegetation occurring in standing water. Usually found in and on the shallow margins of lakes, ponds, and reservoirs. Emergent plants are *Typha, Scirpus,* or other aquatic species.

***Scirpus* spp. - *Typha* spp. Herbaceous Vegetation Mapping Unit (4101)**

IB. Sites perennially to temporarily wet and dominated by grasses and/or forbs. Stands are small to large, occurring on subirrigated floodplains, and can be limited to the wet edges of creeks and seeps. Sites are saturated during the growing season, and can occur in wide wet meadows or swales. Common graminoid genera include *Carex, Juncus, Hordeum brachyantherum, Poa pratensis, Eleocharis, Distichlis, Equisetum*, and forbs *Mimulus guttatus, M. cardinalis, M.*

pilosus, *Veronica* or *Epilobium.* Some stands of graminoids, like *Juncus* and *Distichlis,* can become very dry in some years, or even for certain times of the year, and may have been mapped as dry sites (see Group II). Conversely, stands that are wet now may have been dry in the mapping imagery. Currently wet meadows should always key here.

Western North America Wet Meadow and Low Shrub Carr Herbaceous Vegetation Macrogroup (4500)

IC. Mesic sites dominated by forb species. Subshrubs may be present; grasses are few. Herbaceous associations on alluvial fans, sandy or gravelly flats, and low terraces. Herbs and low shrubs present may include *Artemisia dracunculus*, *Escholtzia californica, Lotus scoparius, Senecio* spp., *Artemisia douglasiana, Lupinus albifrons*, and *Eriogonum fasciculatum*. Sites can vary in cover of herbs and shrubs forming a sparse to very sparse a mixture of plants. *Baccharis salicifolia* and *Salix lasiolepis* may also be present at very low cover or occurs in immediately adjacent stream channels. These are often open to very sparse stands of herbaceous vegetation on floodplains and flat canyon bottoms. In more moist areas an herbaceous stand may be quite dense. This mapping unit is found on sand or gravel bars and active floodplain terraces adjacent to braided stream channels, as well as in alluvial canyon bottoms. There can be a high exposure of sand and gravel substrate. The stands can have very limited extent, or can run along the floodplain for some distance. This mapping unit includes bare dry stream channels, and associated unvegetated sand bars that are well below minimum mapping unit, with no or very few interfluvial low terraces.

Alluvial Herb and Shrub Vegetation Mapping Unit (4004)

ID. Sandy, gravelly, or rocky stream channels and adjacent flats with sparse to very sparse vegetation. This type is limited to the stream channel, and any associated flats are well below minimum mapping unit, with no or very few interfluvial low terraces. These areas may have *Populus, Salix, Baccharis, Rosa, Diplacus* or other woody species as few stunted individuals, generally never more than 10% canopy cover.

Alluvial Herb and Shrub Vegetation Mapping Unit (4004)

Group II: Herbaceous vegetation occupying xeric and upland sites including dry drainages, terraces, and benches; community not controlled by water table or subsurface flow of water. This includes areas dominated by non-vascular plants such as lichens and the semi-vascular plant *Selaginella bigelovii*. Total canopy cover of vascular plants is greater than 8-%.

IIA. Dry to mesic upland sites with low to tall vascular plants forming meadows and grasslands.

IIA1. Herbaceous dominated by grass and/or forb species such as *Avena, Bromus, Gnaphalium, Eriogonum, Erodium, Epilobium, Escholtzia, Heterotheca, Hordeum, Muhlenbergia, Nassella, Poa* or *Vulpia*. Includes stands of dense *Artemisia dracunculus*. Stands that are bone dry at time of field assessment, and that were once wet, for example meadows of *Juncus, Carex* or *Distichlis*, may have been mapped as dry grasslands. Conversely very wet years may make these uplands saturated and contain luxurious growth,

and may have been mapped as wet meadows (4500), but their species composition should key them here.

Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Macrogroup (4300)

IIA1a. Herbaceous community on a gentle, south-facing slope or on alluvial plains, dominated by *Muhlenbergia rigens*. Other graminoids include *Bromus diandrus*. The shrub layer *Eriogonum fasciculatum* may also be present in low cover. Only one stand of this type was sampled in the park.

***Muhlenbergia rigens* Herbaceous Vegetation Alliance (4510)**
***Muhlenbergia rigens* Herbaceous Vegetation**

IIA2. Open to very sparse stands of herbaceous vegetation on floodplains and flat canyon bottoms. This mapping unit is found on sand or gravel bars and active floodplain terraces adjacent to braided stream channels, as well as in alluvial canyon bottoms. There can be a high exposure of sand and gravel substrate. Sites may be mesic in the spring by can be quite dry in summer and fall. Generally dominated by forb species. Subshrubs may be present, grasses are few. Herbaceous associations on alluvial fans, sandy or gravelly flats, and low terraces. Herbs and low shrubs present may include *Artemisia dracunculus*, *Escholtzia californica, Lotus scoparius, Senecio* spp., *Artemisia douglasiana, Lupinus albifrons*, and *Eriogonum fasciculatum*. Sites can vary in cover of herbs and shrubs forming a sparse to very sparse with a mixture of plants. *Baccharis salicifolia* and *Salix lasiolepis* may also be present at very low cover, or occurs in immediately adjacent in stream channels. The stands can have very limited extent, or can run along the floodplain for some distance. This mapping unit includes bare dry stream channels, and associated unvegetated sand bars that are well below minimum mapping unit, with no or very few interfluvial low terraces.

Alluvial Herb and Shrub Vegetation Mapping Unit (4004)

IIB. Open to sparsely vegetated grasses, forbs, non-vascular and semi-vascular plants occurring on thin substrate soils. Herbaceous cover is usually greater than 5-10% . Shrubs and sub-shrubs may be present at very low cover. These areas are usually neutral in shape on gentle to steep slopes. In many cases this unit can occur as a mosaic of grass, gravelly substrates with small isolated rock, scree and/or loose detritus. Plant species present may include *Sedum, Artemisia dracunculus, Eriogonum elongatum, Epilobium canum, Eriogonum fasciculatum*, grasses. Since *Selaginella bigelovii* is not mappable by photo interpretation, it may be present in this class at very low to high cover.

Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit (9420)

Class D: Sparsely Vegetated and Non-vascular dominated areas.
Sparsely vegetated areas with scattered shrubs and herbs. Total vascular vegetated cover is less than 8-10% cover. Lichens, mosses and spike mosses may have high cover. Area may be predominantly rock, gravel, cliffs or scree slopes.

I. Rocky exposures with vegetative cover ranging from unvegetated to low. Predominantly solid rock to large boulder areas with some sparsely vegetated patches. They can appear in various forms, from pinnacle rock formations, to low profile rock outcrops, and may include extremely steep eroded cliffs with little or no vegetation. Isolated trees and shrubs may grow in rock crevices and/or in deep concavities. Herbaceous vegetation may include *Sedum, Artemisia dracunculus, Eriogonum elongatum, Epilobium canum*, grasses, and *Selaginella bigelovii*. Since *Selaginella bigelovii* is not mappable by photo interpretation, it may be present in this class at very low to high cover. Lichens are often present on rock exposures.

Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit (9420)

II. Open to sparsely vegetated grasses, forbs, non-vascular and semi-vascular plants occurring on thin substrate soils. Herbaceous cover is usually greater than 5-10%. Shrubs and sub-shrubs may be present at very low cover. These areas are usually neutral in shape on gentle to steep slopes. In many cases this unit can occur as a mosaic of grass, gravelly substrates with small isolated rock, scree and/or loose detritus. Plant species present may include *Sedum, Artemisia dracunculus, Eriogonum elongatum, Epilobium canum, Eriogonum fasciculatum*, grasses. Since *Selaginella bigelovii* is not mappable by photo interpretation, it may be present in this class at very low to high cover.

Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit (9420)

III. Stands densely covered in mats of *Selaginella bigelovii*. Scattered *Eriogonum fasciculatum* can be present with as much as 25% cover. Grasses may have high cover (>10%) but are always less than half that of *Selaginella bigelovii*. This type can also be keyed through the shrubland section.

***Eriogonum fasciculatum / Selaginella bigelovii* Herbaceous Vegetation Association of the *Selaginella bigelovii* Herbaceous Alliance**

IV. Sandy, gravelly, or rocky stream channels and adjacent flats with sparse to very sparse vegetation. Includes bare dry stream channels, and associated unvegetated sand bars that are well below minimum mapping unit, with no or very few interfluvial low terraces.

Alluvial Herb and Shrub Vegetation Mapping Unit (4004)

Appendix J

Mapping Descriptions

Natural Resource Report NPS/SFAN/NRR—2012/574

Aerial Information Systems, Inc.
112 First Street
Redlands, California 92373

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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Introduction

The study area for the project consists of 44,997 acres and consists of two tiers. The first tier (park and buffer area) includes lands within the park boundary as well as a quarter-mile buffer around the park. The second tier (expanded study area) includes several areas of interest, of varying sizes, adjacent to the park and buffer.

The mapping descriptions characterize the mapping classes used in the Pinnacles National Monument vegetation map that was compiled in 2007-08. The descriptions are based on field reconnaissance, releve field samples, and 2005 NAIP natural color imagery. Other supplemental imagery may be applicable where noted.

Each mapped class is presented with the following format:

- The top of each page lists the Map Code with the Common Name of the map class, followed by the Scientific Name of the map class.
- Any vegetation classification associations that nest hierarchically into the map class are listed next.
- A snapshot of the vegetation map showing an example mapped polygon of the map class draped over the NAIP aerial imagery.
- A map showing the distribution of the map class in the original database over the study area. The inner boundary shown is the park boundary.
- A brief description of the map class describing general structure, cover, species, and ecology. Also noted is whether the map class is mapped within the park and buffer, expanded study area, or both.
- A brief description of the photo signature for the map class.
- A list of other map classes which are similar in signature to the map class being described.
- A brief summary of accuracy assessment results.

Dominance and percent cover terms used in these descriptions are represented as follows (values are approximate):

Overall Structural Density

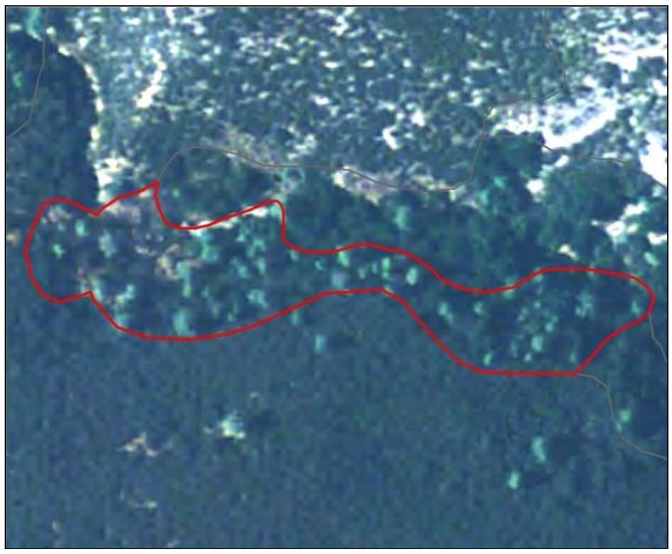
>60%	Dense or continuous
40-60%	Intermittent or slightly open
25-40%	Open
10-25%	Sparse
<10%	Very sparse

Individual Species

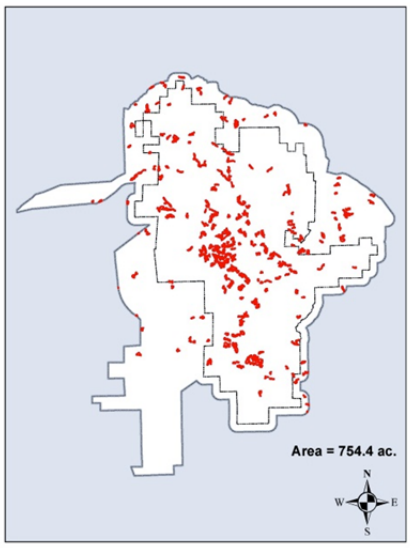
>60%	Extremely High
40-60%	Very High
25-40%	High
10-25%	Moderate
5-10%	Low, for trees this can be emergent
<5%	Very Low, or can be present

1210 – Foothill Pine Woodland Alliance

Pinus sabiniana Woodland Alliance
Pinus sabiniana/Ceanothus cuneatus-Rhamnus ilicifolia Woodland Association
Pinus sabiniana/Eriogonum fasciculatum Woodland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Pinus sabiniana* Woodland Alliance is mapped as intermittent to sparse stands of trees over an understory of intermittent to sparse chaparral, coastal sage scrub, grass, and/or rock. *Pinus sabiniana* is the dominant tree at high to low cover. This alliance can be found on floodplain terraces, canyon bottoms, and lower to upper side slopes. It can occupy northerly or southerly exposures. *Quercus douglasii* or *Quercus agrifolia* may be present at low to very low cover. *Juniperus californica* may be present at very low cover. Typical chaparral shrubs may include *Ceanothus cuneatus, Adenostoma fasciculatum*, *Cercocarpus betuloides*, and *Rhamnus ilicifolia*. In alluvial floodplains and terraces typical short shrubs may include *Eriogonum fasciculatum*, *Lupinus albifrons*, *Lotus scoparius*, and *Eriodictyon tomentosum*. Riparian shrubs including *Salix lasiolepis, Salix exigua*, and *Baccharis salicifolia* may be present at very low to moderate cover, usually as narrow channel inclusions. On steep rocky upper slopes sparse *Pinus sabiniana* may contain an understory of open to sparse chaparral and/or *Eriogonum fasciculatum.* Here *Selaginella bigelovii* may also be present at very low to high cover. This alliance is mapped within the park, buffer, and expanded study area. The alliance also represents the hierarchical class into which all *Pinus sabiniana* types are nested.

Photo Signature:
Pinus sabiniana appears on the imagery as rounded- to irregularly-crowned trees emergent over other shorter trees, chaparral, and grass. It has a light blue-green color with a soft to wispy texture. The chaparral is shorter with a rounded to irregular crown. Some shrubs appear as individuals, others as clusters with no distinctive crown. The chaparral can have a dull green, brownish-green, bluish-green, grayish-green, or brown color. *Eriogonum fasciculatum* is a low

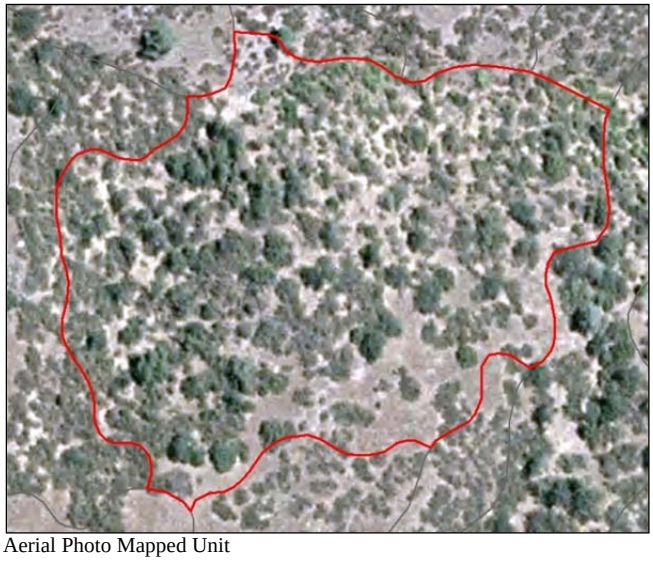
shrub with a gray, tan, or brown to rust color. It appears as small rounded individuals or in small clusters.

Types with Similar Signature:
Quercus agrifolia Woodland Alliance – 2110
Quercus douglasii Woodland Alliance – 2210
Californian Chaparral Shrubland Macrogroup – 3100
Californian Xeric Chaparral Shrubland Group – 3101
California Coastal Scrub Shrubland Macrogroup – 3300
Eriogonum fasciculatum Shrubland Alliance – 3300
Alluvial Herb and Shrub Vegetation Mapping Unit – 4004
Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit – 9420

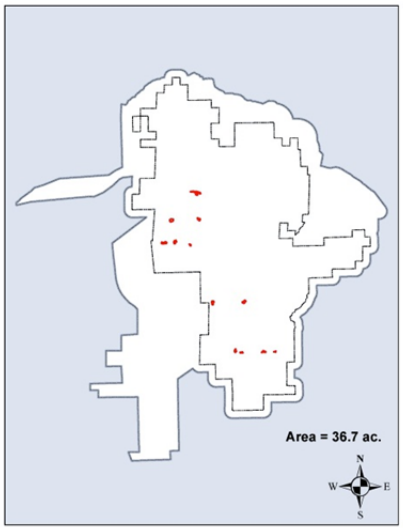
1220 – California Juniper Woodland Alliance

Juniperus californica Woodland Alliance

Juniperus californica/Prunus ilicifolia/Moss Woodland Mapping Unit



Aerial Photo Mapped Unit



Distribution

Description:

The *Juniperus californica* Woodland Alliance is mapped as intermittent to sparse stands of trees over an understory of open to sparse chaparral shrubs or grass. *Juniperus californica* is the dominant tree at moderate to low cover. *Pinus sabiniana* may be present at low to very low cover. *Prunus ilicifolia* is present at moderate to very low cover. Other chaparral shrubs, including *Cercocarpus montanus*, *Ceanothus cuneatus* and *Diplacus aurantiacus*, may be present at very low cover. This alliance favors northerly, gentle to moderately steep lower to upper slopes. Due to the difficulty in photo interpretation of this type, field visits and releve sites are used to identify known locations of this alliance. It is mapped within the park, buffer, and expanded study area. The alliance also represents the hierarchical class into which *Juniperus californica* types are nested.

Photo Signature:

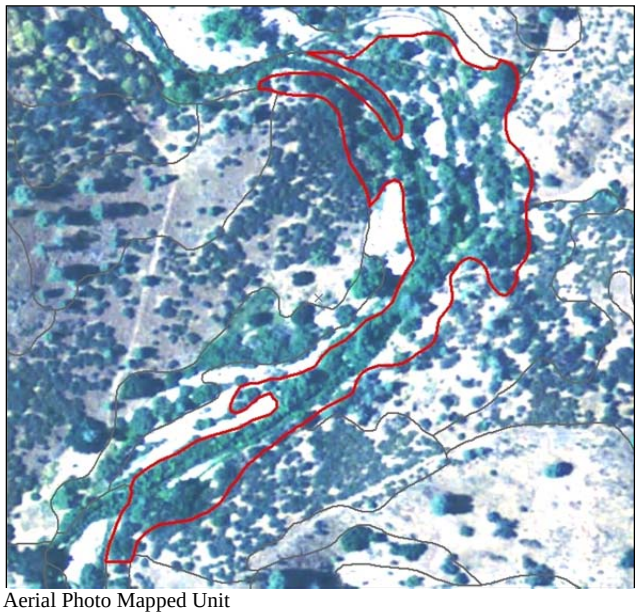
Juniperus californica appears on the imagery as a dull medium green to yellow-green color with a rounded crown. Its signature is very similar to *Quercus douglasii*, which has a blue cast to its color. *Juniperus californica*, however, will have a green cast to it. *Prunus ilicifolia* appears as a bright medium green color with individual rounded to irregular crowns. *Prunus ilicifolia* has a very bright red color on the supplementary CIR imagery, which aids in its identification.

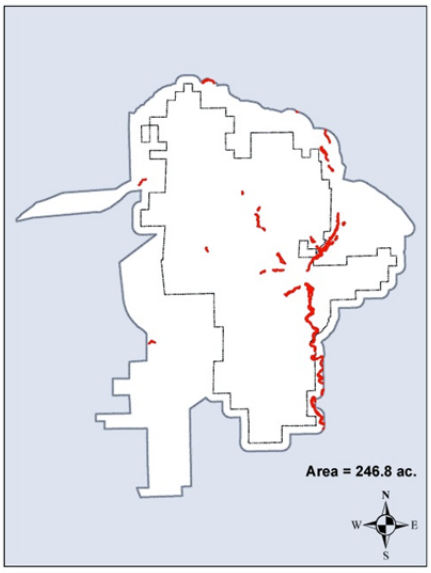
Types with Similar Signature:

Quercus douglasii Woodland Alliance – 2210
Quercus douglasii/Mixed Herbaceous Woodland Association – 2212

1300 – Southwestern North American Riparian Evergreen and Deciduous Forest Group

Salix laevigata Temporarily Flooded Woodland Alliance
Salix laevigata/Artemisia douglasiana-Rubus ursinus Woodland Association
Populus fremontii Temporarily Flooded Woodland Alliance
Populus fremontii-Salix laevigata Woodland Association
Populus fremontii/Baccharis salicifolia Woodland Associaton
Platanus racemosa Temporarily Flooded Woodland Alliance
Platanus racemosa-Quercus agrifolia Woodland Association


Aerial Photo Mapped Unit



Distribution

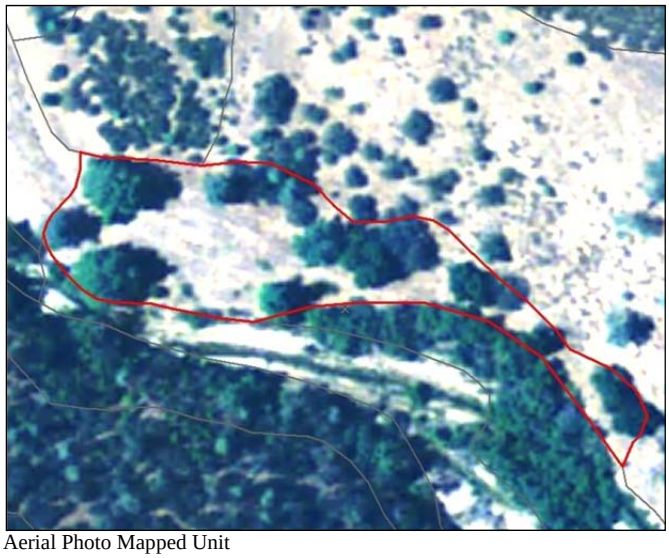
Description:
The Southwestern North American Riparian Evergreen And Deciduous Forest Group is mapped as dense to sparse stands of riparian trees over intermittent to sparse shrubs and herbs. Trees are typically dominated by *Salix laevigata*, *Populus fremontii*, and/or *Platanus racemosa* at high to low cover. *Quercus agrifolia*, and *Quercus lobata*, may be present at moderate to very low cover. *Pinus sabiniana* may be present at low to very low cover. Riparian or mesic shrubs, including *Salix lasiolepis*, *Baccharis salicifolia*, *Baccharis pilularis*, *Toxicodendron diversilobum*, and *Rosa californica* may be present, each at high to very low cover. This type favors riparian corridors along perennial streams on major flat floodplains. The trees usually occupy the stream channel edge or are within the active floodplain. *Platanus racemosa* is common in the Bear Gulch and South Wilderness Chalone Creek areas. *Populus fremontii* is common in Bear Valley and in the South Wilderness Chalone Creek areas. *Quercus lobata* is common in the Bear Valley area. This class is mapped within the park, buffer, and expanded study area.

Photo Signature:
The trees are usually clustered together with no clear indication of individuals. *Salix laevigata* and *Populus fremontii* both appear as dull green with a large, irregularly shaped, dense crown. Due to the similarity of signature, they are very difficult to discern from each other. *Platanus racemosa* also has a similar signature as *Salix laevigata* and *Populus fremontii*. However, *Platanus racemosa* is usually taller than the other trees in the canopy. It also has a more open crown and occurs as individuals. *Quercus agrifolia* is more discernible on the imagery. It is dark green in color with a coarse texture, and a rounded billowy crown. Individuals can be seen among the other riparian trees. *Quercus lobata* is dull to dark green with a large rounded crown containing many small openings.

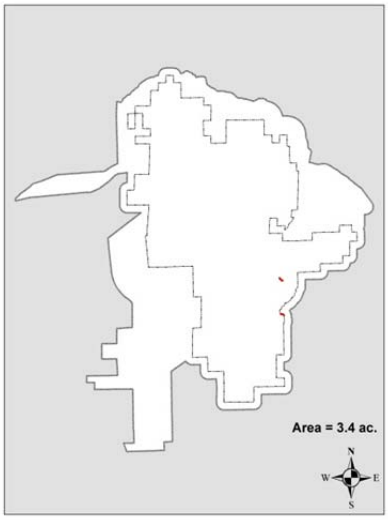
Types with Similar Signature:
Platanus racemosa Temporarily Flooded Woodland Alliance – 1310
Platanus racemosa-Quercus agrifolia Woodland Association – 1311
Quercus agrifolia Woodland Alliance – 2110
Southwestern North American Riparian/Wash Scrub Shrubland Group – 3400

1310 – California Sycamore Temporarily Flooded Woodland Alliance

Platanus racemosa Temporarily Flooded Woodland Alliance
Platanus racemosa Temporarily Flooded Woodland Association
Platanus racemosa-Quercus agrifolia Woodland Association



Aerial Photo Mapped Unit



Distribution

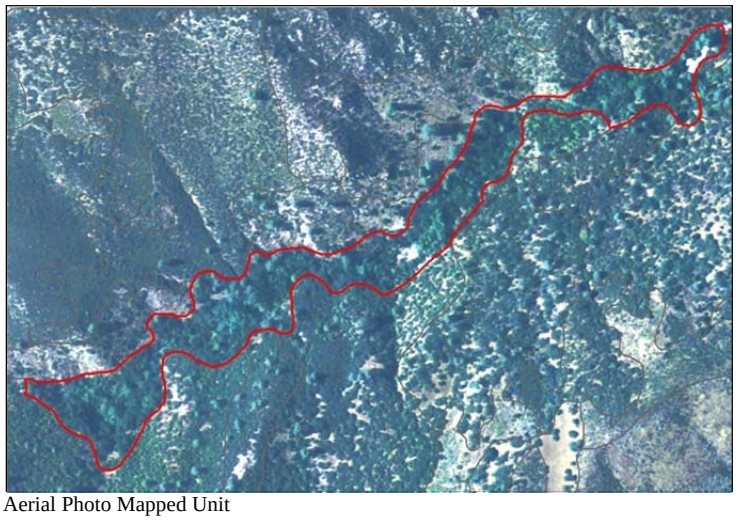
Description:
The *Platanus racemosa* Temporarily Flooded Woodland Alliance is mapped as dense to open stands of trees. *Platanus racemosa* is the dominant tree at high to moderate cover. *Quercus agrifolia* is present at moderate to low cover. Other trees, including *Quercus agrifolia*, *Salix laevigata*, and *Populus fremontii* may be present at moderate to very low cover. This alliance favors riparian areas on fairly flat perennial stream floodplains. This type is found only on the east side of the park. This alliance is mapped within the park, buffer, and expanded study area. The alliance also represents the hierarchical class into which all *Platanus racemosa* types are nested.

Photo Signature:
Platanus racemosa appears on the imagery as a dull to bright green color with an irregularly shaped open crown, usually taller than the other trees in the canopy.

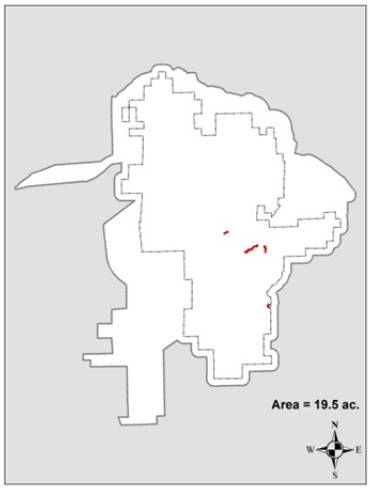
Types with Similar Signature:
Southwestern North American Riparian Evergreen And Deciduous Forest Group – 1300
Quercus agrifolia Woodland Alliance – 2110

1311 – California Sycamore-Coast Live Oak Woodland Association

Platanus racemosa-Quercus agrifolia Woodland Association



Aerial Photo Mapped Unit



Distribution

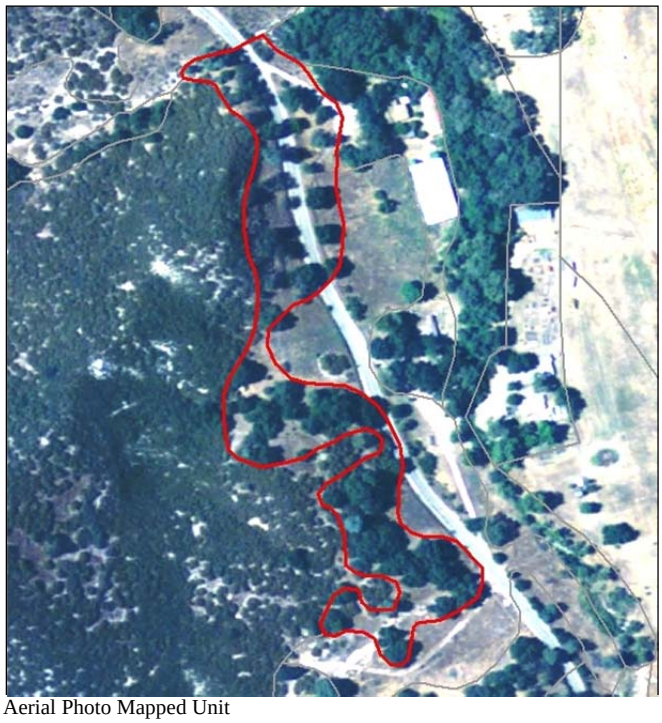
Description:
The *Platanus racemosa-Quercus agrifolia* Woodland Association is mapped as dense to open stands of trees. *Platanus racemosa* and *Quercus agrifolia* co-dominate, each at high to moderate cover. *Populus fremontii* and *Salix laevigata* may be present at low to very low cover. *Toxicodendron diversilobum* may be present in the understory at moderate to very low cover, and is usually hidden from view under the tree canopy. This association favors riparian areas on fairly level and flat perennial stream floodplains. It is only found on the east side of the park. This type is mapped within the park and buffer. In the expanded study area it is mapped as *Platanus racemosa* Temporarily Flooded Woodland Alliance (1310).

Photo Signature:
Platanus racemosa appears on the imagery as a dull to bright green color with an irregularly shaped open crown, usually taller than the other trees in the canopy. *Quercus agrifolia* is dark green in color with a coarse texture, and a rounded billowy crown.

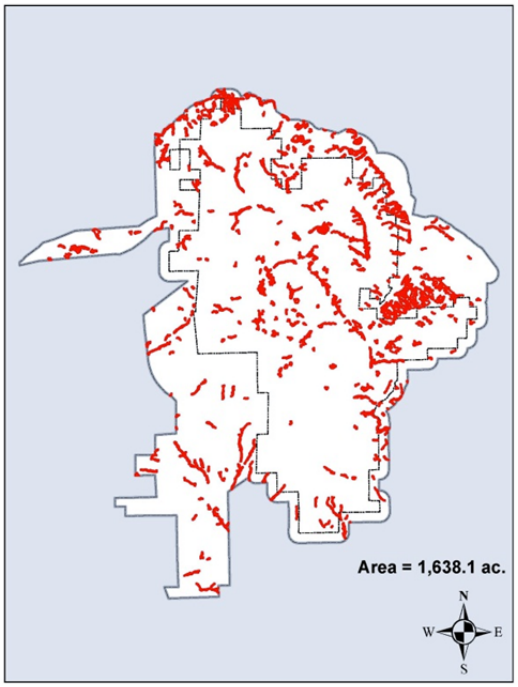
Types with Similar Signature:
Southwestern North American Riparian Evergreen And Deciduous Forest Group – 1300
Quercus agrifolia Woodland Alliance – 2110

2110 – Coast Live Oak Woodland Alliance

Quercus agrifolia Woodland Alliance
Quercus agrifolia-Aesculus californica Woodland Association
Quercus agrifolia/*Toxicodendron diversilobum* Intermittently Flooded Woodland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Quercus agrifolia* Woodland Alliance is mapped as dense to sparse stands of trees over open to sparse chaparral, short shrubs, grasses and herbs. *Quercus agrifolia* dominates at high to low cover. *Pinus sabiniana*, *Quercus douglasii*, *Quercus wislizenii*, and *Aesculus californica* may be present at moderate to very low cover. *Quercus lobata* may be present at low to very low cover. *Toxicodendron diversilobum* may be present at moderate to very low cover. In riparian areas riparian or mesic shrubs, including *Salix lasiolepis*, *Baccharis salicifolia*, *Baccharis pilularis*, and *Rosa californica* may be present, each at low to very low cover. This alliance favors dry to mesic ravines, canyon bottoms, and floodplains, and lower slopes adjacent to floodplains. It may also be found on northerly, moderately steep, concave to neutral, lower to upper slopes. It also favors sites at the base of pinnacles, cliffs and large rock outcrops. This alliance is mapped within the park, buffer, and expanded study area. The alliance also represents the hierarchical class into which all *Quercus agrifolia* types are nested. Note that although *Quercus wislizenii* stands were not mapped, small stands may occur within the study area mapped as this alliance. *Q. wislizenii* is known to occur in the Balconies area and on the north face of Mt. Defiance.

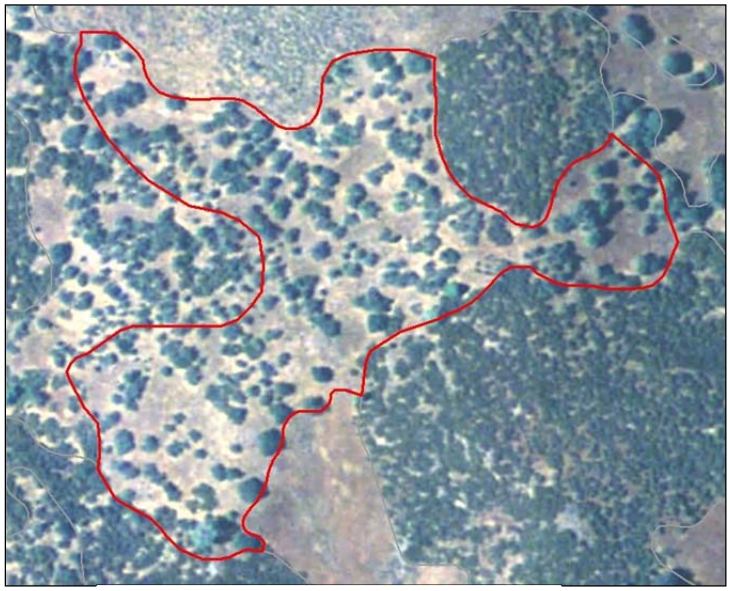
Photo Signature:
Quercus agrifolia is dark green in color with a coarsely textured, large, rounded, billowy crown. The grass-herb understory is brown to tan in color with a smooth texture. *Pinus sabiniana*

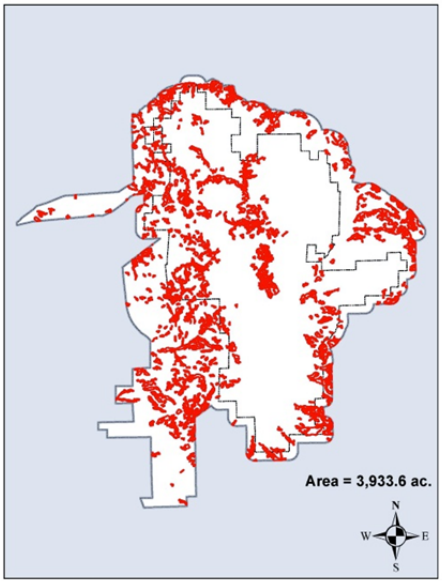
appears on the imagery as rounded to irregularly crowned trees emergent over other shorter trees, chaparral, and grass. It has a light blue-green to blue-gray color with a soft to wispy texture. *Quercus douglasii* has a large, rounded crown that is dull blue to blue-green color. *Aesculus californica* appears as large, round-crowned individuals with a soft texture. The signature on the supplemental natural color imagery can appear as bright green, medium green, yellow-green, or yellow-tan to light tan, depending on its stage of senescence. *Quercus wislizenii* is medium to dark green in color with a coarsely textured, large, rounded, billowy crown. The signature is similar to that of *Quercus agrifolia*, which has a darker green color and taller, larger stature. *Quercus agrifolia* prefers deeper soils than *Quercus wislizenii*.

Types with Similar Signature:
Pinus sabiniana Woodland Alliance – 1210
Southwestern North American Riparian Evergreen And Deciduous Forest Ggroup – 1300
Platanus racemosa Temporarily Flooded Woodland Alliance – 1310
Platanus racemosa-Quercus agrifolia Woodland Association – 1311
Quercus douglasii Woodland Alliance – 2210
Quercus lobata Woodland Alliance – 2230
Quercus berberidifolia Shrubland Alliance – 3160

2210 – Blue Oak Woodland Alliance

Quercus douglasii Woodland Alliance





Aerial Photo Mapped Unit

Distribution

Description:

The *Quercus douglasii* Woodland Alliance is mapped as a dense to sparse stand of trees over chaparral, coastal sage scrub, and/or grasses and herbs. *Quercus douglasii* is the dominant tree at high to low cover. *Pinus sabiniana*, *Aesculus californica*, and *Juniperus californica* may be present, or may co-dominate, at moderate to very low cover. *Quercus agrifolia* can be present at low to very low cover. Chaparral shrubs may include *Cercocarpus montanus*, *Ceanothus cuneatus*, *Adenostoma fasciculatum*, *Prunus ilicifolia*, and/or *Rhamnus ilicifolia*. The amount and proportions of shrubs and grasses may vary throughout the stand.In some situations

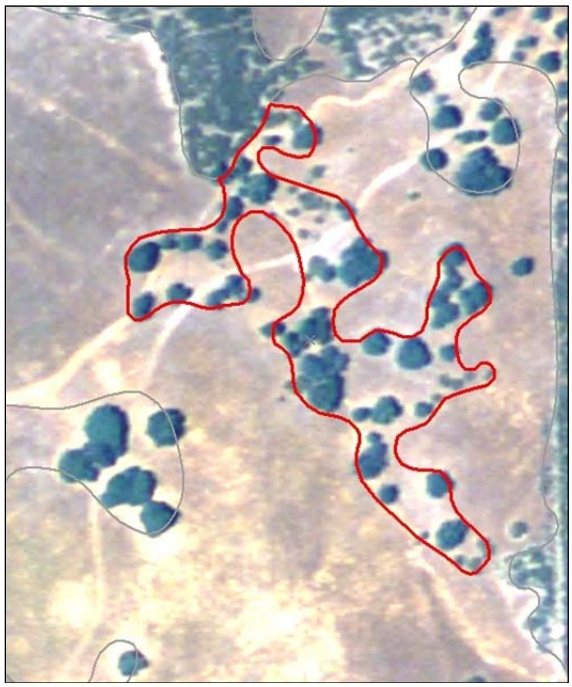
Artemisia californica and/or *Eriogonum fasciculatum* may dominate the understory at high to low cover, with *Salvia mellifera* sometimes present at moderate to very low cover. This alliance favors northerly, gentle to moderately steep, lower to upper slopes. This alliance is mapped within the park, buffer, and expanded study area. The alliance also represents the hierarchical class into which all *Quercus douglasii* types are nested.

Photo Signature:
Quercus douglasii has a large, rounded crown that is dull green to blue-green in color. *Pinus sabiniana* appears on the imagery as tall, rounded to irregularly crowned trees, emergent over other shorter trees, chaparral, and grass. It has a light blue-green to blue-gray color with a soft to wispy texture. *Quercus agrifolia* is dark green in color with a coarsely textured, large, rounded, billowy crown. *Aesculus californica* appears as large, round-crowned individuals, with a soft texture. The signature on the natural color imagery can appear bright green, medium green, yellow-green, or yellow-tan to light tan, depending on its stage of senescence. *Juniperus californica* appears as dull medium green color with a rounded crown. Its signature is very similar to *Quercus douglasii*, which has a blue cast to its color. However, *Juniperus californica* will have a green to yellow-green cast to it. The chaparral is shorter with a rounded to irregular crown. Some shrubs appear as individuals, others as clusters with no distinctive crown. *Artemisia californica* is gray in color, occurring as patches or individuals, with a smooth texture. *Eriogonum fasciculatum* is gray, tan, or reddish brown in color, occurs as small rounded individuals. *Salvia mellifera* can be green, gray, or tan in color, occurring in patches or as individuals, with a smooth texture. Grasses and herbs have a brown to tan color with a smooth texture.

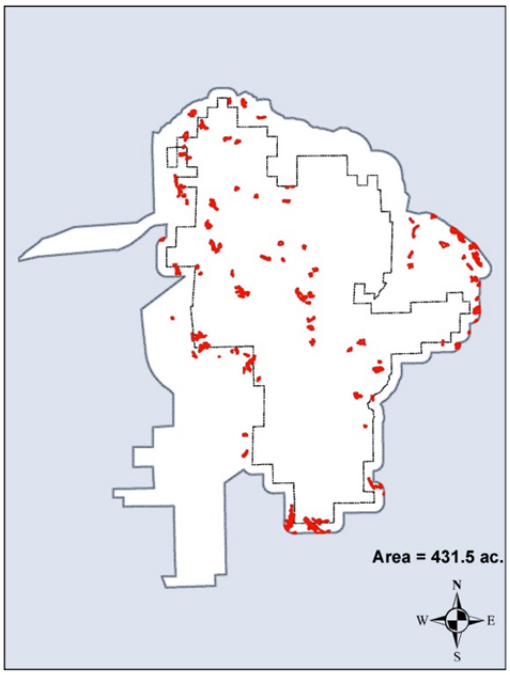
Types with Similar Signature:
Pinus sabiniana Woodland Alliance – 1210
Juniperus californica Woodland Alliance – 1220
Quercus agrifolia Woodland Alliance – 2110
Quercus douglasii/Mixed Herbaceous Woodland Association – 2212
Aesculus californica Woodand Alliance – 2220

2212 – Blue Oak/Mixed Herbaceous Woodland Association

Quercus douglasii/Mixed Herbaceous Woodland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Quercus douglasii*/Mixed Herbaceous Woodland Association is mapped as an open to sparse stand of trees over grasses and herbs. *Quercus douglasii* is the dominant tree at high to low cover. *Pinus sabiniana* and/or *Juniperus californica* may be present at very low cover. Shrubs may also be present at low to very low cover, but are mainly inclusional or in isolated patches. This mapping unit favors northerly, gentle to moderately steep, lower to upper slopes. This type is mapped within the park and buffer. Within the expanded study area it is mapped as *Quercus douglasii* Woodland Alliance (2210).

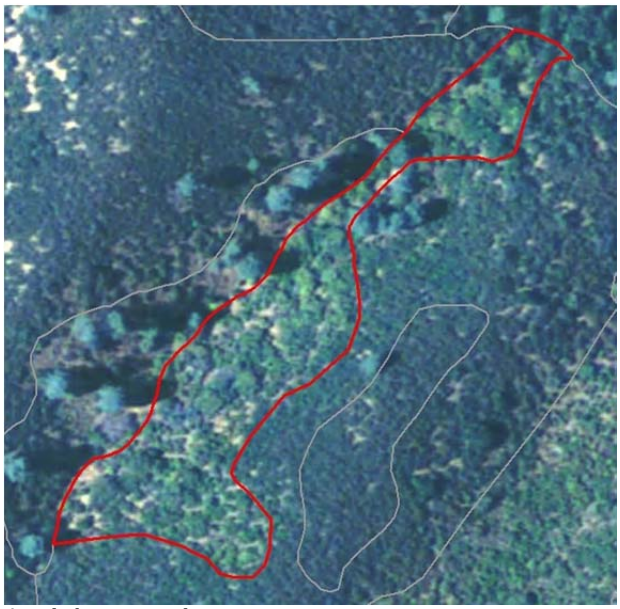
Photo Signature:
Quercus douglasii has a large, rounded crown that is dull green to blue-green in color. *Pinus sabiniana* appears on the imagery as tall, rounded to irregularly crowned trees emergent over other shorter trees, chaparral, and grass. It has a light blue-green to blue-gray color with a soft to wispy texture. Grasses and herbs surround the trees, and have a brown to tan color with a smooth texture.

Types with Similar Signature:
Pinus sabiniana Woodland Alliance – 1210
Quercus douglasii Woodland Alliance – 2210

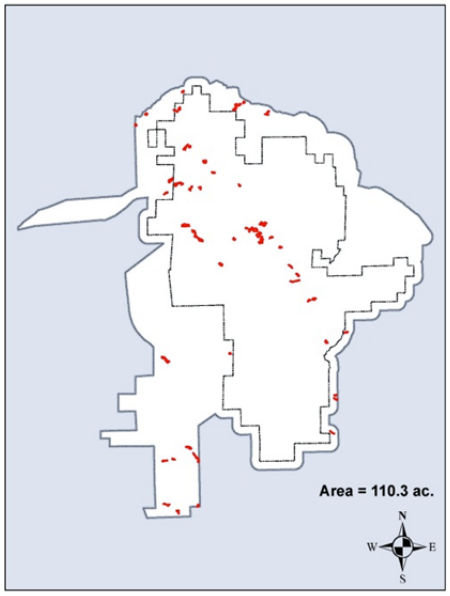
2220 – California Buckeye Woodland Alliance

Aesculus californica Woodland Alliance

Aesculus californica/*Toxicodendron diversilobum*/Moss Woodland Association



Aerial Photo Mapped Unit



Distribution

Description:

The *Aesculus californica* Woodland Alliance is mapped as a dense to intermittent stand of trees over open to sparse shrubs. *Aesculus californica* is the dominant tree at high to moderate cover. *Quercus douglasii* and *Quercus agrifolia* may be present at low to very low cover. *Pinus sabiniana* may be present at low to very low cover. This alliance favors northerly, protected, gentle to moderately steep, lower to mid slopes. This type is mapped within the park, buffer, and expanded study area.

Photo Signature:

Aesculus californica appears as large, round-crowned individuals with a soft texture. The signature on the supplemental natural color imagery appears bright green, medium green, yellow-green, or yellow-tan to light tan, depending on its stage of senescence. *Quercus douglasii* has a large, rounded crown that is dull green to blue-green in color. *Quercus agrifolia* is dark green in color with a coarsely textured, large, rounded billowy crown. *Pinus sabiniana* appears on the imagery as tall, rounded to irregularly crowned trees emergent over other shorter trees, chaparral, and grass. It has a light blue-green to blue-gray color with a soft to wispy texture. The chaparral is shorter with a rounded to irregular crown. Some shrubs appear as individuals, others as clusters with no distinctive crown.

Types with Similar Signature:

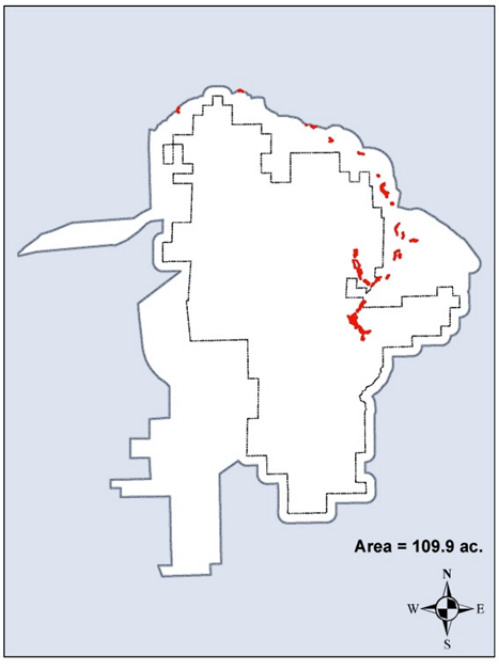
Quercus agrifolia Woodland Alliance – 2110
Quercus douglasii Woodland Alliance – 2210

2230 – Valley Oak Woodland Alliance

Quercus lobata Woodland Alliance



Aerial Photo Mapped Unit



Distribution

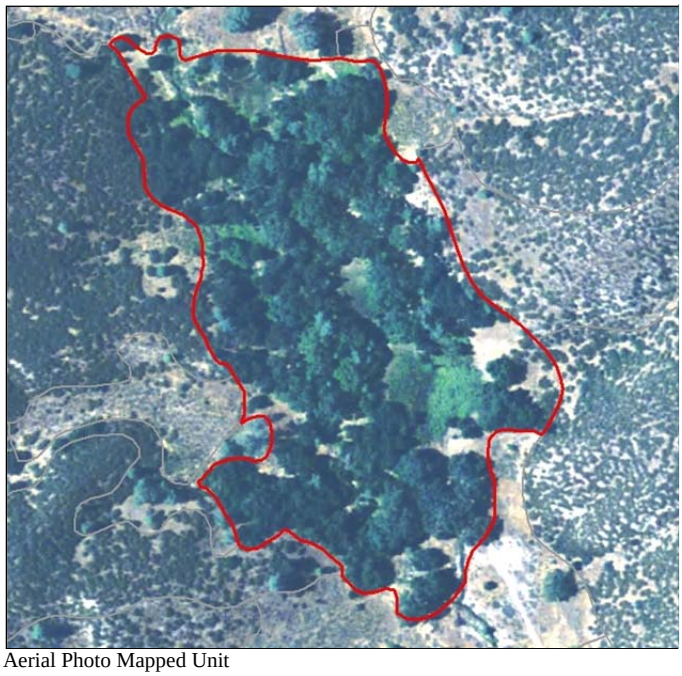
Description:
The *Quercus lobata* Woodland Alliance is mapped as dense to sparse stands of trees over grasses and herbs. *Quercus lobata* dominates at moderate to low cover. *Quercus agrifolia* may be present or co-dominate at moderate to very low cover. Dense to open grasses and herbs form the understory. This association favors flat, level floodplain terraces and valley bottoms. This class is mapped in the expanded study area only. The *Quercus lobata* Woodland Alliance is mapped within the park, buffer, and expanded study area. The alliance also represents the hierarchical class into which all *Quercus lobata* types are nested.

Photo Signature:
Quercus lobata is dull green to dark green with a large, rounded crown containing many small openings. The signature may be similar to very large *Quercus douglasii*, which may have a blue cast to it. *Quercus agrifolia* is dark green in color with a coarsely textured, large, rounded, billowy crown. Dry or moist grasses and herbs surround the trees. Dry grasses and herbs have a brown, tan, or green color with a smooth texture. Moist grasses and herbs have a green color, with a smooth texture, indicating moist situations.

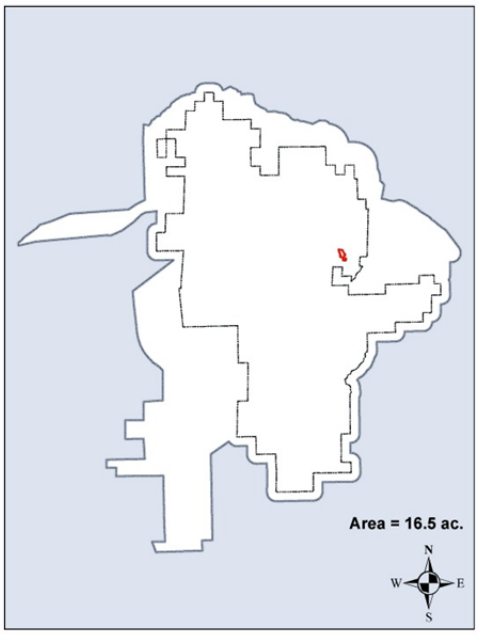
Types with Similar Signature:
Quercus agrifolia Woodland Alliance – 2110
Quercus douglasii Woodland Alliance – 2210
Quercus douglasii/Mixed Herbaceous Woodland Association – 2212
Quercus lobata-*Quercus agrifolia*/Grass Woodland Association – 2231

2231 – Valley Oak-Coast Live Oak/Annual Grass Woodland Association

Quercus lobata-Quercus agrifolia / Grass Woodland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Quercus lobata-Quercus agrifolia*/Mesic Grass-Herb Woodland Mapping Unit is mapped as dense to sparse stands of trees over wet grass and herbs. *Quercus lobata* and *Quercus agrifolia* may co-dominate at moderate to very low cover. Dense to open wet grasses and herbs form the understory. This association favors wet sites on flat floodplain terraces and valley bottoms where seeps occur. This type is mapped within the park and buffer. Within the extended study area it is mapped as *Quercus lobata* Woodland Alliance (2230).

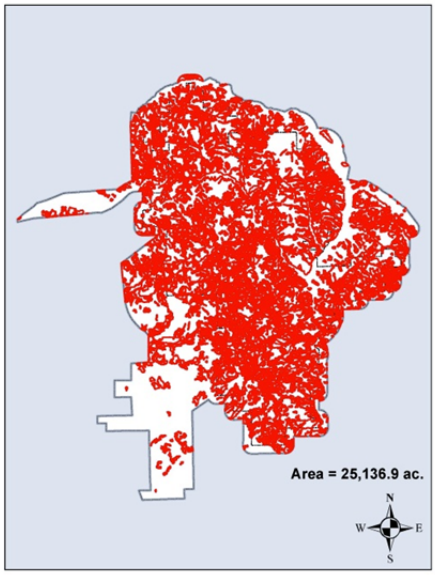
Photo Signature:
Quercus lobata is dull green to dark green with a large rounded crown containing many small openings. The signature may be similar to very large *Quercus douglasii*, which may have a blue cast to it. *Quercus agrifolia* is dark green in color with a coarsely textured, large, rounded, billowy crown. Grasses and herbs surrounding the trees have a green color, indicating moist grasses with a smooth texture.

Types with Similar Signature:
Quercus agrifolia Woodland Alliance – 2110
Quercus douglasii Woodland Alliance – 2210
Quercus douglasii/Mixed Herbaceous Woodland Association – 2212
Quercus lobata Woodland Alliance – 2230

3100 – Californian Chaparral Shrubland Macrogroup

Adenostoma fasciculatum Shrubland Alliance
Adenostoma fasciculatum Shrubland Association
Adenostoma fasciculatum-Arctostaphylos glauca Shrubland Association
Adenostoma fasciculatum-Arctostaphylos pungens Shrubland Association
Adenostoma fasciculatum-Ceanothus cuneatus Shrubland Association
Adenostoma fasciculatum-Salvia mellifera Shrubland Association
Adenostoma fasciculatum/Selaginella bigelovii Shrubland Association
Arctostaphylos glauca Shrubland Alliance
Arctostaphylos glauca Shrubland Association
Ceanothus cuneatus Shrubland Alliance
Ceanothus cuneatus var. *cuneatus* Shrubland Association
Cercocarpus montanus var. *glaber* Shrubland Alliance
Cercocarpus montanus var. *glaber* Shrubland Association
Prunus ilicifolia Shrubland Alliance
Prunus ilicifolia-Ceanothus cuneatus Shrubland Association
Prunus ilicifolia-Fraxinus dipetala Shrubland Association
Prunus ilicifolia-Heteromeles arbutifolia Shrubland Association
Rhamnus ilicifolia-Clematis lasiantha Shrubland Association
Quercus berberidifolia Shrubland Alliance
Quercus berberidifolia Shrubland Association
Quercus berberidifolia-Cercocarpus montanus var. *glaber* Shrubland Association


Aerial Photo Mapped Unit



Distribution

Description:
The Californian Chaparral Shrubland Macrogroup is mapped as dense to sparse stands of dominant undifferentiated chaparral shrubs. In the expanded study area no attempt is made to differentiate between xeric and mesic chaparral types other than *Prunus ilicifolia* Shrubland

Alliance (3150) and *Quercus berberidifolia* Shrubland Alliance (code 3160). Xeric chaparral shrubs present may include *Adenostoma fasciculatum, Ceanothus cuneatus, Arctostaphylos glauca,* and *Arctostaphylos pungens.* Mesic chaparral shrubs may include *Prunus ilicifolia, Rhamnus ilicifolia, Clematus lasiantha, Quercus berberidifolia,* and *Cercocarpus montanus* var. *glaber*. Coastal sage scrub shrubs, including *Salvia mellifera* or *Eriogonum fasciculatum* may also be present at moderate to very low cover. *Selaginella bigelovii* may be present at moderate to very low cover. In the extended study area this mapping unit includes xeric as well as mesic sites on all aspects, slope positions, slope steepness, and slope shapes.

Within the park and buffer Californian Xeric Chaparral Shrubland Group (3101), Prunus ilicifolia Shrubland Alliance, and Quercus berberidifoia Shrubland Alliance were mapped separately from Californian Chaparral Shrubland Macrogroup (3100). Most areas of this type are mapped mainly on northerly, gentle to moderately steep, lower to mid slopes, with concave to neutral shapes, or on canyon bottoms and some sparsely vegetated floodplains. In many areas within the park and buffer *Ceanothus cuneatus* dominates or co-dominates with *Adenostoma fasciculatum.* Mesic shrubs areas include *Prunus ilicifolia, Cercocarpus montanus* var. *glaber, Ceanothus cuneatus, Rhamnus ilicifolia, Quercus berberidifolia, Heteromeles arbutifolia, Clematis lasiantha, Dendromecon rigida,* and *Fraxinus dipetala. Quercus douglasii* and *Pinus sabiniana* may be emergent at very low cover. In some instances *Quercus agrifolia, Quercus wislizenii,* or *Juniperus californica* may also be present at very low cover.

Photo Signature:
The signatures of the xeric chaparral shrub species are very difficult to distinguish from each other on the imagery. Species interpretation using environmental characteristics is sometimes employed**;** however, in this case, the shrubs are not consistent with the environmental characteristics and cannot be discerned by this method. The xeric shrubs range from dark green to tan or dark gray on the imagery. They have a coarse to smooth texture, and occur as dense groups or open patches. Individual crowns are usually not distinguishable. The shrubs will usually appear as a burgundy color on the supplemental CIR imagery, but sometimes will also appear as individual bright red dots within the burgundy. The signatures of the individual mesic shrubs are also very difficult to distinguish from each other on the imagery. *Prunus ilicifolia* will appear as bright green with a coarse texture. On the supplemental CIR imagery it will appear as a bright red color. The other mesic shrubs range from medium green to dull green to dark green. On the supplemental CIR imagery they will show as bright red to burgundy, or a mix of red shades, but not a consistent dark burgundy. The texture will tend to be coarse.

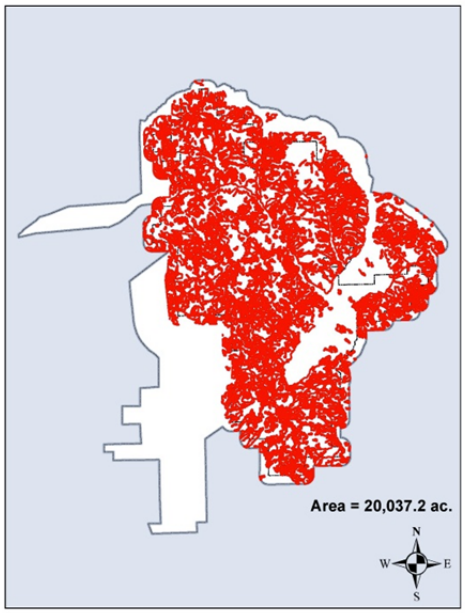
Types with Similar Signature:
Californian Xeric Chaparral Shrubland Group – 3101
Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit – 3103
Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit – 3104
California Coastal Scrub Shrubland Macrogroup – 3300

3101 – Californian Xeric Chaparral Shrubland Group

Adenostoma fasciculatum Shrubland Alliance
Adenostoma fasciculatum Shrubland Association
Adenostoma fasciculatum-Arctostaphylos glauca Shrubland Association
Adenostoma fasciculatum-Arctostaphylos pungens Shrubland Association
Adenostoma fasciculatum-Ceanothus cuneatus Shrubland Association
Adenostoma fasciculatum-Salvia mellifera Shrubland Association
Adenostoma fasciculatum/Selaginella bigelovii Shrubland Association
Arctostaphylos glauca Shrubland Alliance
Arctostaphylos glauca Shrubland Association
Ceanothus cuneatus Shrubland Alliance
Ceanothus cuneatus var. *cuneatus* Shrubland Association



Aerial Photo Mapped Unit



Distribution

Description:

The Californian Xeric Chaparral Shrubland Group is mapped as a dense to sparse stand of xeric chaparral shrubs. *Adenostoma fasciculatum* is typically strongly dominant or dominant at low to high cover. *Ceanothus cuneatus* may dominate in some lower slope or gently sloping areas, and in some areas may co-dominate with *Adenostoma fasciculatum*. Generally *Ceanothus cuneatus* has a high to very low cover. *Arctostaphylos glauca* and *A. pungens* occur in some areas as scattered plants, but can occur in some patches as the dominant shrub, or co-dominant with *Adenostoma fasciculatum*. *Arctostaphylos* spp. may have high to very low cover. *Salvia mellifera*, *Eriogonum fasciculatum*, *Lotus scoparius*, and *Selaginella bigelovii* may be present at very low to moderate cover, typically on southerly slopes. *Eriogonum fasciculatum* and *Selaginella bigelovii* will occur on rockier sites. This mapping unit favors dry sites on all aspects, slope positions, slope steepness, and slope shapes. This type is mapped within the park

and buffer. Within the expanded study area it is included in the Californian Chaparral Shrubland Macrogroup (3100).

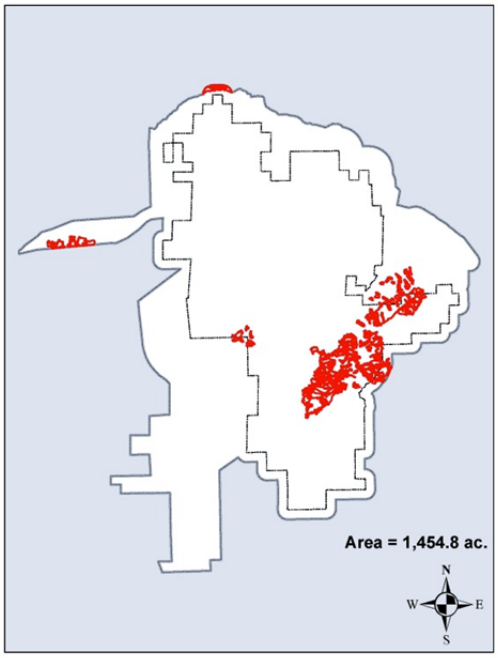
Photo Signature:
The signatures of the individual xeric chaparral shrubs are very difficult to distinguish from each other on the imagery. Species interpretation using environmental characteristics is sometimes employed**;** however, in this case, the shrubs are not consistent with the environmental characteristics and cannot be discerned by this method. The xeric shrubs range from dark green to tan or dark gray on the imagery. They have a coarse to smooth texture and occur as dense groups or open patches. Individual crowns are usually not distinguishable unless the shrub canopy is open. They will usually appear as a burgundy color on the supplemental CIR imagery, but sometimes are mottled, with individual red dots within the burgundy, which may be *Prunus ilicifolia, Heteromeles arbutifolia, Ceanothus cuneatus,* or *Arctostaphylos pungens*.

Types with Similar Signature:
Californian Chaparral Shrubland Macrogroup – 3100
Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit – 3103
Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit – 3104
Salvia mellifera Shrubland Alliance – 3360

3103 – Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit



Aerial Photo Mapped Unit



Distribution

Description:

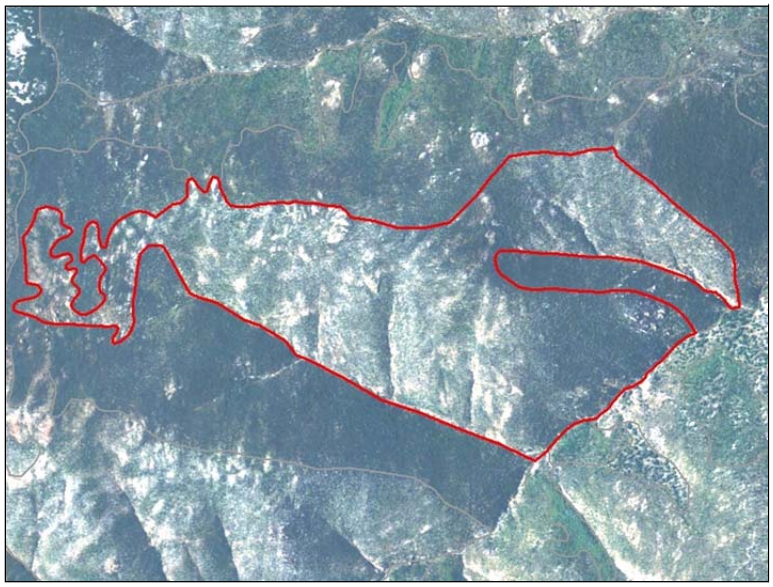
The Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit is mapped as an intermittent to sparse stand of chaparral shrubs occurring in a mesic to semi-mesic environment, usually on northerly, concave to neutral, lower to mid slooes. The shrubs are regenerating or recovering from a burn or disturbance that had occurred within the last ten years. Most shrubs are short and sparse, and are therefore difficult to identify by photo interpretation within the imagery limitations. Field visits were used in some cases to help in the identification of the shrubs present.

Ceanothus cuneatus typically is dominant at high to low cover. *Adenostoma fasciculatum* may also be present at very low cover. Mesic shrubs, including *Prunus ilicifolia*, *Heteromeles arbutifolia*, and *Clematis lasiantha* may be present, each at a very low cover. In many cases, the mesic shrubs grew back slower than the *Ceanothus cuneatus* or *Adenostoma fasciculatum*. Mesic shrubs would grow beneath the taller xeric shrubs. Fire and disturbance followers, including *Eriodictyon tomentosum*, *Lotus scoparius*, and *Dendromecon rigida* may be present at moderate to very low cover. These species may be more prevalent in stands with open to sparse cover. *Quercus agrifolia* may also be present. Emergent *Quercus douglasii* snags may be in the stand, but are not visible on the imagery. This mapping unit favors northerly, protected, concave to neutral shapes, lower to middle slopes and canyon bottoms. It can be found on gentle to moderately steep slopes. It also occurs below rock outcrops and pinnacles. This type is mapped within the park and buffer. Within the expanded study area it is mapped as the Californian Chaparral Shrubland Macrogroup (3100).

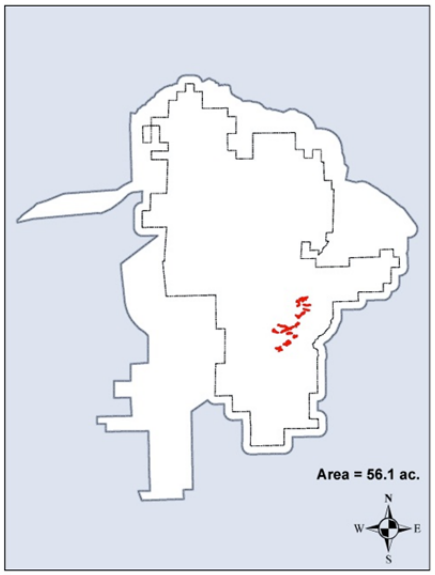
Photo Signature:
The burned area appears as shorter shrubs than the adjacent older stands. There is usually a burn line where the fire stopped, dividing the low stature regenerating stands from the taller older unburned stands. The texture of the shrubs in the burned areas is smooth. The signatures of the individual shrubs are very difficult to distinguish from each other on the imagery. *Ceanothus cuneatus* and *Adenostoma fasciculatum* will appear as dark green on the imagery. It will appear as a light pink on the supplemental CIR imagery. *Prunus ilicifolia* and *Heteromeles arbutifolia* will usually not be distinguishable on the imagery because they may be hidden under the taller xeric shrubs.

Types with Similar Signature:
Californian Chaparral Shrubland Macrogroup – 3100
Californian Xeric Chaparral Shrubland Group – 3101
Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit – 3104
Prunus ilicifolia Shrubland Alliance – 3150
Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Regeneration Mapping Unit – 9700

3104 – Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland Mapping Unit



Aerial Photo Mapped Unit



Distribution

Description:
The Post Burn and Post Disturbance Californian Xeric Shrubland Mapping Unit is mapped as a dense to sparse stand of short xeric chaparral shrubs that are regenerating or recovering from a burn or disturbance that had occurred within the last ten years. Most shrubs are short and sparse, and therefore are difficult to identify by photo interpretation within the imagery limitations. Field visits were used in some cases to help in the identification of the shrubs present. *Adenostoma fasciculatum* is typically strongly dominant or dominant at high to low cover. *Ceanothus cuneatus* may dominate in some lower slope or gently sloping areas, and in some areas may co-dominate with *Adenostoma fasciculatum*. Generally *Ceanothus cuneatus* has a high to very low cover. *Salvia mellifera, Eriogonum fasciculatum*, and *Selaginella bigelovii* may be present at moderate to very low cover. Fire and disturbance followers, include *Salvia mellifera*, *Eriogonum fasciculatum, Eriodictyon tomentosum*, *Lotus scoparius*, and *Dendromecon rigida,* at moderate to very low cover. *Malacothamnus arboriginum* is a rare plant within the park and was observed in the 1998 burn area near the mouth of Grassy Canyon. These species may be more prevalent in stands with sparse cover. This mapping unit favors dry sites on all aspects, slope positions, slope steepness, and slope shapes. This type is mapped within the expanded area, park and buffer.

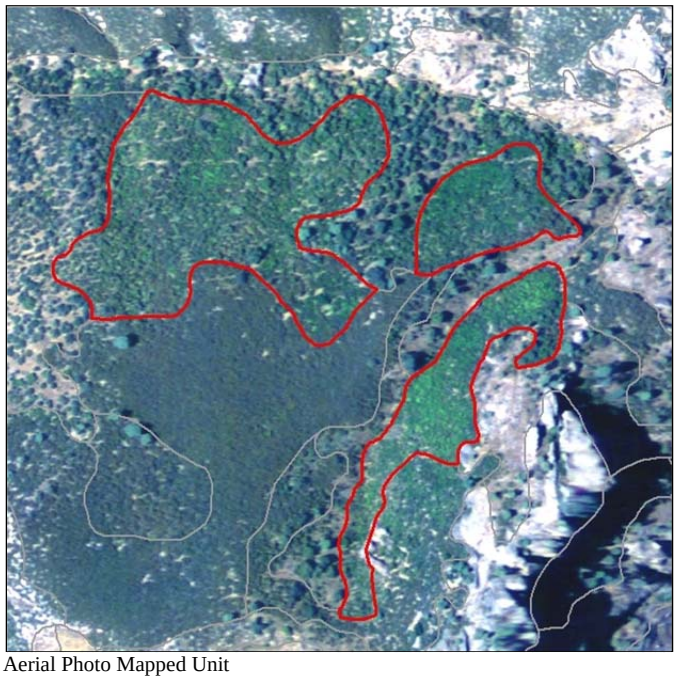
Photo Signature:
The burned area appears as shorter shrubs in comparison to the adjacent older stands. There is usually a burn line where the fire stopped, dividing the low stature regenerating stands from the taller older unburned stands. The texture of the unburned areas is coarse, while that of the burned areas are smoother. The signatures of the individual xeric chaparral shrubs are very difficult to distinguish from each other on the imagery. Species interpretation using

environmental characteristics is sometimes employed**;** however, in this case, the shrubs are not consistent with the environmental characteristics and cannot be discerned by this method. The xeric shrubs are dark green, tan or dark gray on the imagery. They have a coarse texture, and occur as dense groups or open patches. Individual crowns are usually not distinguishable. They will appear as a burgundy color on the supplemental CIR imagery. Regenerating *Adenostoma fasciculatum* and *Ceanothus cuneatus* are dark green in color and appear as very small individuals. *Eriodictyon tomentosum* appears as white to gray or bluish gray color with a soft fuzzy texture. *Eriogonum fasciculatum* can be reddish brown in color, but sometimes appears tan or gray. It usually occurs as small individuals, but can appear in clumps. *Salvia mellifera* will appear as medium green or gray to tan. *Lotus scoparius*, *Dendromecon rigida*, and *Malacothamnus arboriginum* are very difficult to identify on the imagery.

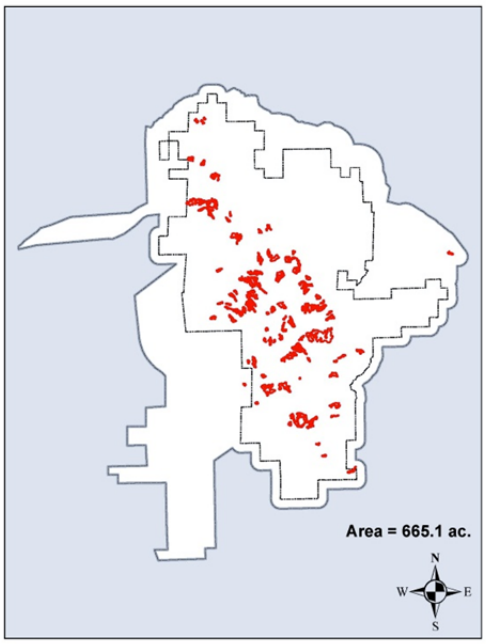
Types with Similar Signature:
Californian Chaparral Shrubland Macrogroup – 3100
Californian Xeric Chaparral Shrubland Mapping Unit – 3101
Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit – 3103
Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Regeneration Mapping Unit – 9700

3150 – Hollyleaf Cherry Shrubland Alliance

Prunus ilicifolia Shrubland Alliance
Prunus ilicifolia Shrubland Association
Prunus ilicifolia-Ceanothus cuneatus Shrubland Association
Prunus ilicifolia-Heteromeles arbutifolia Shrubland Association
Prunus ilicifolia-Fraxinus dipetala Shrubland Association



Aerial Photo Mapped Unit



Distribution

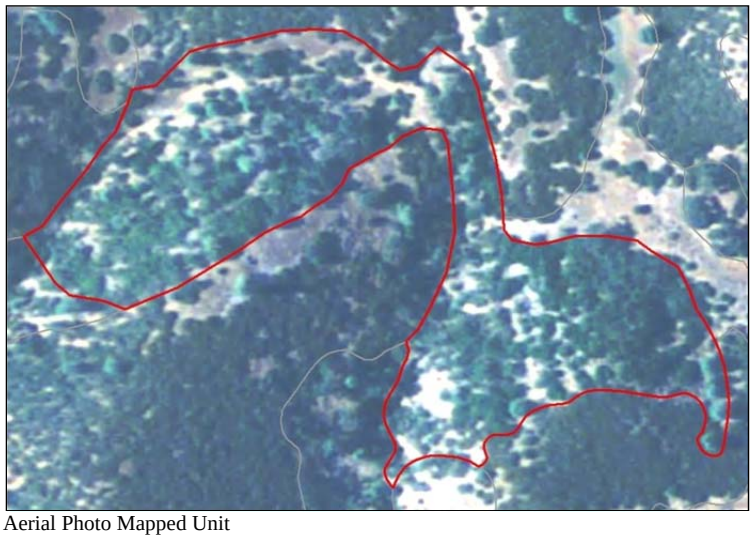
Description:
The *Prunus ilicifolia* Shrubland Alliance is mapped as dense to open stands of strongly dominant or dominant *Prunus ilicifolia* at high to low cover. Mesic shrubs, including *Prunus ilicifolia, Cercocarpus montanus* var. *glaber*, *Ceanothus cuneatus, Rhamnus ilicifolia, Quercus wislizenii, Heteromeles arbutifolia, Clematis lasiantha,* and *Fraxinus dipetala,* may be present, each at high to very low cover. *Prunus ilicifolia* may co-dominate with *Ceanothus cuneatus, Heteromeles arbutifolia* or *Fraxinus dipetala*. *Adenostoma fasciculatum* may be present at low to very low cover. This Alliance favors northerly, protected, concave to neutral shapes, lower to middle slopes and canyon bottoms. It can be found on gentle to steep slopes. It also occurs below rock outcrops and pinnacles. This type is mapped within the park and buffer. Within the expanded study area it is mapped as the Californian Chaparral Shrubland Mapping Unit (3100).

Photo Signature:
Prunus ilicifolia will appear as bright green with a coarse texture. On the supplemental CIR imagery it will appear as a bright red color. Since *Prunus ilicifolia* is the dominant shrub, its vivid signature overwhelms that of the other shrubs. The other mesic shrubs range from medium green to dull green to dark green. Therefore this type is mapped when the imagery is bright green and the supplemental CIR is bright red throughout the unit.

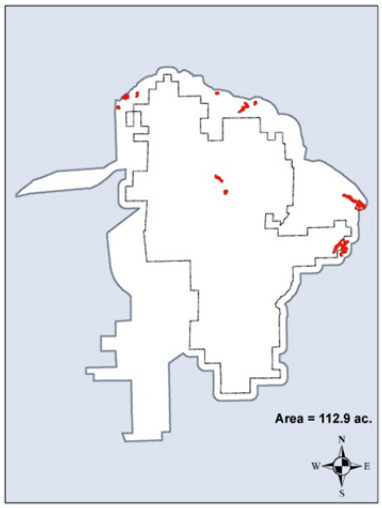
Types with Similar Signature:
Californian Chaparral Shrubland Macrogroup – 3100
Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit – 3103

3160 – California Scrub Oak Shrubland Alliance

Quercus berberidifolia Shrubland Alliance
Quercus berberidifolia Shrubland Association
Quercus berberidifolia-Cercocarpus montanus var. *glaber* Shrubland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Quercus berberidifolia Shrubland* Alliance is mapped as dense to open stands of tall shrubs. *Quercus berberidifolia* is the dominant plant at high to moderate cover. Other tall shrubs, including *Adenostoma fasciculatum*, *Cercocarpus montanus* var. *glaber*, *Prunus ilicifolia*, *Ceanothus cuneatus*, *Heteromeles arbutifolia*, and *Rhamnus ilicifolia* may be present at low to very low cover. *Pinus sabiniana* may also be present at moderate to low cover. This association favors northerly, moderately steep, lower to upper slopes. This class is mapped within the park buffer and expanded study area.

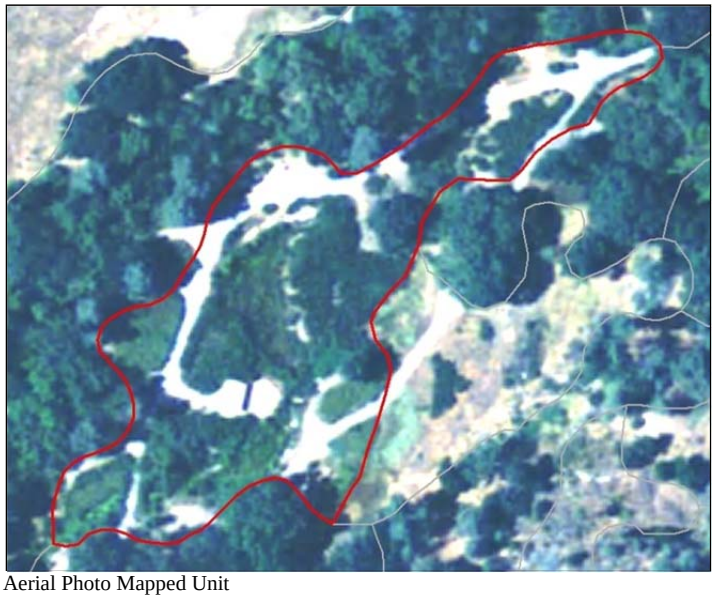
Photo Signature:
Quercus berberidifolia appears on the imagery as groups of large, round-crowned individuals with a medium to dark green color and a coarse texture. The supplemental CIR imagery shows it as bright red individuals.

Types with Similar Signature:
Quercus agrifolia Woodland Alliance – 2110
Quercus douglasii Woodland Alliance – 2210
Californian Chaparral Shrubland Macrogroup – 3100
Californian Xeric Chaparral Shrubland Group – 3101
Prunus ilicifolia Shrubland Alliance – 3150

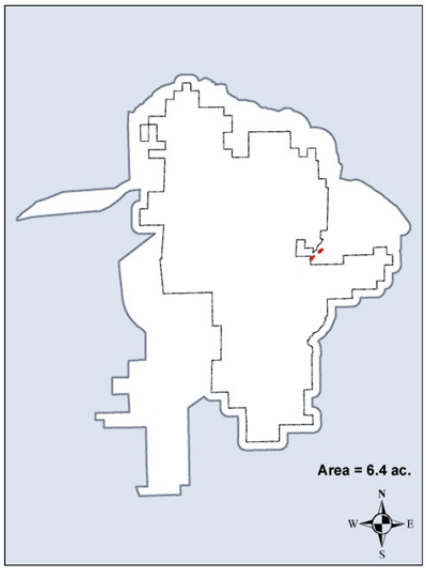
3210 – Coyote Brush Shrubland Alliance

Baccharis pilularis Shrubland Alliance

Baccharis pilularis/Annual Grass-Herb Shrubland Association



Aerial Photo Mapped Unit



Distribution

Description:

The *Baccharis pilularis* Shrubland Alliance is mapped as a dense to open stand of shrubs consisting of dominant *Baccharis pilularis* at moderate to high cover. Emergent trees, including *Quercus lobata* and *Quercus agrifolia*, occur at very low cover. This alliance is found on flat floodplain terraces. Survey points, including releve and reconnaissance sites, that identify known positions assisted in the extrapolation to other nearby possible locations. This type is mapped within the park and buffer. Within the expanded study area it is mapped as the California Coastal Scrub Shrubland Macrogroup (3300).

Photo Signature:

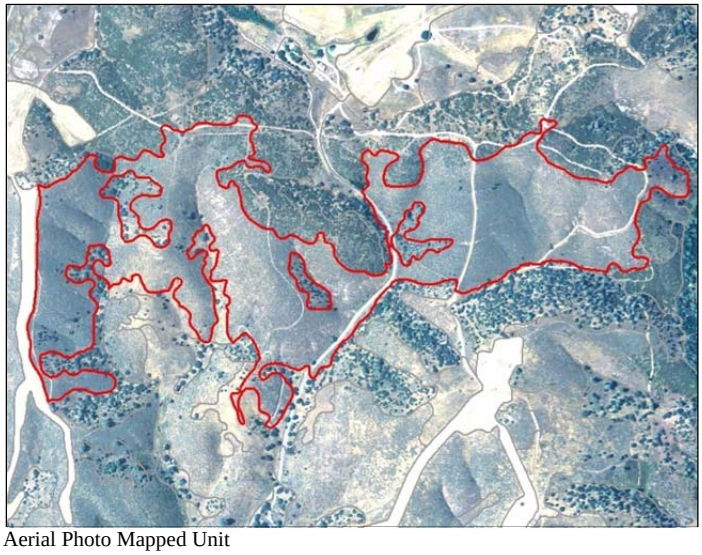
Baccharis pilularis is a tall shrub and appears as dark green clumps or patches with a slightly coarse texture.

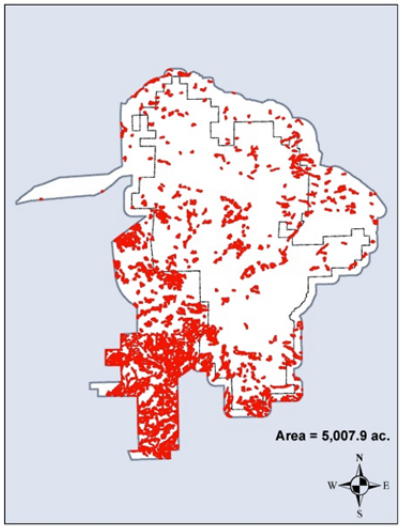
Types with Similar Signature:

Southwestern North American Riparian/Wash Scrub Shrubland Group – 3400
Rosa californica Shrubland Alliance – 3410
Alluvial Herb and Shrub Vegetation Mapping Unit – 4401

3300 – California Coastal Scrub Shrubland Macrogroup

Artemisia californica Shrubland Alliance
Artemisia californica Shrubland Association
Eriogonum fasciculatum Shrubland Alliance
Eriogonum fasciculatum Shrubland Association
Salvia mellifera Shrubland Alliance
Salvia mellifera Shrubland Association
Salvia mellifera-Eriogonum fasciculatum/Bromus rubens Shrubland Association
Artemisia califorica-Eriogonum fasciculatum Shrubland Alliance
Artemisia californica-Eriogonum fasciculatum/Annual Grass-Herb Shrubland Association
Lupinus albifrons Shrubland Alliance
Lupinus albifrons-Senecia flaccidus var. *douglasii* Shrubland Association
Diplacus aurantiacus Shrubland Alliance
Diplacus aruantiacus Shrubland Association


Aerial Photo Mapped Unit



Distribution

Description:
The California Coastal Scrub Shrubland Macrogroup is mapped as dense to sparse stands of coastal sage scrub shrubs at high to sparse cover. This class is mapped where it is difficult to photointerpret and/or differentiate the coastal sage scrub types. *Artemisia californica*, *Eriogonum fasciculatum*, and/or *Salvia mellifera* may be present as dominant or co-dominant with each other. *Eriogonum fasciculatum* tends to favor the driest locations, *Salvia mellifera* not as dry, and *Artemisia californica* the least dry locations of the three. *Adenostoma fasciculatum* may be present at low to very low cover. *Quercus douglasii* and *Pinus sabiniana* may also be present at very low cover. This class also includes other low shrubs including *Eriogonum fasciculatum*, *Lupinus albifrons*, *Lotus scoparius*, and *Eridictyon tomentosum*. This mapping unit is found on gentle to moderately steep, lower to upper slopes. It is also found in alluvial washes and fans, and floodplain terraces, where *Eriogonum faciculatum* and *Lupinus albifrons* may occur. Throughout most of the park, coastal sage scrub tends to occur on southerly aspects.

However, on the west side, mainly within the expanded study area, coastal sage scrub may be found on northerly as well as southerly aspects. This type is mapped within the park, buffer, and expanded study area.

Photo Signature:
The coastal sage scrub shrubs tend to overlap in signature, making it difficult to distinguish between them in many cases. *Artemisia californica* is usually gray in color with a fine texture. It can occur as small individuals or in clumps. *Eriogonum fasciculatum* can be reddish brown in color, but sometimes appears tan or gray. It usually occurs as small individuals, but can also appear as clumps. *Salvia mellifera* can be green in color, but sometimes appears tan or gray. It usually occurs as clumps with a smooth or coarse texture rather than as individuals. *Eriodictyon tomentosum* appears as white to gray or bluish gray in color with a soft texture. It is found as individuals or in patches. *Lupinus albifrons* is difficult to distinguish on the imagery, and occurs in similar situations as *Eriogonum fasciculatum*.

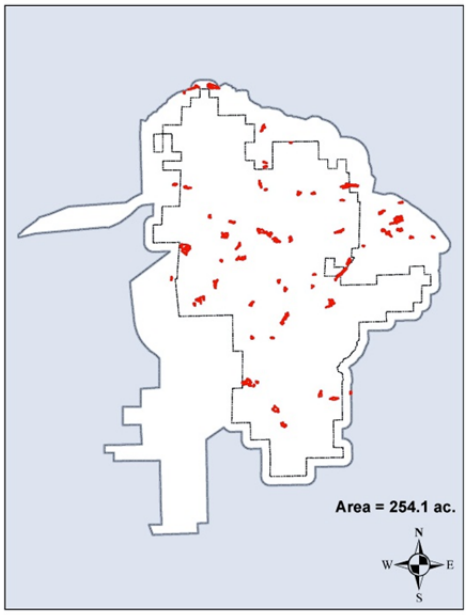
Types with Similar Signature:
Quercus douglasii Woodland Alliance – 2210
Californian Xeric Chaparral Shrubland Group – 3100
Eriogonum fasciculatum Shrubland Alliance – 3330
Salvia mellifera Shrubland Alliance – 3360
Artemisia californica-Eriogonum fasciculatum Shrubland Alliance – 3370
Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit – 9420

3330 – California Wild Buckwheat Shrubland Alliance

Eriogonum fasciculatum Shrubland Alliance
Eriogonum fasciculatum Shrubland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Eriogonum fasciculatum* Shrubland Alliance is mapped as open to sparse stands of dominant *Eriogonum fasciculatum* at high to low cover. This alliance favors dry sites on southerly steep slopes, or flat alluvial floodplains, alluvial terraces, fans, and gently sloping toe slopes. On sideslopes *Salvia mellifera, Lotus scoparius,* and *Artemisia californica* may be present, or co-dominant, at moderate to very low cover. On alluvial floodplain terraces *Eriodictyon tomentosum* may subdominate at moderate to very low cover; *Lupinus albifrons* may also be present at very low cove; and *Pinus sabiniana* may be emergent at very low cover. Riparian shrubs, including *Baccaris salicifolia*, *Salix lasiolepis*, and *Salix exigua* may occur in adjacent narrow stream channels as inclusions. On moderate to very steep rocky upper slopes *Eriogonum fasciculatum* may dominate at moderate to very low cover. Other short shrubs, including *Lotus scoparius, Eriodictyon tomentosum,* and *Lupinus albifrons* may be present at very low cover. In rockier areas *Selaginella bigelovii* may be present at very low to high cover. *Pinus sabiniana* may be emergent at very low cover. The alliance also represents the hierarchical class into which all *Eriogonum fasciculatum* types are nested. In areas where the signature does not allow for distinguishing the coastal sage scrub species, then the California Coastal Scrub Shrubland Group (3300) is used. This type is mapped within the park, buffer. In the expanded study area the California Coastal Scrub Shrubland Group (3300) is used.

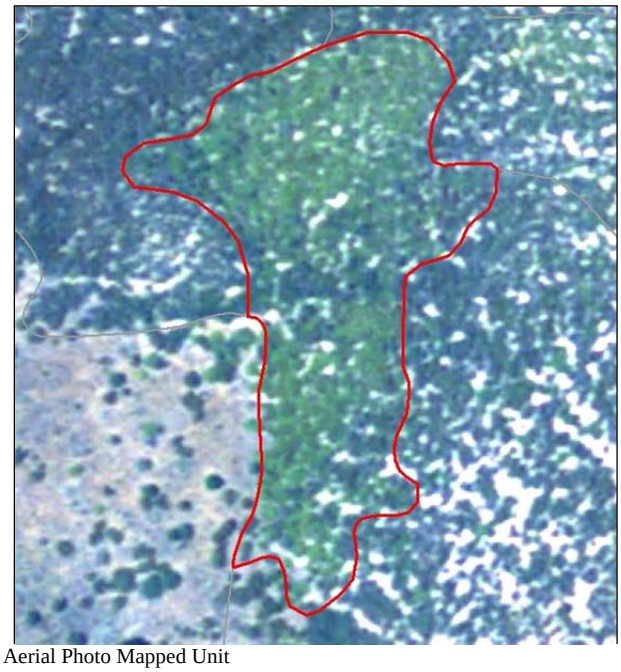
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Photo Signature:
Eriogonum fasciculatum can appear tan, gray, or reddish-brown on the imagery. It usually occurs as small individuals, but can also appear as clumps.

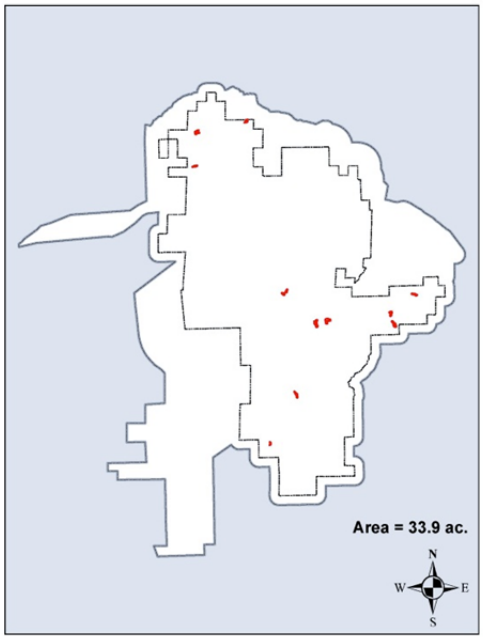
Types with Similar Signature:
Pinus sabiniana Woodland Alliance – 1210
Californian Xeric Chaparral Shrubland Group – 3101
California Coastal Scrub Shrubland Macrogroup – 3300
Salvia mellifera Shrubland Alliance – 3360
Artemisia californica-Eriogonum fasciculatum Shrubland Alliance – 3370
Southwestern North American Riparian/Wash Scrub Shrubland Group - 3400
Alluvial Herb and Shrub Vegetation Mapping Unit – 4004
Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit – 9420

3360 – Black Sage Alliance

Salvia mellifera Shrubland Alliance
Salvia mellifera Shrubland Association
Salvia mellifera-Eriogonum fasciculatum/Bromus rubens Shrubland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Salvia mellifera* Shrubland Alliance is mapped as dense to open stands of strongly dominant *Salvia mellifera* at high to low cover. *Adenostoma fasciculatum, Eriogonum fasciculatum,* or *Artemisia californica* may be present at very low cover. The association favors southerly, gentle to moderately steep, concave, convex, and neutral shapes on lower to upper slopes and ridgetops. Field reconnaissance and releve sites were used to identify known positions for this type and assisted in the extrapolation to other possible locations. In areas where the signature does not allow for distinguishing the coastal sage scrub species, then the California Coastal Scrub Shrubland Group (3300) is used. This type is mapped within the park, buffer. In the expanded study area the California Coastal Scrub Shrubland Group (3300) is used.

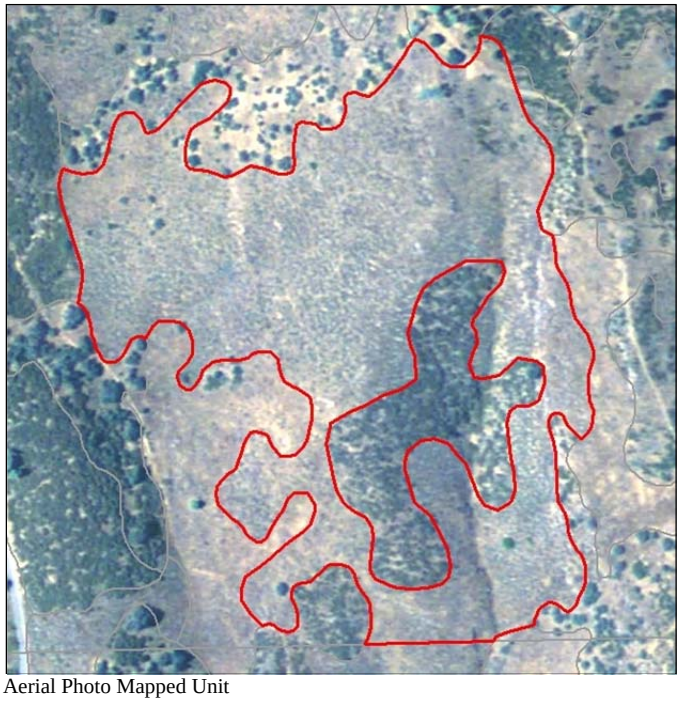
Photo Signature:
Salvia mellifera is a short shrub and can be green in color, but sometimes appears tan or gray. It usually occurs as clumps with a smooth or coarse texture rather than as individuals. The lighter color is an indication of its presence. The supplemental CIR will show it as a light red color.

Types with Similar Signature:
Californian Chaparral Shrubland Macrogroup – 3100
Californian Xeric Chaparral Shrubland Group – 3101
California Coastal Scrub Shrubland Macrogroup - 3300
Eriogonum fasciculatum Shrubland Alliance – 3330

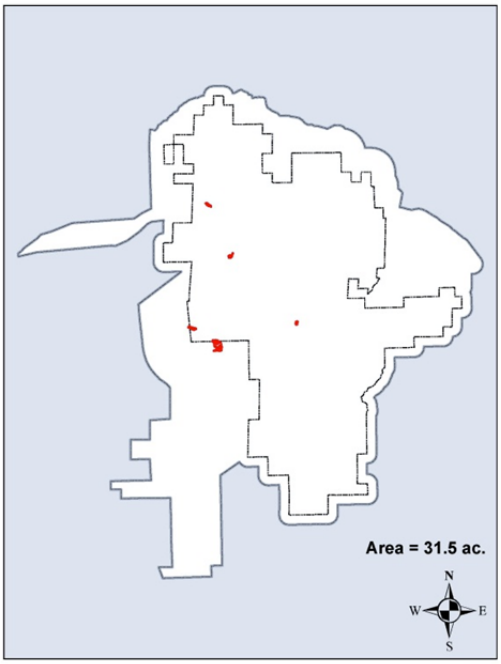
Artemisia californica-Eriogonum fasciculatum Shrubland Alliance – 3370

3370 – California Sagebrush-California Wild Buckwheat Shrubland Alliance

Artemisia californica-Eriogonum fasciculatum Shrubland Alliance
Artemisia californica-Eriogonum fasciculatum/Annual Grass-Herb Shrubland Association



Aerial Photo Mapped Unit



Distribution

Description:
The *Artemisia californica-Eriogonum fasciculatum* Shrubland Alliance is mapped as dense to sparse stands of low shrubs consisting of a co-dominance of *Artemisia californica* and *Eriogonum fasciculatum*, each at moderate to low cover. The alliance favors southerly, moderate to steep, neutral to convex lower to upper slopes. Field reconnaissance and releve sites were used to identify known positions for this type and assisted in the extrapolation to other possible locations. In areas where the signature does not allow for distinguishing the coastal sage scrub species, then the California Coastal Scrub Shrubland Group (3300) is used. This type is mapped within the park, buffer. In the expanded study area the California Coastal Scrub Shrubland Group (3300) is used.

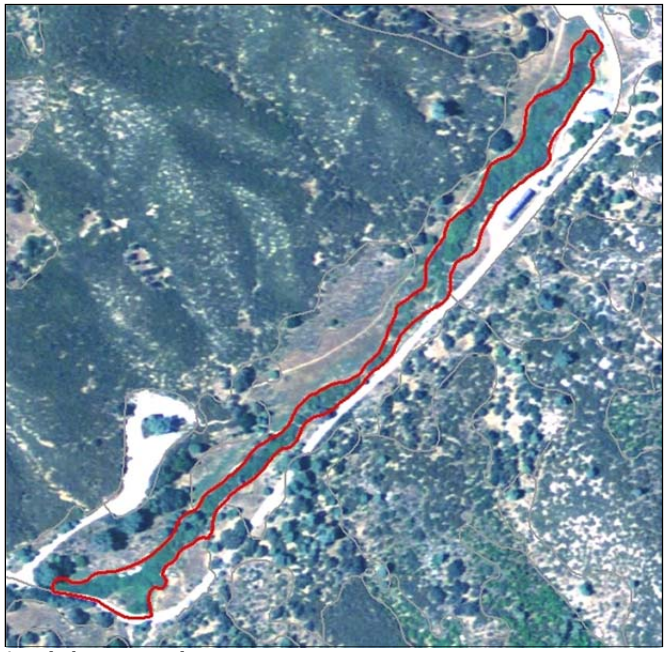
Photo Signature:
Artemisia californica is a short shrub with a gray color on the imagery and can appear as individuals or in patches. The texture may be smooth or coarse. *Eriogonum fasciculatum* will appear tan or gray, and sometimes reddish-brown. It is usually difficult to distinguish the two species when they intermix. Sometimes *Salvia mellifera* is in the area and appears tan or gray on the imagery. Its signature can be confused with that of *Artemisia californica* or *Eriogonum fasciculatum*.

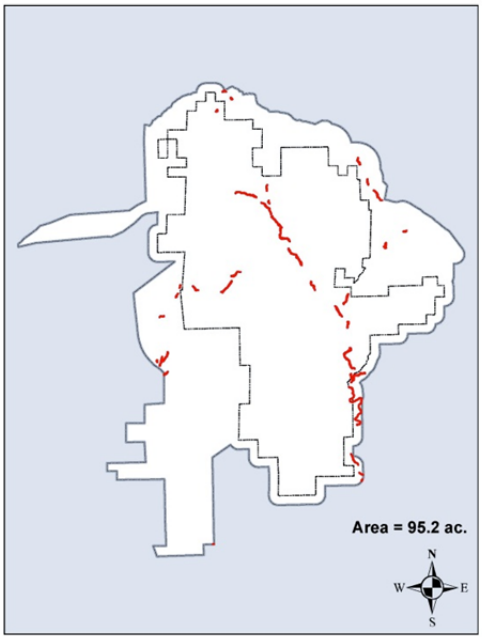
Types with Similar Signature:

California Coastal Scrub Shrubland Macrogroup - 3300
Eriogonum fasciculatum Shrubland Alliance – 3330
Salvia mellifera Shrubland Alliance – 3360

3400 – Southwestern North American Riparian/Wash Scrub Shrubland Group

Salix lasiolepis Temporarily Flooded Alliance
Salix lasiolepis/*Baccharis salicifolia* Shrubland Association
Salix lasiolepois/*Rosa californica* Shrubland Association
Salix (exigua, interior) Temporarily Flooded Shrubland Alliance
Salix exigua Temporarily Flooded Shrubland Association
Baccharis salicifolia Intermittently Flooded Shrubland Alliance
Baccharis salicifolia Riparian Shrubland Association


Aerial Photo Mapped Unit



Distribution

Description:
The Southwestern North American Riparian/Wash Scrub Shrubland Group is mapped as dense to open stands of short riparian trees and saplings and riparian shrubs. The short-statured trees may include *Salix laevigata*, *Salix lasiolepis*, *Populus fremontii*, and *Platanus racemosa* at high to very low cover. Shrubs include *Salix lasiolepis*, *Salix exigua*, and *Baccharis salicifolia* at high to very low cover. The mapping unit is found in or at the edge of the active channel, as well as in the active floodplain. This unit may braid around small isolated sand bars, alluvial terraces, and may contain inclusions of other riparian types. This class is mapped within the park, buffer, and expanded study area.

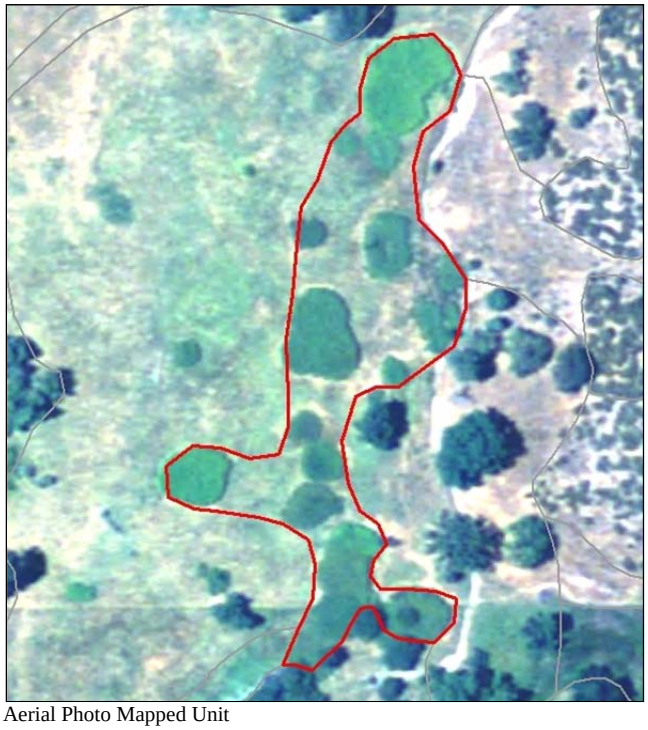
Photo Signature:
The signatures of the individual riparian short trees and shrubs are very difficult to distinguish from each other on the imagery. Species interpretation using environmental characteristics is sometimes employed**;** however, in this case, the shrubs are not consistent with the environmental characteristics and cannot be discerned by this method. Therefore the riparian low-growth trees

and shrubs have been mapped together as this mapping unit. The plants are bright green or dull green to gray-green on the imagery. They have a smooth texture and tend to occur as dense groups or open patches. Individual crowns are usually not distinguishable. They will appear as a bright red color on the supplemental CIR imagery. Many times they occur in a linear path along the stream channel or braids of the channel.

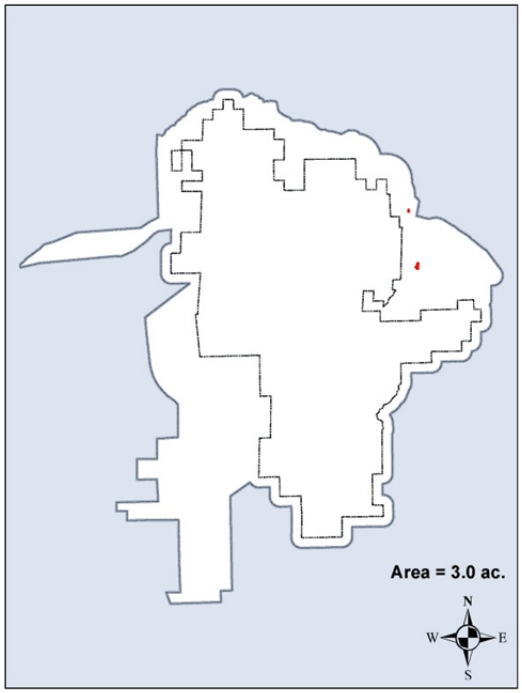
Types with Similar Signature:
Pinus sabiniana Woodland Alliance – 1210
Southwestern North American Riparian Evergreen And Deciduous Forest Group – 1300
Quercus agrifolia Woodland Alliance – 2110
Eriogonum fasciculatum Shrubland Alliance – 3330
Alluvial Herb and Shrub Vegetation Mapping Unit – 4004

3410 – California Wildrose Shrubland Alliance

Rosa californica Shrubland Alliance
Rosa californica Shrubland Association



Aerial Photo Mapped Unit



Distribution

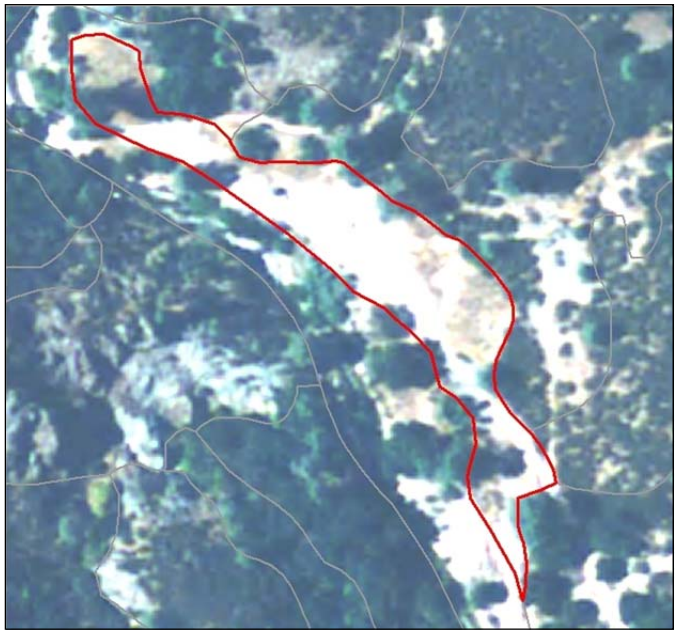
Description:
The *Rosa californica* Shrubland Alliance is mapped as dense stands of shrub thickets consisting of very dominant *Rosa californica* at high cover. The thickets are usually small patches in riparian corridors and floodplains. This type is mapped within the park, buffer, and expanded study area.

Photo Signature:
Rosa californica appears as short dense thickets with a bright green color, very smooth texture, and rounded edges. The thickets may occur in small groups.

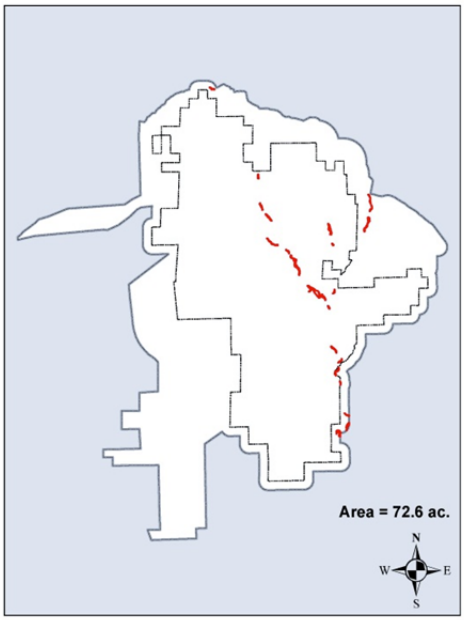
Types with Similar Signature:
Southwestern North American Riparian/Wash Shrubland Group – 3400

4004 –Alluvial Herb and Shrub Vegetation Mapping Unit

(*Artemisia dracunculus*)-*Gnaphalium canescens* Herbaceous Vegetation
Artemisia dracunculus Alluvial Fan Herbaceous Vegetation



Aerial Photo Mapped Unit



Distribution

Description:
The Alluvial Herb and Shrub Vegetation Mapping Unit is mapped as open to very sparse stands of herbaceous vegetation on floodplains and flat canyon bottoms. Scattered shrubs may occur within the stand. This class may contain *Artemisia dracunculus*, *Artemisia douglasiana*, *Lotus scoparius*, *Eriogonum fasciculatum*, *Escholtzia californica*, and *Lupinus albifrons* in various combinations at very low cover. Riparian shrubs, including *Salix lasiolepis* and *Baccharis salicifolia*, and trees, including *Salix laevigata*, *Platanus racemosa*, *Quercus agrifolia* and *Pinus sabiniana*, may also be present at very low cover or occurs in immediately adjacent stream channels. This mapping unit is found on sand or gravel bars and active floodplain terraces adjacent to braided stream channels, as well as in alluvial canyon bottoms, and bare dry active stream channels. Because of frequent flooding it usually has a very sparse vegetative cover. This type is mapped within the park and buffer.

Photo Signature:
The mapping unit appears as a white signature with very sparse vegetation and a sandy to gravelly substrate. Tiny dots of vegetation are visible. In denser more moist areas an herbaceous stand may appear green in color. The units are either of very limited extent, or can run along the canyon and/or floodplain stream drainage.

Types with Similar Signature:
Pinus sabiniana Woodland Alliance – 1210
Southwestern North American Riparian Evergreen And Deciduous Forest Group – 1300

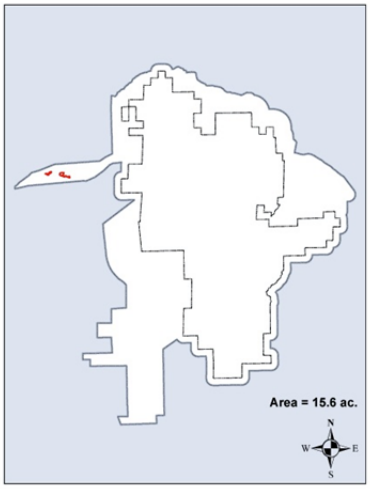
California Coastal Scrub Shrubland Macrogroup – 3300
Eriogonum fasciculatum Shrubland Alliance – 3330
Southwestern North American Riparian/Wash Scrub Shrubland Group – 3400
Western North America Wet Meadow And Low Shrub Carr Macrogroup – 4500

4101 – Bulrush–Cattails Herbaceous Vegetation Mapping Unit

Scirpus spp.-*Typha* spp. Herbaceous Vegetation Mapping Unit



Aerial Photo Mapped Unit



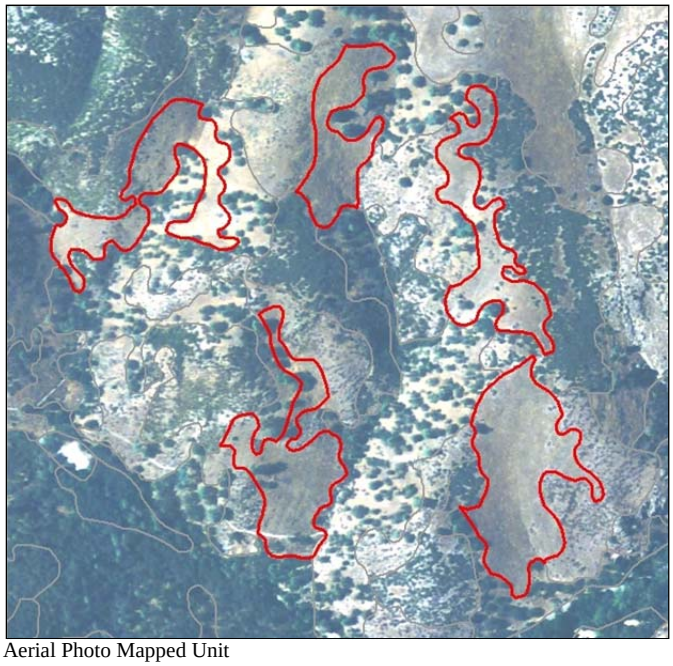
Distribution

Description:
The *Scirpus* spp.-*Typha* spp. Herbaceous Vegetation Mapping Unit is mapped where herbaceous vegetation is situated in standing water. *Scirpus* spp. or *Typha* spp. may be present at high to low cover. It is found on the flat edges of water bodies or in shallow water. This class is mapped within the park, buffer, and expanded study area.

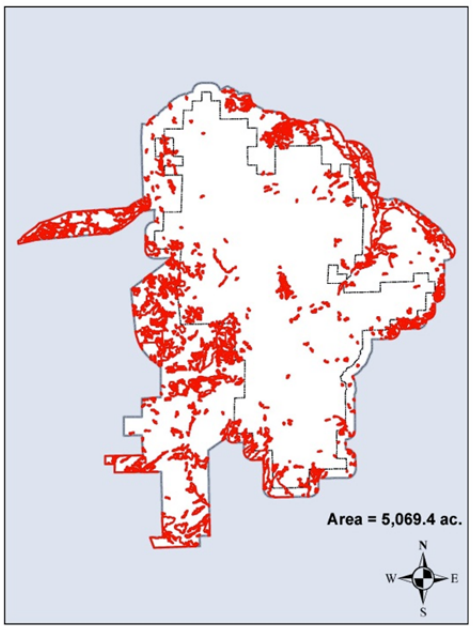
Photo Signature:
The signature of the plant is bright to medium green within the black or dark blue to light blue signature of the water body.

Types with Similar Signature:
Western North America Wet Meadow And Low Shrub Carr Macrogroup – 4500
Water Mapping Unit – 9500

4300 – Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Group



Aerial Photo Mapped Unit



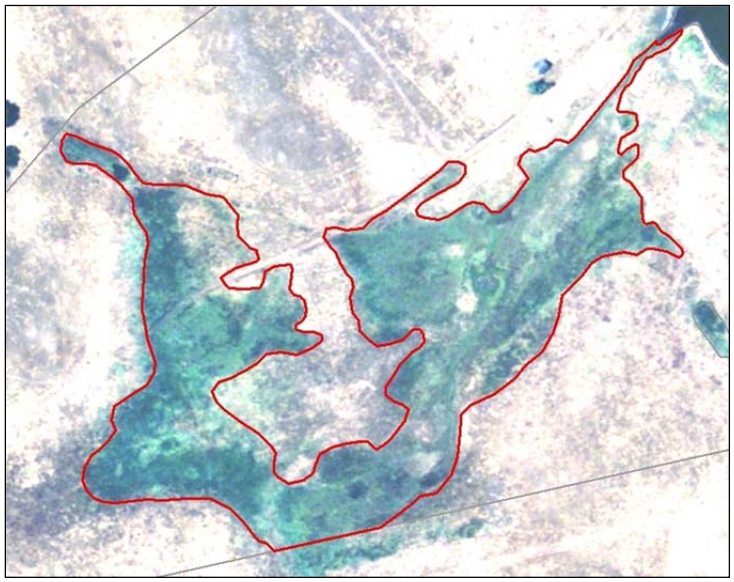
Distribution

Description:
The Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Group is mapped as dense to sparse stands of grasses at high to moderate cover. There is usually a thin to deep soil layer that allows for grassy vegetation. There may be some limited rocky areas where *Selaginella bigelovii* and *Eriogonum fasciculatum* may be present at very low cover. Stands of dense to open *Artemisia dracunculus* on floodplains are included. The mapping unit typically occurs on level to gentle slopes in all aspects, but at times may occur on moderately steep slopes. It is usually found on canyon bottoms, floodplains, and lower slopes, but can occur on mid to upper slopes. This type is mapped within the park, buffer, and expanded study area. The rockier, thin substrate grassy areas are mapped as Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit (9420).

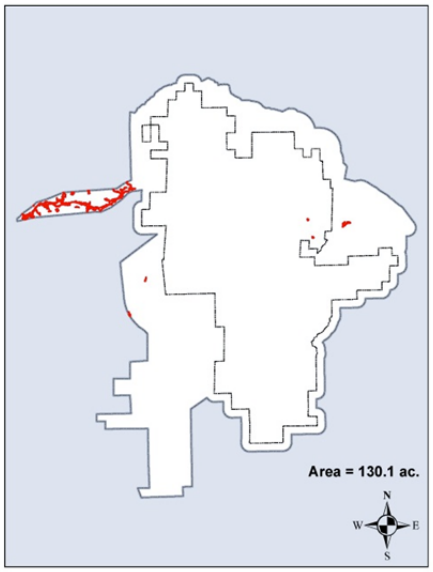
Photo Signature:
The grasslands appear as brown, tan to light tan or yellow areas with a smooth texture. In rockier areas they may be mottled with white or gray rocky exposures and scattered shrubs.

Types with Similar Signature:
Californian Xeric Chaparral Shrubland Group – 3101
Eriogonum fasciculatum Shrubland Alliance – 3330
Western North America Wet Meadow And Low Shrub Carr Herbaceous Vegetation Macrogroup – 4500
Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit – 9420

4500 – Western North America Wet Meadow And Low Shrub Carr Herbaceous Vegetation Macrogroup



Aerial Photo Mapped Unit



Distribution

Description:
The Western North America Wet Meadow And Low Shrub Carr Herbaceous Vegetation Macrogroup is mapped as dense herbs, grasses, and forbs in moist areas such as seeps and springs, and adjacent to wet stream channels and moist floodplains. Plants may include *Carex* spp., *Juncus* spp., *Scirpus* spp., *Typha* spp., wet graminoids, and sparse sandbar vegetation, including *Artemisia dracunculus*. Vegetation in standing water is mapped as *Scirpus* spp.-*Typha* spp. Herbaceous Vegetation Mapping Unit (4101). This type is mapped within the park, buffer, and expanded study area.

Photo Signature:
The moist herbaceous vegetation typically has a bright to medium green signature with a smooth texture. It may include the sand bar areas, which have a white to gray signature.

Types with Similar Signature:
Scirpus spp.-*Typha* spp. Herbaceous Vegetation Mapping Unit – 4101
Mediterranean California Natrualized Annual and Perennial Grassland Herbaceous Vegetation Group – 4300

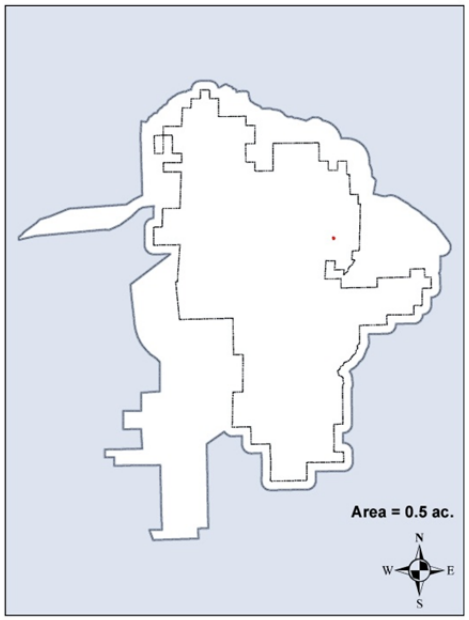
4510 – DeerGrass Herbaceous Vegetation Alliance

Muhlenbergia rigens Herbaceous Vegetation Alliance

Muhlenbergia rigens Herbaceous Vegetation Association



Aerial Photo Mapped Unit



Distribution

Description:

The *Muhlenbergia rigens* Herbaceous Vegetation Alliance is mapped as open to sparse stands of herbaceous vegetation. *Muhlenbergia rigens* is dominant at high to moderate cover. Only one site was mapped, in McCabe Canyon, on the flat canyon bottom.

Photo Signature:

The site mapped as *Muhlenbergia rigens* is not distinguishable from wet graminoids. It appears as a medium green signature with a smooth to bumpy texture.

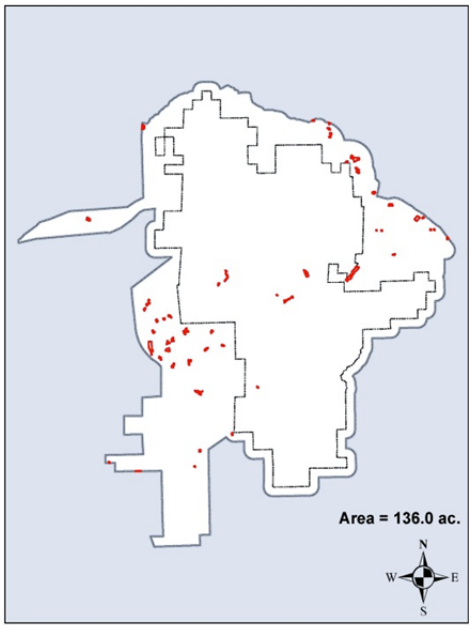
Types with Similar Signature:

California Coastal Scrub Shrubland Macrogroup – 3300
Alluvial Herb and Shrub Vegetation Mapping Unit – 4004
Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Group – 4300
Western North America Wet Meadow And Low Shrub Carr Herbaceous Vegetation Group – 4500

9100 – Built-up Mapping Unit



Aerial Photo Mapped Unit

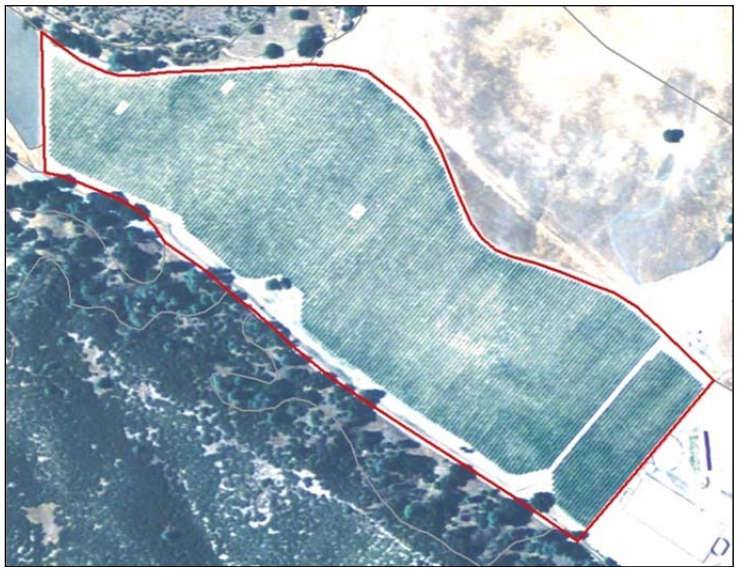


Distribution

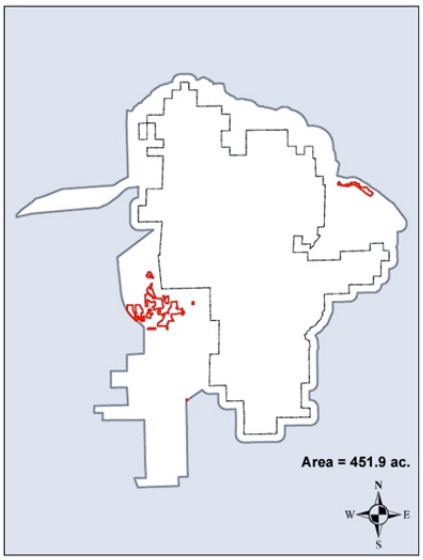
Description:
The Built-up Mapping Unit is mapped in areas consisting of man-made structures that are used for residential, commercial, industrial, or utility purposes. Vegetation is very limited, sparse, or not present. If significant vegetation occurs in a land use area, then the appropriate vegetation class is used. This class is mapped within the park, buffer, and expanded study area.

Photo Signature:
The signature shows one or more building structures, usually in a cluster. Their associated grounds, landscaped areas, parking areas, or activity disturbances area are included.

9200 – Agriculture Mapping Unit



Aerial Photo Mapped Unit

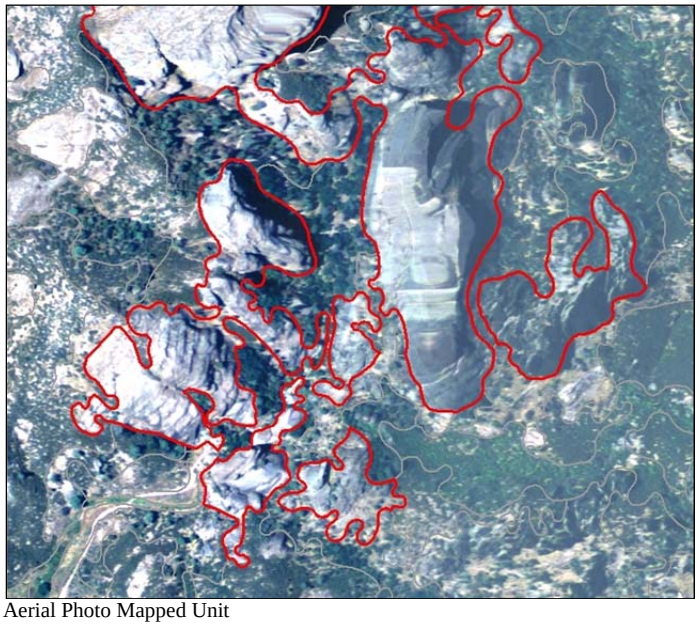


Distribution

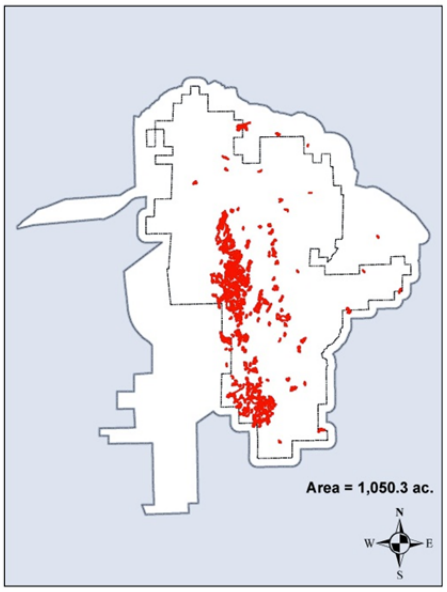
Description:
The Agriculture Mapping Unit is mapped in areas consisting of open space agricultural uses including corrals and pens, orchards, vineyards, cropland, and nurseries. Trees may be present in open pasture or field crop areas, in which case the appropriate woodland alliance class may be used. This mapping unit is mapped within the park, buffer, and expanded study area. Farm buildings including residences, barns, and outbuildings are mapped as the Built-up Mapping Unit (9100). Fenced grasslands are mapped as California Annual Grasslands Herbaceous Vegetation Mapping Unit (4310).

Photo Signature:
Corrals and pens appear as a series of square, rectangular or straight-sided fenced enclosures covering very small areas. Vineyards are usually consecutive thin rows of green vegetation showing some relief. Orchards are an array of green trees in a consistent pattern of rows and columns. Cropland is consistent, green, smooth vegetation or thin rows of green vegetation showing very low relief. Freshly tilled fields are also included. Nurseries are thin rows of vegetation that are not in a consistent pattern of color or texture. They also include temporary greenhouse structures of white or gray.

9420 – Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit



Aerial Photo Mapped Unit



Distribution

Description:
The Cliffs, Rock Outcrops and Steep Eroded Slopes Mapping Unit is mapped as rocky exposures with no to low cover of vegetation. They can appear as steep cliffs, pinnacle rock formations, or low flat rocky areas, and herbaceous areas with thin soils. Scattered trees and shrubs, including *Pinus sabiniana*, *Juniperus californica*, *Quercus agrifolia*, *Quercus wislizenii*, *Adenostoma fasciculatum*, *Ceanothus cuneatus*, *Cercocarpus montanus*, *Prunus ilicifolia*, *Heteromeles arbutifolia*, *Arctostaphylos glauca*, and *Arctostaphylos pungens* may be found. *Salvia mellifera* and *Eriogonum fasciculatum* may be present at very low to low cover. Patchy stands of herbaceous vegetation, including grasses, may also be present at very low to low cover as a mosaic, especially with low profile rock outcrops. *Selaginella bigelovii*, however may be present at very low to high cover. Mesic shrubs and trees tend to occur at the bottom edges of the rock pinnacles and cliffs, with some also situated in narrow cracks in the outcrop. Scree or talus may be present within the cliff, outcrop, or eroded slope. Grasses and *Selaginella bigelovii* can occur on flatter areas with thin substrate. This mapping unit is mapped within the park, buffer, and expanded study area.

Photo Signature:
Cliffs, rock outcrops, and steep eroded slopes can appear as white, gray, or tan colors with a mottled appearance and a smooth to rough texture. Green to dark green shrubs may be visible. The grasslands appear tan to light tan with a smooth texture. Rockier areas are mottled with white or gray. The tan of grass will mix or mosaic with the white or gray of rock. The grass signature in the rocky areas can appear flat and low in height grading into the thin-soil areas.

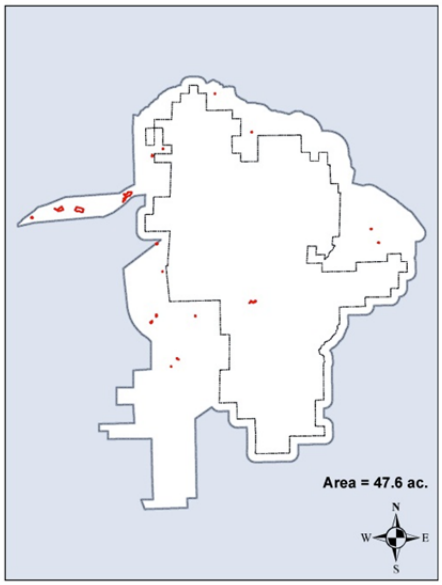
Types with Similar Signature:

Pinus sabiniana Woodland Alliance – 1210
Californian Xeric Chaparral Shrubland Group – 3101
California Coastal Scrub Shrubland Macrogroup – 3300
Eriogonum fasciculatum Shrubland Alliance – 3330
Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Group – 4300

9500 – Water Mapping Unit



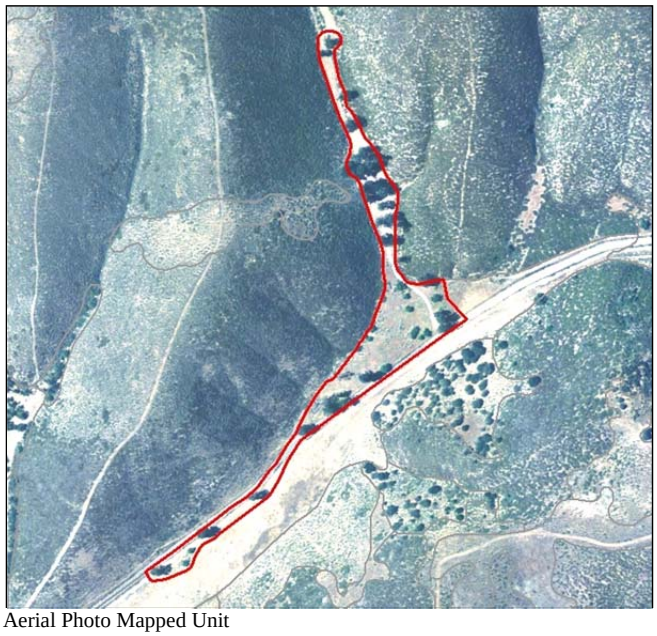
Aerial Photo Mapped Unit



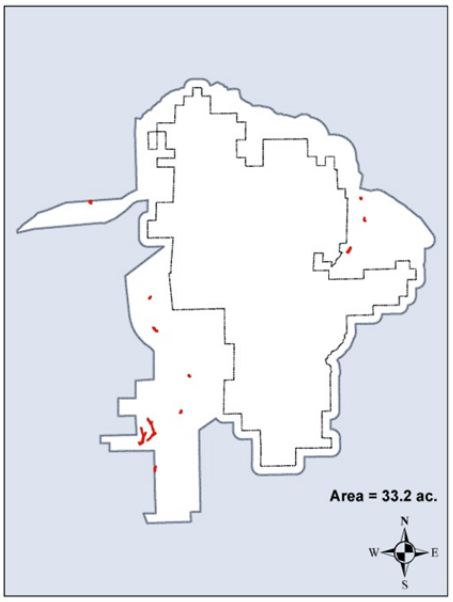
Distribution

Description:
Water bodies such as man-made ponds and reservoirs are included here. Water has a black or deep blue signature on the imagery. Sometimes it may have a white or silvery appearance from reflected sunlight. If the signature shows vegetation growing within the water body, then the *Scirpus* spp.-*Typha* spp. Herbaceous Vegetation Mapping Unit (4101) is mapped for that portion of the water body. This class is mapped within the park, buffer, and expanded study area.

9600 – Planted Trees & Shrubs Mapping Unit



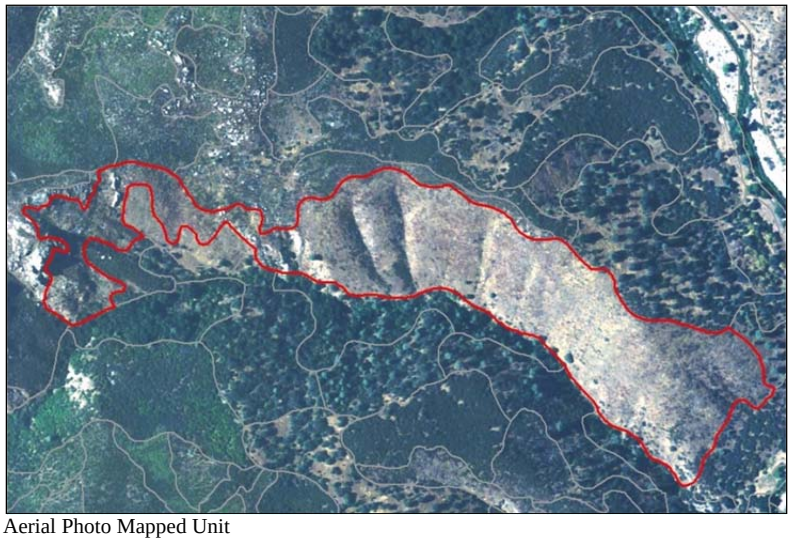
Aerial Photo Mapped Unit



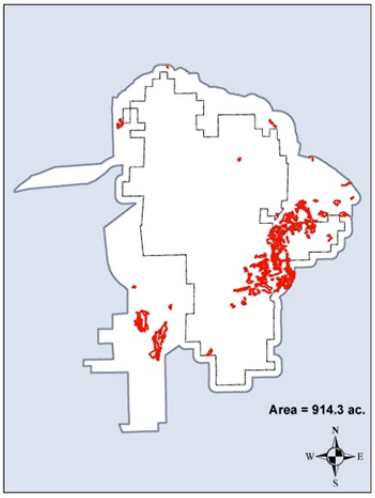
Distribution

Description:
The Planted Trees & Shrubs Mapping Unit is mapped as areas consisting of exotic trees and shrubs. Trees may include *Eucalyptus* spp., *Schinus molle*, and non-native conifers. Exotic trees and shrubs are common in land use areas. Orchards and vineyards are mapped as Agriculture Mapping Unit (9200). Exotic trees are difficult to photo interpret and differentiate from native trees due to the limitations of the imagery. Proximity to land use, context, and supplemental field site visits assist in interpretation of this mapping unit. This mapping unit is mapped within the park, buffer, and expanded study area.

9700 – Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Regeneration Mapping Unit



Aerial Photo Mapped Unit



Distribution

Description:
The Post Burn and Post Disturbance Undifferentiated Shrub and Grass-Herb Regeneration Mapping Unit is mapped as open to very sparse stands of short regenerating shrubs, grasses, and/or herbaceous vegetation that has been disturbed by man-induced activity, grading, or fire within the last ten years. Most shrubs are short and sparse, and are therefore unidentifiable by photo interpretation within the imagery limitations. Attempts were made to identify the vegetation through alternate means. Typically there are no releve sites in the burned or disturbed areas. Field visits were used in some cases to help in the identification of the shrubs present. Shrubs present following disturbance may include *Lotus scoparius, Eriodictyon tomentosum*, *Malacothamnus aboriginum*, *Dendromicon rigida*, *Salvia mellifera*, and *Eriogonum fasciculatum* at moderate to very low cover. *Adenostoma fasciculatum* or *Ceanothus cuneatus* may be present at low to very low cover, regenerating from crown sprouting or seeding after disturbance. Grasses and herbs may also be present at high to very low cover. This mapping unit is mapped within the park, buffer, and expanded study area. If a burned/disturbed stand was determined to be dominant xeric shrubs, then it was mapped as Post Burn and Post Disturbed Xeric Chaparral Shrubland Mapping Unit (3104). If a burned/disturbed stand was determined to be in a mesic environment, usually with *Ceanothus cuneatus* dominant, then it was mapped as Post Burn and Post Disturnbed Mesic Chaparral Shrubland Mapping Unit (3103). If a burned/disturbed stand is not otherwise identifiable then it is mapped as 9700.

Photo Signature:
Sparse vegetation is very difficult to identify with the imagery, unless it occurs in denser clumps. Regenerating *Adenostoma fasciculatum* is dark green in color and appears as very small individuals. *Eriodictyon tomentosum* appears as white, gray, or bluish-gray color with a soft texture. It occurs in clumps or patches. *Eriogonum fasciculatum* can be reddish-brown in color, but sometimes appears tan or gray. It usually occurs as small individuals, but can also appear as

clumps. *Salvia mellifera* will appear as medium green, gray, or tan. *Lotus scoparius*, *Dendromecon rigida*, and *Malacothamnus arboriginum* are very difficult to identify on the imagery.

Types with Similar Signature:
Post Burn and Post Disturbance Californian Chaparral Shrubland Mapping Unit – 3103
Post Burn and Post Disturbance Californian Xeric Shrubland Mapping Unit – 3104
Mediterranean California Naturalized Annual and Perennial Grassland Herbaceous Vegetation Macrogroup – 4300

COVER CLASS DENSITY VALUES
Conifer, Hardwood, Shrub

1 = >60%
2 = 40-60%
3 = 25-40%
4 = 10-25%
5 = 2-10%
9 = None

LAND USE MAP UNITS

100 – Urban – Non-park facilities and private in-holdings
- 110 – Residential (includes farmsteads [residences with associated farm buildings] along Hwy 25, Regan ranch, Schmidt ranch, McCabe Canyon, and the West side)

200 – Agriculture
- 210 – Cropland
- 220 – Orchards and Vineyards
- 230 – Other Agriculture

300 – Mining

400 - National Park/Monument Facilities
- 401 – Bear Gulch Facilities (Headquarters, Visitor Center, Employee Residence, Parking, Restroom)
- 402 – Chalone Creek Facilities (Maintenance, Employee Residence)
- 403 – Bear Gulch Parking (Parking, Restroom)
- 404 – Pinnacles Campground Facilities
- 405 – Chaparral Facilities (Visitor Center, Parking, Picnic Area, Employee Residence)
- 408 – Eastern Addition Former Farmsteads
- 409 – Eastern Addition Airport Buildings
- 410 – North Chalone Peak Lookout/Restroom

800 - Water

900 - Vacant

Appendix K

Crosswalk 2009 Map Classes to 2005 Map Classes

Natural Resource Report NPS/2012/NRR—2012/574

NatureServe
4001 Discovery Drive, Suite 2110
Boulder, CO 80302

Aerial Information Systems, Inc.
112 First Street
Redlands, California 92373

September 2012

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

Crosswalk of AIS 2009 Map Classes with Univ MT 2005 Map Classes.

AIS 2009 Map Classes	**Univ Mt 2005 Map Classes**
Woodlands	**Woodlands**
1200 – California Evergreen Coniferous Forest & Woodland Group	W1 Oak/Pine
1210 – Foothill Pine Woodland Alliance	W1 Oak/Pine
1220 – California Juniper Woodland Alliance	W1 Oak/Pine
1300 – Southwestern North American Riparian Evergreen and Deciduous Forest	W3 Mixed Riparian
1310 – California Sycamore Temporarily Flooded Woodland Alliance	W3 Mixed Riparian
1311 – California Sycamore-Coast Live Oak Woodland Association	W3 Mixed Riparian
2100 – Californian Broadleaf Forest and Woodland Group [non-deciduous]	W1 Oak/Pine
2110 – Coast Live Oak Woodland Alliance	W1 Oak/Pine
2200 – Californian Broadleaf Forest and Woodland Group [deciduous]	W1 Oak/Pine
2210 – Blue Oak Woodland Alliance	W1 Oak/Pine
2212 – Blue Oak/Mixed Herbaceous Woodland Association [Park/Buffer]	W1 Oak/Pine
2220 – California Buckeye Woodland Alliance	W2 Buckeye
2230 – Valley Oak Woodland Alliance	W1 Oak/Pine
2231 – Valley Oak-Coast Live Oak/Grass Woodland Association [Park/Buffer]	W1 Oak/Pine
Shrublands	**Shrublands**
3100 – Californian Chaparral Shrubland Macrogroup	S1, S2, S3
3101 – Californian Xeric Chaparral Shrubland Group [Park/Buffer]	S1, S2, S3
3103 – Post Burn and Post Disturbance Californian Chaparral Shrubland	S1, S2, S3
3104 – Post Burn and Post Disturbance Californian Xeric Chaparral Shrubland	S1, S2, S3
3150 – Hollyleaf Cherry Shrubland Alliance [Park/Buffer]	S4 Prunus/MixedChaparral
3160 – California Scrub Oak Shrubland Alliance	W1 Oak/Pine

3200 – Evergreen Coastal Scrub Shrubland Group	W1 Oak/Pine
3210 – Coyote Brush Shrubland Alliance	W3 Mixed Riparian
3300 – California Coastal Scrub Shrubland Macrogroup	S5 Buckwheat/Cal.Sage
3330 – California Wild Buckwheat Shrubland Alliance [Park/Buffer]	S5 Buckwheat/Cal.Sage
3360 – Black Sage Shrubland Alliance [Park/Buffer]	S6 Chamise-Black Sage
3370 – California Sagebrush-California Wild Buckwheat Shrubland Alliance	S5 Buckwheat/Cal.Sage
3400 – Southwestern North American Riparian/Wash Scrub Shrubland Group	W3 Mixed Riparian
3410 – California Rose Shrubland Alliance	W3 Mixed Riparian
Herbaceous	**Herbaceous**
4004 – Alluvial Herb and Shrub Vegetation Mapping Unit [Park/Buffer]	W3 Mixed Riparian
4100 – Western North America Freshwater Marsh Herbaceous Vegetation Macrogroup	G Grassland/Herbaceous
4101 – Bulrush–Cattails Herbaceous Vegetation Mapping Unit	G Grassland/Herbaceous
4300 – Mediterranean California Naturalized Annual and Perennial Grassland	G Grassland/Herbaceous
4500 – Western North America Wet Meadow And Low Shrub Carr Herbaceous	G Grassland/Herbaceous
4510 – Deergrass Herbaceous Vegetation Alliance [Park/Buffer]	G Grassland/Herbaceous
Other	
9100 – Built-up Mapping Unit	N Sparse/Non-veg
9200 – Agriculture Mapping Unit	G Grassland/Herbaceous
9400 – Sparsely Vegetated to Non-vegetated Mapping Units	N Sparse/Non-veg
9420 – Cliffs, Rock Outcrops, and Steep Eroded Slopes Mapping Unit	N Sparse/Non-veg
9500 – Water Mapping Unit	n/a
9600 – Planted Trees & Shrubs Mapping Unit	n/a